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Reflections on Technique Conceptions in Marx, Spengler, Mumford and Ellul

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Abstract

Due to the importance and consequent impacts that technology has been causing on society, studies in the History of Technology have been gaining increasing space in the academic environment. These studies have diverse objectives and aim to shed light on the multiple uses of technology. In labor relations, through remote work, in education systems, through distance learning, in economic production, aiming at increasingly automated systems, and cheaper products that are better adapted to consumer tastes. In the areas of health, with increasingly revolutionary applications, urban mobility, autonomous vehicles, and practically all sectors of social and political life, in view of this global panorama, the History of Science, Technology and Epistemology Program (HCTE) at UFRJ has been offering courses focused on a critique of technological development. This paper is an excerpt from a set of reflections on technology by three professors in the field.

Keywords

Science and Technology, Technology and Society, History of Technology, Philosophy of Technology

1. Introduction

Critical studies on technology[1], philosophical reflections on its meaning, history and sociology, have increasingly received attention in literature and academia,

[1]A preliminary distinction between technique and technology can be characterized, as: technique, as belonging more to the domain of action (immediate or not) of man in relation to the environment that surrounds him (nature and later also culture), and therefore not restricted to artifacts and things, but also to processes (speech techniques, organization, etc.). Technology, referring more to doing things in accordance with scientific knowledge, arising from modern science. One of the purposes of this paper is to shed light on reflections on this distinction by addressing the various authors that will be presented in the body of this work.

given their scope, invading every imaginable corner of reality. In addition to their significant presence in economic studies, their most visible and oldest *locus* of attention, research on technical developments appears intensely in the areas of health, education, leisure, energy, communication and transportation, to name the most notable. In literature, there is already an increase in topics related to both the philosophy of technology (Feenberg, 1991) and ethical issues related to the modern technological world, attracting the attention of many scholars (Coyne, 2021). There are countless themes raised by modernity that are relevant to research and studies. Here we can highlight just a few, such as: Is technical development (technology) autonomous? What factors determine changes in techniques, the economy, social needs, chance, politics? And, conversely, how does technical evolution determine social changes, the economy and politics? Do they harm or enhance cultural development? Do they contribute to human well-being, or to what extent do they cause problems for human beings? Is it morally permissible to produce anything technically? Do technical discoveries increase or restrict our freedom? Are techniques solutions or causes of the degradation of the environment that our civilization now faces (Dominique & Grüber, 1996)? How does the issue of profit interact with technology? What are the relationships between technology and traditional knowledge, virtue and beauty? What is the meaning of saving time? Is it positive or negative for human development?

These questions are certainly linked and illustrate the ubiquity that technical development brings to the contemporary world (Ellul, 1954).

In order to better understand the role of technology in society and its interaction with politics, economics, industry, education, leisure and the production of physical or cultural goods, we will focus on studies by authors who deal with the history of technology itself, as well as authors who work more on what we can call the sociology and philosophy of technology, but who base their discussions on technical development. Authors who contribute to clarifying the role of technology in society from a historical perspective (Bernal, 1953).

Preliminary studies have indicated that the History of Techniques is a subject that has not been widely developed in academia. It does not yet have the same scope as the History of Sciences. The latter already has a Scientific Society in Brazil, and its community has participated in and promoted seminars, congresses, and national and international meetings. These meetings on the History of Sciences often seek to cover topics related to the History of Techniques, thus allowing it to remain a particular interest, especially due to historiographical and current considerations about its understanding: techniques, as well as economics, culture, and science are intertwined, in such a way that the understanding of scientific development is sometimes more solidly established when problems concerning the evolution of techniques are taken into account (Oliveira, 2024). Here, the notion of evolution has to do with "evolving" over time; this notion is related to the ideas of overcoming (conserving and innovating) and complexification in which current techniques seek to deal with updated and more complex problems. Furus

on the particular, but who dothermore, it is possible to formulate the idea that more detailed studies on the technique and its evolution provide particularities that help us understand Social History in a broad sense (Daumas, 1962).

In this sense, the History of Techniques presents itself, from the outset, with a vast scope and, therefore, a work of delimitation and choice of the object of study, period and location becomes necessary (Baudet, 2016). As a reference, we will use the research and study work carried out at HCTE in its master's and doctoral programs.

Delimitation becomes necessary and useful as, routinely, one can list a multitude of types and forms that the technique assumes: oratory; writing; painting; production of goods, services and instruments; healing; training; etc. In short, it is necessary to clearly characterize the object of study in order to build a discipline that has it as its center of attention. In order not to lose the feeling of this multitude of considerations, within the scope of an edition of the discipline, we chose authors who present positions on the technique that refer to a vision of totality. Authors who instigate us to focus on the particular, but who do not distance themselves from the concept of totality imprinted on the Technique. Therefore, we are not dealing with historians who have dealt with the History of Techniques in a strict sense, but rather those who have correlated and integrated it with other aspects of society and culture as a whole. However, the ultimate goal is always the everyday concerns of how we can understand the most immediate relationships, of techniques, with the social whole to be included in the debate on issues related to sustainability, with a view to building a more harmonious, fair and democratic society (Daly & Farley, 2004).

