Technology, Capitalism, History:
The Enduring Desire for an Artificial Intelligence, the Accumulating Suffering of the Creatures of Nature

Aristotle Tympas*

What follows is a critical introduction to the history of the pursuit of constructing intelligent (thinking) machines in the era we call *modernity* and *historical capitalism*, as it is subdivided into two sub-periods: commercial and industrial capitalism.

The first image we've chosen for our paper is an advertisement from the interwar period, before the electronic age and the advent of computers [Fig. 1]. It depicts a calculator, a pre-computer calculating machine, in which we see people kneeling down before it and worshipping it. We have chosen this image to indicatively illustrate the depth of the ideology of artificial intelligence, which has not emerged in recent years or decades. It is an ideological mechanism organically embedded in the dominant ideology of modernity since its origin[1].

The second image belongs to the beginnings of modernity, of commercial capitalism, the time of Leonardo da Vinci, who, like many of his contemporaries, was not an artist in the contemporary sense of the word. He also represented something that, in the context of industrial capitalism, was involved into what we call "engineer". During the

* Aristotle Tympas is Professor at the Department of History and Philosophy of Science, of the School of Science of the National and Kapodistrian University of Athens.

1. For a more detailed introduction to this subject, see M. Simos, K. Konstantis, K. Sakalis & Ar. Tympas, "'AI Can Be Analogous to Steam Power' or from the 'Postindustrial Society' to the 'Fourth Industrial Revolution': An Intellectual History of Artificial Intelligence", *ICON: Journal of the International Committee of the History of Technology* 27, 1 (2022), pp. 97-116. For the provenance of the images reproduced here, see Ar. Tympas, *Calculation and Computation in the Pre-electronic Era: The Mechanical and Electrical Ages*, Springer-Verlag, London Ltd 2017.

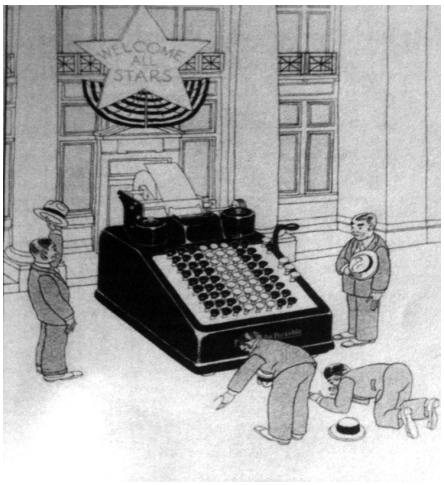

Figure 1

Figure 2

heyday of commercial capitalism, these engineers were visiting the courts of the powerful rulers of the time, carrying with them an assortment of engravings of mechanical designs. A typical case is the engravings contained in Andreas George Böckler's book entitled *Theatrum Machinarum Novum* (New Mechanical Theatre), that was published in 1661 [Fig. 2]. These engravings present various mechanisms – it is not correct to speak of machines in this particular case; at that time, there have been no machines yet. The New Mechanical Theatre and its mechanisms promoted what over time evolved into machines.

The relevant engraving depicts a theatre, a scene. The curtains of the stage are opened and something unprecedented in human history is presented. We do not see people on the stage; instead, there are some mechanical constructions – water mill and windmill mechanisms. The action on the stage is their movement. The idea behind this engraving is that, from now on, these mechanisms would be the history's primary movers; they would be the historical subject – in other words, we are dealing here with the first seeds of the now popular ideology of *technological determinism*. It would have been unthinkable for a man in classical antiquity, just as it would have been unthinkable in Byzantium,

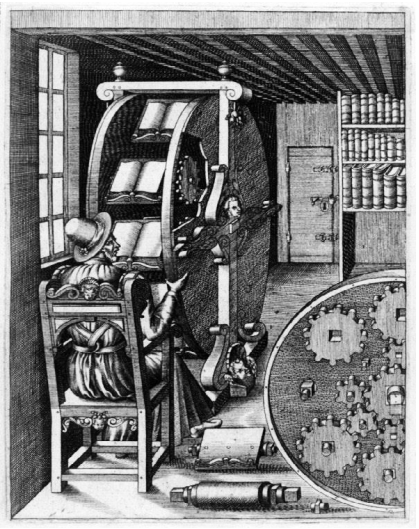

Figure 3a

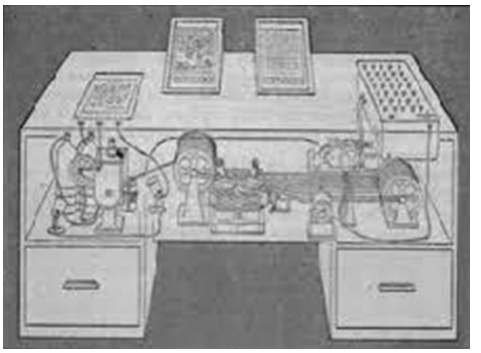

Figure 3b

a representation-image according to which the subject of history could be some mechanical constructions[2].