It is now a question of pointing to the place where we intend to hold discussions. Technique is situated in the sphere of action. Here we will deal preferably with techniques related to production, that is, with the relationship between man and nature with a view to the production of goods and services, and with how the survival of human beings has always depended on humanity's connection with the natural environment (Røpke, 2004).

There is an old question, especially since the 19th century, that runs through all discussions about technique (or technology) and that will be given priority in this text, due to its importance as a differentiating element among the most diverse scholars of the question of technique and its instigating power to make people take political and human positions in the face of technical facts.

It is essentially about incorporating a positive or negative value judgment of technique. The aim is to direct the study and discussion of important authors on this theme, seeking to identify the extent to which technical and technological developments are considered beneficial or harmful to society by them. The most prosaic view of engineers, or people who work or are directly responsible for the construction of technical devices, is that technology is the projection of human organs increasing their power to manipulate materials; they therefore focus their attention on the potential of technological progress, per se, as a way of maximizing

production and multiplying human capacity provided by Technique (Kirby et al., 1956). The human being is seen in a universal way, without paying attention to the role of each one in production. Here we observe how this discussion about technique (technology) is quite political, that is, it is an element that actively participates, today more than ever, in the games of management and power.

Furthermore, we would like to add that ecological and environmental issues, which have been much debated in recent times, have reintroduced debates on technical progress in a renewed way, largely rescuing this hidden conflict in its development. Here, technology appears, for now, as the solution to burning problems of our social and economic reality and, for now, as the cause of the problems—polluting and destroying the environment that is so essential for the continuity of life on earth (Mayumi, 2001).

There are many thinkers and scholars who have, in one way or another, studied the technical phenomenon. However, a smaller number of them have managed to broadly influence thinking about technology and build a school of thought revolving around technology. When they do so, they are able to relate technical production to other social activities, relating it to culture or the economy or, in the case of more recent thinkers, creating a philosophy of technology. It was this thought that guided the authors of this work in creating the criteria for the thinkers we will study from the next item onwards.

2. Karl Heinrich Marx (1818-1883)

A significant author for the debate on the History of Technology is Karl Marx[2]: a 19th-century philosopher, sociologist, economist and politician. Marx did not produce a History of Technology (Oliveira, 2022) in a strict sense. Nor did he evaluate technical development in a universal way as something common to all historical periods. He always considered both technology and science in a particular way: as determined and determining the capitalist system. Determined: because both had in capitalism a cultural *humus* conducive to sharp growth, they were linked to the production of goods and favored its development. Determining: because they dynamized capitalism itself from its inception and over time, both, each in their own way, came to show themselves to be effective ways of exploiting and controlling the labor of portions of the population.

In "Capital", Book I, chapters XI to XIII, Marx deals with technology linked to social relations of production where some own the means of production and others only hold their labor power. Thus, technology in capitalist production is an element (like science and machines) through which the capitalist extracts surplus value from the worker and enables the valorization of capital. In this work process, the worker lost his subjectivity as he stopped controlling his work instrument and the pace of his production: the machine began to reign supreme over these aspects.

[2]Marx's thought influences several areas: such as philosophy, geography, history, law, sociology, literature, pedagogy, political science, anthropology, biology, psychology, economics, theology, communication, administration, design, architecture, among others. A survey conducted by BBC Radio 4 in 2005, he was elected the greatest philosopher of all time. (extracted from Wikipedia).

This led to the separation between the conception and execution of work in the worker's domain. The conditions of mechanized work made the individual worker dispensable in the work process. He became a mere appendage of the machine. As a result, man became dependent on machines, impoverishing and fragmenting his actions and thoughts (Oliveira, 2014).

In the conditions set by Marx, we see that the negativity of technology outweighs the positive aspects of this part of Capital. In other chapters and in the prefaces, he extols the value of science. In the preface to the French edition, he concludes by saying: "There is no royal road to science, and only those who endure the toil of climbing it by steep paths have a chance of reaching its luminous peaks[3]." According to him, Darwin's book provoked in Marx a basis in natural science for the class struggle in history[4]. Thus, Marx was aware of and valued scientific knowledge.

The purpose of technology in the capitalist mode of production is to produce exchange values to realize Capital, but this is done with the substrate of the use value present in the commodity. When it becomes essential to talk about the use value of commodities and relate it to the conditions of their production, where knowledge and technology come into play, it does not show negativity but rather positivity, linked to the creative faculties of men. But, even here, Marx always rescues the subsumption of science and technology by capital (Oliveira, 2021). This contradiction and tension between use value and exchange value, between abstract and concrete labor, between science and technology as positive and negative for human development is always remembered. The following excerpt is paradigmatic, as it illustrates this tension well:

> Machinery, as an instrument, shortens working time, makes work easier, is a victory of man over natural forces, increases the wealth of those who really produce, but, with its capitalist application, it generates opposite results: it prolongs working time, increases intensity, enslaves man through natural forces, and impoverishes the true producers[5].

In Marx we find no indication that technology is a liberator for the worker, but we also find nothing that discredits scientific and technical knowledge in itself, although he confirms that scientific and technical knowledge has been increasingly useful within capitalism for the expansion and valorization of capital. He states that, in the Industrial Revolution, technical discoveries helped to further intensify the work of the workers themselves, demanding more attention, care and longer working hours from them. So, if, on the one hand, technical discoveries were positive in multiplying the production of goods with less physical effort from

[3]Marx, Karl. *Capital: Critique of Political Economy.* Book 1, Volume I, Rio de Janeiro, Editora Civilização Brasileira, 1971, p. 19.

[4]Karl Marx and Friedrich Engels, *Selected Correspondence 1846–1895* (New York: International Publishers, 1975), 126 in MECW vol. 41, 232. This passage is translated "the book which, in the field of natural history, provides the basis for our view."

[5]Marx, Karl. Capital: Critique of Political Economy. Book 1, Volume I, Rio de Janeiro, Editora Civilização Brasileira, 1971, p. 506.

a given individual, on the other hand, they were negative in intensifying human labor for a significant portion of society: the workers. It is worth remembering here that at the beginning of the Industrial Revolution, the working day was 14 hours. It is worth noting that this working day did not decrease over time over the centuries because the machine was more productive and yes, because the workers fought for it. For Marx, the context in which the machine expanded its actions, in the so-called Industrial Revolution, the exploitation of the workforce was immense due to the relations of production and not due to the machine.

In short, Marx begins a careful study of what a tool and a machine are, prototypes of technology in the field of material production, limited to the capitalist mode of production, which means that the discussion on technique and technology has a necessary and inseparable link with social and economic events, establishing that technical developments do not benefit all social classes and, furthermore, deny and destroy the subjectivity of the man who works in industrial production. In capitalism, machines are built and improved to obtain greater profit and not to alleviate human labor.

A relevant debate for contemporary times within the Marxist field that deals with science and technology refers to Jürgen Habermas (1929-), considered one of the last representatives of the Frankfurt School. In 1968, he wrote a book, "Technique and Science as Ideology," establishing a debate with Herbert Marcuse (1898-1979). In his book, "The Ideology of Industrial Society", the author states that science and technology in late capitalist societies have come to play an ideological role. When questioning this, Habermas brings to the debate whether science and technology refer to the development of man as a species, or whether they refer to science and technology linked to social classes.

3. Oswald Spengler (1880-1936)

Oswald Spengler[6] (Spengler, 1980) published the book "The Decline of the West" from 1918 to 1922, and "Man and Technology" in 1931. These books caused a strong impact at the time of their publication, and in them Spengler discussed technology, affirmed the decadence already established in Western civilization, and presented history as consisting of cycles of peoples who developed culturally and materially, reaching a peak, then stagnating and declining. The leap in development of these people was due to their ability to fight and defeat other people and their nature. The people were not aware of this process, only at the moment of maximum development did some people have a vision of imminent decline.

[6]Oswald Arnold Gottfried Spengler was born on May 29, 1880, and died on May 8, 1936. He was a German historian and philosopher whose work *The Decline of the West* (1918) became a landmark in the historiographical, philosophical and political debates of the European intelligentsia during the 20th century. He was the son of a postal worker and studied at the Universities of Munich, Berlin and Halle. He was a professor of Mathematics in Hamburg. A supporter of a "conservative revolution", he campaigned in favor of the traditional Prussian virtues: work, discipline and authority. Many of his positions were adopted by National Socialism, but Spengler himself was a staunch critic of that movement, especially its racism. He published the book on Technique that will be discussed in the body of this work: Spengler, O Homem e a Técnica. Lisbon, Portugal, Guimarães e Cia. Editores, 1980.

Spengler identified the phase of development as Culture, and the phase of stagnation and decline as Civilization, and defended pure spirituality in his works, attributing to the machine the direct or indirect cause of man's spiritual decadence.

To present his conception of History, he begins by defining the most important characteristics of the human being. To do this, he creates a taxonomy of living beings based on their "souls" and not on their anatomy. At the basic level, there is the plant. It lives, breathes, feeds and reproduces, but it cannot choose, it does not move.

At the next level are unicellular animals, up to palmipeds and ungulates. They are tied to the immobile plant world, which cannot escape. They do not need special tactics to seek food.

At the highest level are hunting animals. They kill, and for them killing is life. The victim is a mobile, a fighter, cunning, uses escape, speed and concealment. The hunter is the "highest" form of life, has autonomy, responsibility for himself, integrity, and the need to assert himself through combat for victory. The herbivore defends itself and allows itself to be led and tamed; the carnivore has a rectilinear attack movement and does not submit. Herbivores are dominated by hearing and smell, carnivores by sight. The herbivores' eyes are lateral to control the surrounding world; the predator's eyes are directed forward, fixated on the victim, and dominate space and time. Technique is their life tactic.

For this German philosopher, the human being is an intrepid, cunning predator. The innate superiority of carnivores expanded externally to the world and internally to the "soul". Herbivores live by numbers, in herds, by gregarious action. The predator is the enemy of others, expels others from its lair, has property, and it is here that the "authentic idea of property" emerges, it is the sovereign right to dispose of one's space and things and is cruel. It lives by attacking, killing and destroying. This is its immutable nature. It reveals itself throughout the historical process. Thus, in the struggle for life, animals have developed techniques of escape and attack, of protection and defense. These are lifelong techniques, inherent to the species, invariable. For humans, technique is conscious, voluntary, susceptible to modification, personal, imaginative and inventive. They are interested in behaviors directed towards an objective and never a question of things or objects. With this presentation, Spengler locates the beginning of the technique as being prior to the human being. Hominids already had a technique. Furthermore, he differentiates human technique from that of animals because it is evolutionary and constitutive of the evolution of the human being itself (Gourhan, 1971).