In one of the most famous engravings of the New Mechanical Theatre era, a man is depicted reading not a single book, as people had always read up to that time, but many books together. He has before him a cylinder that contains these books; it can turn in such a way, that the reader's time can be as productive as possible [Fig. 3a]. In 1945, at the dawn of the electronic age, Vannebar Bush, an electrical engineer, would present the idea of something similar, the so-called memex, in which not just many but all the books of the world could be stored in electronic form (microfilms) [Fig. 3b]. Bush was an MIT professor, a key player in the Manhattan Project –the construction of the first atomic bomb–, the first science advisor to the President of the United States, and author of the book *Science, The Endless Frontier*[3], in which he proposed the

2. For the New Mechanical Theatre see Al. G. Keller, *A Theater of Machines*, MacMillan, New York 1965.

3. *Science, The Endless Frontier: A Report to the President by Vannevar Bush, Director of the Office of Scientific Research and Development*, July 1945, United States Government Printing Office, Washington 1945, available at: https://www.nsf.gov/about/history/vbush1945.htm [28.9.2023].

government provision for funding scientific research through various institutions. His propositions led to the latter's immediate establishment, such as the National Science Foundation. As it has been written, the 20th century, the century of the US hegemony, has been a product of his own "engineering"[4].

We realize, therefore, that the idea of a society in which there will be intelligent mechanical constructs goes back quite a long way, to the modernity's very beginnings. Along with the intelligent mechanisms came the intelligent machines; the latter first appeared around mid-18th century, the period of the Enlightenment, coupled with the beginnings of industrial capitalism. The first machine was not invented, as is usually wrongly assumed, by James Watt in the late 18th century; the first steam engine, that of Thomas Newcomen, appeared during the first decades of the 18th century. This steam engine was large, like the water mills and windmills it would eventually replace completely. It was not constructed to a factory. The craftsman would go and build it on the spot where there was a factory; its use would provide the movement. In one of the earliest engravings of a Newcomen steam engine, there is a section in the middle and the people are depicted as tiny in front of it [Fig. 4]. Nature, in this case man, is depicted as insignificant in front of the engine. In the engraving, the uninterrupted movement produced by the locomotive is also contrasted with the unpredictable movement created by the wind, as a ship with sails is depicted in the background, whose movement depends on the unpredictability of nature, in this case the wind.

The point is that, with the advent of machines, we've become independent of nature – human or otherwise. More precisely, the owner of the machine could allegedly be completely independent of the unpredictable natural phenomena. At the same time, we had the introduction of what is called the "black box" of technology. The input and output, the transformation of heat into motion, has been demonstrated; still, what was happening inside the machine has been concealed. The human and other work, the labor and the intelligence required for it,

4. See G. P. Zachary, *Endless Frontier: Vannevar Bush, Engineer of the American Century*, Free Press, New York 1997.

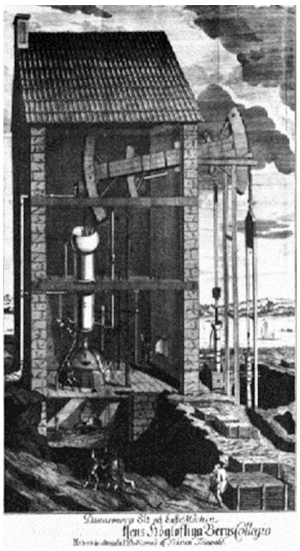

Figure 4

were concealed. Unlike the material conditions of classical antiquity or Byzantium, in which no inside and outside could be observed, with the advent of *industrial capitalism* and the machines, in all their possible variations (generator/motor, device of any kind), there has been a visible and an opaque part, hidden in an enclosed interior. The concealment of human intelligence allows the demonstration of intelligence as artificial.

Alongside the diffusion of machines and the consolidation of industrial capitalism, a new, extremely popular, literary genre, was emerged: the "lives of engineers". Biographies of James Watt and other engineers are bought by families for their boys to become engineers, as they were now perceived as providing the social model; not only engineers were projected as people possessed with critical knowledge and skills; they were also projected as virtuous people, who provide the standard of virtuous living. So, we have a substitution of the "lives of saints" for the "lives of engineers" – this is the argument we've propounded in an article published in the *Theologia/Θεολογία*[5]. The "lives of saints", the

5. See T. Tympas, «Ἀπὸ τούς "Βίους Ἁγίων" στούς "Βίους Μηχανικῶν": Γιὰ μία ἱστοριογραφία τῆς ἁγιογράφησης τῆς τεχνολογίας», *Θεολογία/Theologia* 91, 1 (2020), pp. 19-30.

extremely popular, dominant, literary genre both in the Western Middle Ages and in Byzantium, was replaced by this new literary genre – the "lives of mechanics".