For him, human beings were created thanks to their hands, their upright position and their vertical head. The hand is the tactile organ that allows the use of tools. After using it, human beings began to make their own weapons and tools and began to choose and use these weapons. "Human beings freed themselves from the constraints of the species." This is another important characteristic for the eminent historian, as it allows human beings to differentiate themselves from the species by differentiating their technique from the technique of the species,

thus allowing their species to progress.

Spengler asserts that the hand allowed the development of "hand thinking," which translated into practical, active thinking, cunning, and intelligence (Engels, 2020). The eyes allowed the "eye thinking," which translated into observant, theoretical, contemplative thinking, reasoning, and wisdom. According to him, this distinction explains the emergence of people who plan, direct, and determine, and people who execute and obey.

There was a moment in prehistory when humanity took a leap forward and began to produce objects of different shapes and materials, indicating this "sudden" change. Until then, human beings were hunters and had a technique for producing their weapons, but they could not live independently of others. The transposition occurred through combined collective action, where the action required coordination between human beings, increasing their strength and giving rise to language. Verbal language is preceded by simpler forms of expression, such as signs, gestures, and shouts, until dialogue emerged, and with it conversation and sentences (Gourhan, 1993). At first, speaking was a difficult action, but soon it ceased to be related only to immediate physical activity, allowing meditation and calculation. Once adapted to collective action and its successes, human beings began to undertake enterprises, and these began to occupy their vital activity.

The domestication of animals and plants improved subsistence conditions, increasing the population, settling them on the land and differentiating their productive activities. New activities then emerged: transportation, storage, preparation of land and animals for agriculture and for raising them themselves. These differences gave rise to landowners and soldiers to defend production against other people.

Projects became more complex, requiring a separation between project formulation and execution, and separating management from execution, leaving the most enterprising and imaginative minds to take command. According to Spengler, a natural hierarchy was thus created between those born to command and those born to obey, as previously noted. This stage gave rise to "organization" with the concentration of active life in defined forms and gave rise to wars as organized ventures between tribes. The strongest dominate, which constitutes "peace". This peace occurs between tribes and within a tribe with the emergence of the State. There are people who have preserved the vigor of predators and people who have become prey. Within them, a conflict arose between personalities and the masses. The riches in the arts and in thought were due to the concentration of wealth in the hands of a few. This concentration was also the basis for the development of technology, considered a spiritual luxury. Inventions sprang from the pleasure of human beings in triumphing over nature. The inventor does not worry about the results. Inventions multiply, but they do not spare human labor. New work is required. The advent of machines has resulted in increased tension between those who give orders and those who are ordered. Machines have aggravated the spiritual sterility of those under their command, thus giving rise to spite and hatred

towards their bosses. Men no longer discern that "the work of the bosses is the hardest, that their lives depend on the work and success of these bosses[7]" (Spengler, 1980). Here, his analysis of the widening gap between the chiefs and those commanded by the development of technology. What brought power over nature and other peoples begins to corrode civilization from within.

According to Spengler, the more complex and sophisticated the technology, the more it is misunderstood by the "hands", and its creators are hated. In addition, extreme mechanization has entered a phase of tension. Many forests have been destroyed, animals have become extinct, as well as countless ethnic groups have become extinct or are close to extinction. This mechanization is causing everything to be thought of mechanically. A waterfall is seen for the energy it can generate, a field for its production, cattle for the meat it can produce, artisanal processes are seen only as something to be mechanized to increase production. Beauty is lost.

In this process, according to this thinker, there are three basic causes that lead to the end of Western civilization. First, the machine is causing consequences contrary to the objectives of its use. As an example, he mentions automobiles in large cities. The better they are, the more and better they are, in practice, the slower they become, and one can walk faster. Second, he describes the need for creative technicians, exceptional inventors and engineers, so that technology remains at its peak. Thus, the best brains of the youth of the "white race" have been formed in long and expensive processes. But according to Spengler:

> Faustian thinking begins to feel sick of the machine. A lassitude, a kind of pacifism in the struggle against nature, is spreading. Men turn to simpler ways of life, closer to nature; they devote more time to sports than to technical experiments. Big cities seem hateful to them, and they long to escape from the crushing oppression of soulless activities, from the yoke of the machine, from the rigid and glacial atmosphere of technical organization. And it is precisely the strong and creative talents who thus turn their backs on the practical problems of science and throw themselves into pure speculation[8].

On the other hand, there is also a revolt on the part of the "hands" against the role they play, transformed into mere numbers, with the loss of individuality, which increases the antagonism with the leaders. The third cause pointed out is what he called "the betrayal of technology". During the second half of the 19th century, Western Europe and America enjoyed undisputed industrial, economic, political and military superiority. They produced and sold their industrialized products to other countries, which in turn sold their raw materials. At the end of the 19th century, the "white peoples" began to offer other peoples their best weapon, technology, in the most diverse forms of dissemination. These privileges of the "white races" were squandered, and the revenge of the exploited peoples

[7]Spengler, *Man and Technology*. Lisbon, Portugal, Guimarães and Cia. Editores, 1980, p. 113.
[8]Idem, p.121.

against their masters began. With the disseminated technologies and lower wages, they began to compete advantageously, leading to unemployment for the "whites". According to Spengler, this is a catastrophe and not a simple crisis.

In this paper, we can see how, from a naturalist perspective, Spengler characterizes the essence of the human being, the basis for his idea of technique. The division he makes between predatory animals and prey animals is applied to explain and justify the dominant peoples and the dominated peoples, and within the peoples, to explain and justify the leaders in opposition to the led.

In the evolution of technology, he considers technology to be positive in the remote past of human beings, and negative in the present. Strictly speaking, he begins to perceive the negative aspects of technology as early as Babylon and Egypt of the pharaohs, where workers could no longer understand the purposes of enterprises. This situation led to a distance between the leaders, creators and planners of enterprises, and the mass of workers, the "hands", as Spengler calls them. This negative aspect, discussed by him, comes from the organization of work. This began with the division of labor and later differentiated rights and duties were associated with it. As the social structure became more complex, the "hands" became alienated in work. They no longer understood their objectives, because their activities were imposed by others. Spengler links this process to the quote in the Bible about Paradise on Earth: human beings lived in harmony and were expelled with work as a curse.

There is one aspect of Spengler's books that should be noted. The term "technique" is used above as a noun, to mean something inherent to human beings. It is part of the culture. When Spengler uses the term "technique" to give a negative characteristic of today's society, by citing it as a technical civilization, the term is used as an adjective, which introduces syntactical confusion. This discussion was raised by (Oliveira, 2006) in his analysis of the issue of technique in Spengler and Heidegger.

4. Lewis Mumford (1895-1990)

A work specifically on the History of Technology that is already considered a classic is Lewis Mumford's[9] work: "Technics and Civilization" (Mumford, 1934). It is considered a critique of technology and its myths: the idea that each technological advance is always an advance (and/or progress) for civilization. At the time, there was great confidence in the role of technology in human destinies. Even within

[9]American sociologist, researcher and critic of art and architecture, Lewis Mumford (1895-1990). He dedicated his long life to the study of the consequences of technology on society, criticizing the resulting dehumanization. In this theorizing, Mumford's concern with the breakdown of balances and the growing alienation in the last two phases is clear. His essential works, *Technics and Civilization* (1934) and *The City in History* (1961), are clear in their demand for a new humanism. Main works: 1922, *The Story of Utopias*, 1924, *Sticks and Stones,* 1926, *The Golden Day*, 1931, *The Brown Decades: a Study of the Arts in America,* 1865-1895, 1934, *Technics and Civilization*, 1938, *The Culture of Cities*, 1944, *The Condition of Man,* 1945, *City Development*, 1951, *The Conduct of Life*, 1952, *Art and Technics*, 1955, *The Human Prospect,* 1957, *The Transformations of Man*, 1961, *The City in History*, 1967-70, *The Myth of the Machine,* 2 vols., 1979, *My Work and Days: a Personal Chronicle* (autobiographical).

the Marxist camp, Marx's followers did not place emphasis on the negative aspects of science and technology; they were predominantly seen in a positive light.

The book does not have a particularly optimistic approach, since the effects of industry are portrayed mainly in the paleotechnical era, showing the inhuman side of the relationship between technology and the worker, similar to Marx. However, it did not treat technical development as harshly as it did in later works. In them he becomes more somber, especially in the face of technical advances in the military area, coupled with the technique of controlling the human mass. He makes mournful references to the atomic bomb, the extermination camps and the Vietnam War.

Mumford's inaugural book, "Technics and Civilization[10]", is a true work of history of technology. It is a broad study of the influence of technology on human culture, recording that, until then, the useful and the practical were separated from the realm of the good, the true and the beautiful. His work would break with this traditional neglect. It is a work of highly erudite synthesis covering different fields of study: urbanism, literature, history, anthropology, art and politics. His book, therefore, deals with the reciprocal articulation between social environments—monasticism, capitalism, science, entertainment, luxury and war—and the more specific relationships of the inventor, the industrialist and the engineer. In other words, it is a true study of the history of machines, inventions and tools, permeated by critical views of their effects on civilization. It is observed that many intellectuals, since the last century, have begun to attribute to machines their responsibility for shaping new habits and methods of modern life in our society, but not in a concentrated and directed way to technical issues as Mumford did. With a moralistic bias, he objects to the idea of blind progress inherited from the birth of modern science. Mumford stood out for being one of the first to analyze technology as a global phenomenon from a historical point of view.

Lewis Mumford's book "Technics and Civilization" is therefore indispensable for the study of the relationship between technique and civilization and their environmental effects. The importance of his research lies in the fact that he did not simply present a study of the emergence of machines, devices and gadgets in the past, but rather cast a highly critical eye on the entire cultural and social development that made the emergence of machines possible. In addition, he presented his own terminology for the concepts of tools and machines in time (eotechnic, paleotechnic and neotechnic periods). Mumford shows how the progression of machines affected almost every aspect of human society, including but not limited to sexuality, the economy, ecology, war and the occurrence of diseases.

It is also interesting, as can be seen in the introduction to his book, that he first quotes Karl Marx, whom he criticizes, accusing him of some errors. According to Lewis, Marx mistakenly believed that technical forces developed automatically and that this development determined the character of institutions. However, he does not point out any proof of this alleged error in Marx's work, rendering this

[10]MUMFORD, Lewis. *Technics and Civilization*. Madrid, Alianza. 1979 © 1934.

criticism worthless in the discussion.