What exactly the engineer, this new historical subject, was supposed to do? He was someone like James Watt, who took the steam engines of the practical craftsman Newcomen and inserted a mechanism inside them, allegedly making them automatic, independent of humans, and consequently of human intelligence. Watt, who was presented as a genius, did not actually invent something from scratch. He took a pre-existing mechanism in the most sophisticated windmills of the time, the *steam engine governor* mechanism[6]. At the dawn of the electronic age, it would be translated into English as *cybernetes*, which would be used by Norbert Wiener to name a new field (more precisely: the version that fits the electronic age of an old field): "cybernetics". The steam engine governor is a small mechanical analogue, a locomotive computer, which is connected in a position to deny the steam engine's motion, in a position of, in the vocabulary of the electronic age, negative "feedback". It includes two pellets that centrifugally rise or fall when the steam engine moves faster or slower than it is desired. When the pellets rise, they pull a relative connection, opening a valve of the steam engine, so that the surplus of steam that produces the extra motion is released into the environment, causing the pressure in the steam engine cylinder to drop; thus, the speed of the steam engine's motion eventually drops [Fig. 5]. In this way, there is automatic control, adjusting the steam engine's operation in order for the movement to be controlled, regardless of unforeseen changes in fuel quality, i.e. regardless nature's unpredictability, but also independent of changes in the supply of coal to the stoker, who could work sometimes fast and sometimes slow, depending on its fatigue – that is, independently of the human nature. The movement thus produced is controlled, so that the loom in the factory does not break down and the factories can operate automatically.

6. See Eug. S. Ferguson, "The Origins of the Steam Engine", *Scientific American* 210, 1 (January 1964), pp. 98-107.

Still, the governor mechanism supports something unnatural. How is it possible for someone wishing to get the maximum movement from the available coal and waste some of it by feeding it back into a movement that goes backwards? The answer is: calculation, control, and automation. The governor was considered a highly intelligent computer, in an online connection. It's an intelligent layout, which, when inserted

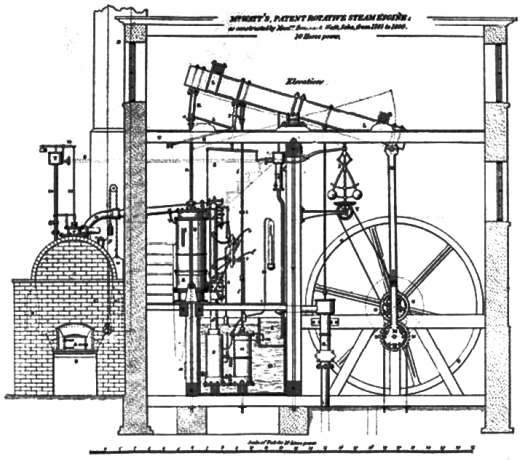

Figure 5

into various electronic devices, such as the thermostat, forms intelligent circuits, lines, and networks. In reality, there were limits to how much the various classes of governors could adjust the movements of the machine. For decades, there had been a frightening number of steam engine explosions in the 19th century, which could not have been avoided despite the introduction of governors, because of nature's almost unlimited variability. On the one hand, there was an ideology of artificial intelligence; on the other, there was the threat of a catastrophic explosion, with many human victims. The accumulation of supposedly automatic, intelligent machines, has nowadays turned this risk into an existential risk for all human beings, into what is called "existential risk/threat".

Let us observe for one last time the mechanism of the governor, allegedly the exemplarily intelligent online computer, this time by

linking the history of technology with that of the environment. The governor opens and closes a valve; the excess steam is expelled to the outside of the factory, so that a desired movement is automatically produced simultaneously, inside the plant, driven by a steam engine. But where does this unwanted surplus steam ends (not to say where does the waste of coal combustion go; let us stick to the unwanted-unpredictable one resulting from the constitution of the intelligent computer governor as such)? To the machine and only to it – there is no such thing in classical antiquity or Byzantium; for the first time in history, a distinction is introduced between something that surrounds and something that it is enclosed in it, an exterior in which unwanted waste is channeled, and an interior in which what we want is provided. The concept of "environment" is being introduced only with the appearance of machines and their dissipation; it is supposed to be an endless reservoir for waste produced by factories, trains, ships, planes, submarines, household appliances and office equipment, while the eminently intelligent computer is based on channeling such waste into it. Yet, as we now know, the environment is not an infinite reservoir. With the environmental crisis, truly an existential threat, things are going awry for humans and the other creatures of nature.