Considering that during the last thousand years both the material base and the cultural forms of the West have been profoundly altered by the development of the machine; he sets out to answer the following questions: How did this happen? Where did it happen? And what were the main reasons that led to this radical transformation of the environment and the routine of life; what were the ends pursued; what were the means and methods, and what unexpected values emerged in the process?

His message is clear: technical progress changes us, interferes with our being, alters not only our reality but also our perception of reality. And critically he goes further by stating that the danger of mechanism lies in burying the human soul under process, logic and mechanism. It turns man into a cog in a huge social mechanism, turning him into an element of a gear. Despite his repeated warning about the danger of dehumanization, given the widespread fascination with technology, Mumford does not advocate a return to a mythical pre-technological era of human purity. For him, this is no longer possible; we are definitely dependent on our technology. The important thing is to humanize, not to lose the human sense amidst mechanisms.

It is known that the myth of progress was shaken, or the confidence that was placed in technological innovations diminished when the atomic bomb exploded. With it, humanity became definitively aware that man could destroy his own world. Interestingly, Mumford had already pointed out problematic aspects in technical development even before the Second World War, and the bomb intensified his skeptical view.

He structures his study, in the book "Technics and Civilization", considering approximately the last 1000 years where the origin of machines is located. To do so, he divides this period into three phases: the eotechnic, the paleotechnic and the neotechnic. The origin of the modern machine is found in the eotechnic phase. Most mechanical discoveries and inventions were made during this period. The Netherlands was the center of technical development: windmills and watermills were their main ways of obtaining energy. The first machines were made of wood. The invention of lenses and mirrors made possible a greater interest in hygiene and led to the emergence of the telescope; mechanical clocks, the printing press and the compass appeared during this period. It also coincided with the birth of science as we understand it today.

The Paleotechnic phase saw the consolidation and systematization of the great advances that had already taken place. This period was based in England, with the Industrial Revolution, which transformed the way of thinking and living and caused a radical change in the means of production: the energy source became coal, which resulted in greater regularity. The type of material used became more resistant: iron. This allowed machines to be more accurate, precise and robust. This association of iron with a more regular energy source allowed for much greater success and brought about changes in the means of transport with the ap-

pearance of more powerful locomotives and boats. A seemingly inexplicable explosion of inventions began around 1750, producing machines such as the steam engine and the blast furnace that allowed mass production and industrialization. Forests were destroyed to make way for railways and to provide support for mines. Poisons, industrial and biological wastes were carelessly dumped into rivers, and the air became so polluted that children were born weak and deformed. There was much waste of energy; the steam engine was only 10% efficient, and last but not least, it produced the "mechanized" of its workers. They were forced to work long hours and in miserable conditions and became an appendage of production. They worked up to 14 hours a day, and in schools the curriculum was reduced to the essentials because it was no longer necessary for the "mechanized" worker. Workers were threatened with being replaced by machines when strikes occurred against working conditions.

The neotechnic phase represents the beginning of the predominance of the life of a worker in the paleotechnic phase was dominated by desolation and lack of hope. Energies come from electricity and magnetism, as well as energy from petroleum. The use of synthetic materials is the result of great developments in chemistry, which also began to try to imitate organic materials; the use of rare metals; the expansion of information and improvements in transportation. The dominance of machines over workers was expanded through automation.

His pessimism and negativity about technical development appear more intensely in later works. In "Technics and Nature of Man[11]" Mumford considers that machines do not design human organs, but rather limit them, and considers that progress generates a state of technological and cultural evolution that he calls mega technology and that triggers a process of constraint on the human condition, transforming it from an active animal into a passive one.

When man used tools, he was active, but when he started using machines, he became passive. Man is, at first, the owner of technology, but this becomes autonomous, and technology imposes its materiality, its artificiality and its quantitative dimension, coercing man into deterministic and necessary actions. It acts on nature and on man himself, restricting him, and with the automation of work in industries, it destroys his subjectivity. In this he resembles Marx, with the difference that he speaks of the human being, while Marx speaks of the worker directly and not in a universal way. For him, the repetitive and monotonous actions imposed by machinery impoverish and provoke neuroses in man. Driven by the coercive dimension of technology, he characterizes the technical progress of the 20th century as an authoritarian mark, whose most accentuated and destructive aspect is translated by an industrial-scientific-military complex. The irrationality of technical progress takes on an unprecedented dimension with the explosion of the atomic bomb.

Mumford denounces the ignominious power that the scientific and military

[11]Mumford, Lewis. *Technics and nature of Man*. In: *Technology and Culture*, Vol. 7, No. 3 (Summer, 1966), pp. 303-317

castes acquire within developed nations. Mumford's most critical and pessimistic book is "The Myth of the Machine" (Mumford, 1967). In this book, he makes it clear, in its final pages, that a possible solution to humanity's problems is to abandon blind faith in science and technology. In this book, the scientific elite is denounced, firstly, for having reduced human beings and reality to purely quantifiable objects. Secondly, for having converted their activities into a field of study so specialized and closed to all human concerns that it does not have an immediate technical application. Science has been reduced to a world of incommunicable fragments, and scientists themselves are left to engage in fragmentary activities separated from the real problems of the world, losing their social responsibility about his work. "The Myth of the Machine" (Mumford, 1970) is a warning against the "techno-scientific-military complex."

5. Jacques Ellul (1912-1994)

Jacques Ellul[12] wrote the book "Technics and the Challenge of the Century" (Ellul, 1954) to show an incompatibility between Technique and Civilization. In the book, Jacques Ellul analyzes the machine as the most evident form of technique, but that technique is not limited to the machine. There is a moment when he places the machine as the starting point of technique, but in other considerations he always places technique as prior, since he considers that techniques have existed since primitive man. He inverts the common idea that technique is an application of science; for him, it is exactly the opposite: science is an instrument of technique.

For Ellul, technology has achieved all human activities, not just its productive activity. This writer presents a unique view on the issues of technology. He opposes Mumford in several ways—stating that machines depend on technology—mainly because, for him, technology includes several spheres of human activity (technology in politics, sports, writing, etc.) that have no relation to machines. Technology has penetrated man himself, ceasing to be an object of man and becoming his essence, integrating himself into him, absorbing him and becoming autonomous. This path was based on the impossibility of refusing the most effective and rational method. Since the method for choosing a solution is itself a technical method, it operates on the means of using technology, thus giving rise to the autonomy of technology that engenders technical decisions and new techniques from its application by man. For him, technology corresponds to a requirement in the realm of thought: how to do things better, faster and more economically. In Ellul we find a rapprochement with Marx who also sees him as an "interlocutor".

[12]Jacques Ellul, French theologian, was born in Bordeaux, France, and studied at the Universities of Bordeaux and Paris. He was a leader in the French resistance during World War II. He was Jewish but converted to Christianity at the age of 22. His works on technology have a fatalistic facet, denouncing technological tyranny over humanity. In addition to writing about technological society, he wrote about the problems of Christianity (1991) where he argued that anarchism and Christianity have the same social perspectives. His book under analysis in this article is: Ellul, Jacques. *Technics and the Challenge of the Century.* Rio de Janeiro, Paz e Terra, 1968 © 1954.

Ellul considers that organization is the application of technology to social, economic and administrative life. Organization is in turn the process of assigning tasks to individuals or groups in order to achieve specific objectives more efficiently or economically, through the coordination and combination of all their activities. Since in practice the most appropriate process is selected, and this remains the rule, organization relies more on methods than on people. From this he deduces that in technology the means are more important than the ends, since what predominates is the method.

To explain the evolution of the technique, Ellul separates the technical operation from the technical phenomenon (Ellul, 1988). The technical operation is the work carried out with a certain method to achieve a result. In this operation there is a double intervention of consciousness and reason, which produces the technical phenomenon. In the transition from the technical operation to the technical phenomenon, one passes from the spontaneous experimental domain to the domain of clear, voluntary and reasoned ideas. Reason creates new methods, diversifies technical operations, but also selects the methods. Awareness allows the application of the technique to other domains.

For him, technology was used by men until the 19th century and developed in production and in various activities. Thus, at the same time that technology advanced in production, it also advanced in war, in the construction of cities, in transport, in the arts, etc. With the introduction of machines into production in the 19th century, production was organized based on the division of labor established by machines. This process was directed by the bourgeoisie, which found in machines and, therefore, in technology, the possibility of applying its capital to production and increasing its efficiency. Competition in the market stimulated the dynamism of the evolution of technology applied to production, selecting in a brutal struggle those who would win and those who would perish. From that moment on, the evolution of technology began to be seen as the evolution of machines and production, in this case of industry, and began to be judged by the efficiency of production. Technology, machines, production, industry and efficiency became one and the same thing.

This process of technical development occurred primarily in the private sector, later reaching the State. As production became more complex and required more resources, many of which were not available to a private company, the State began to take more initiatives to support production and organize it. A contradiction certainly arose between the logic of the market, based on competition, and the logic of the State, based on organization, but the crises of capitalism forced the State to intervene in order to rationalize an irrational economy based on competition. The bourgeoisie itself called for State intervention, forcing it to plan and organize production. Capitalist theorists began to support regulatory intervention by the State in times of crisis.

In his book, Ellul analyzes the emergence of the State/Nation as a consequence of the expansion of the State's activities necessary for the development of capitalism. In addition, some technical applications began to be seen as possible for the

State alone to carry out, as was the case with the atomic bomb. He states that it would be unimaginable to leave instruments such as atomic energy in the hands of private individuals, noting that in 1949 the report to the American Congress established that research and production of atomic energy should be in the hands of the State. Thus, it would be the one to determine what should be private and what should be public. The process that led the State to assume this role is based, according to Ellul, on technical development that began to demand so many resources and allow so much power that it could only be assumed by the State. Ellul shows that technology has its own impetus and exerts similar effects on human society regardless of the official ideology of society (Ellul, 1977). His starting point is that the only thing that matters to technology is production efficiency. Men do not use technology: technology uses men.

Another point addressed by the French theologian is the change that technology has brought about in several concepts considered basic to human beings. When man dominates space, he dominates speed, he loses space and becomes confined. Movement and time change, and time, which was marked by large periods such as seasons, years, moons, is now divided into hours, minutes and even seconds, and technology requires this change to measure productivity, enslaving man to time. Movement was an expression of life and has become abstract, also controlled by machines, measured and compared. Man's time was in line with natural time, but now it is abstract, measured by machines and subdivided according to the needs of the machines. Work was measured by time, but despite being abstract, it had a defined physical measurement. It was possible to measure the time worked and the time of surplus value. With the dematerialization of work and communication networks, this measurement is being lost, and the workday is no longer defined, no longer having a beginning or an end. Before, people worked in the office or in the factory during set hours. Today, people work at home, on the bus, at the theater, in bed, on walks. There is no time to waste, and time is more than ever lost and abstract.

For Ellul, technical progress is always ambiguous: when it adds something, it subtracts something; when technology is applied to solve something, it presents new problems and sometimes more than it solves; its harmful effects are inseparable from its favorable ones and, finally, it always has unpredictable effects.

Finally, the Afterword written by Ellul is pessimistic. He considers the process irreversible and that man has nothing to do against technology and its domination.

6. Brief Comparative Study among the Thinkers on Technique Presented

The four thinkers chosen for this work, based on the criteria outlined above, all present an extremely critical and, in some contexts, very negative view of human beings. The first of them, Karl Marx, although he apparently does not dedicate a comprehensive analysis to technology, but rather restricts it to the economic mode of production and focuses on the working class, nevertheless, he envisions, and his analysis shows, that the capitalist mode of production can be overcome

and from there a new type of society can emerge where technology, instead of being an instrument for enslaving workers, can be used as a means of liberation, no longer of workers, but of humanity itself.

Spengler, who wrote his work on the decline of the West during a period of widespread decadence and was profoundly torn apart by the First World War, saw the machine as the main cause of this decadence. His book on technology was also contemporary with the great economic crisis of the 1930s. His idea of man as the predator par excellence is most likely a natural result of the widespread barbarity caused by war. His lifeline comes from the cyclical behavior of society. Dark times will inevitably give way to other periods and other cycles will come. The other two thinkers, Lewis Mumford and Jacques Ellul, also have pessimistic views on the development of technology throughout history, and both were profoundly impacted by the appearance of the atomic bomb on the world stage, and from then on, the very existence of humanity would be in jeopardy. Ellul is the most fatalistic of all and besides considering technology, not as an application of science, but on the contrary, he considers science as a technical knowledge, seeing no way out for the scope and mastery of technology in all sectors of society.

Regarding the analyses made by the four thinkers, with regard to some insight that prefigured modern technologies and the issues raised by the enormous debate taking place around the world on environmental problems, we can say that current theories on information-capital use Marx's concepts, mainly that of abstract labor, to analyze the enormous production of value generated by high-tech companies. There is also a current called ecosocialist based on Marx's ideas regarding the current climate crisis. Mumford and Ellul, by raising their concerns regarding the destructive potential and threat of the bomb and the military-industrial complex, certainly make a strong denunciation of the very destruction of life on earth. The issues related to AI (Artificial Intelligence) began to be discussed by Alan Turing, from 1936 and from the 1950s onwards in an even more incipient, but more comprehensive environment. It is very likely that the last two thinkers followed these developments. Furthermore, their extreme concerns with the automatization of technology also prefigure the current moment of technology with increasingly autonomous systems and the current discussions about an AI constituted by consciousness.

7. Final Remarks and Conclusion

The main idea of the paper was to present the diversity of views of thinkers who deal with the History of Technology and are used in the study of the area. This panel sought to highlight the positions of these authors who deal with technique and technology, as fundamental concepts for the structuring of their doctrines. In their presentations, the path chosen was to identify how the authors place the negative and positive aspects of technical evolution, as it is a starting point for us to address the burning issues in our current situation: how technical development can help or hinder our actions to fight for a more just society and for the well-being of humanity.

Along the way, we have seen how technology is contemporary with human beings and how it was important for them to produce themselves. It has gone through several phases of humanity until we reached capitalism. In this mode of production, the machine, one of the forms of technology, allowed the accumulation of capital to be accelerated by increasing the efficiency of production and the exploitation of workers. Automation accelerated this process, and more and more production began. To enable production to be produced, technology began to participate in all aspects of human life and to dominate the circulation of goods and consumption, shaping consumers. One cannot be happy without the latest "technology" releases. Alongside this tremendous dynamism of production, social differences have worsened, and human beings may today be the first species to develop their own destruction by promoting the degradation of the environment and possessing weapons of global destruction.

This does not seem to be a reversible process. How can we make technology focus on social and environmental problems? Is technology in itself negative, or can we use all the knowledge we have developed to improve society and the environment if we change the way we produce and the relations of production? We have seen optimistic and pessimistic responses to this question, which we consider to be central today.

We have an optimistic view and believe that the text presented can help us reflect on the problems we must face. The new society to be built is open, but it must certainly be based on a radical democracy in production and in all sectors of society, in order to eliminate alienation, rigid hierarchy, the division between intellectual and manual labor, and between planning and execution.

The future of science and technology is inextricably linked to the future of democracy and freedom in the vast majority of countries in the world, where peace between nations is not achieved through the power of deterrence through war arsenals. Where a society that combats inequality, environmental destruction and the distribution of political power is built, based on knowledge as a public good and accessible to all citizens. In this sense, it is essential that the entire scientific community and all S&T workers adopt a stance to combat scientific denialism, the gateway to political authoritarianism and anti-democratic practices.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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