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Post-human condition between humanoid machines and the dematerialisation of bodies

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Abstract: Since antiquity, the relationship between humans and technological devices has been dense with repercussions on the processes of development and civilisation. Particularly in the last 100 years, this relationship has become so close that it has led to increasingly invasive interfaces, through implants, prostheses and mergers between the machine and human components: robots, androids and cyborgs are the product of this process that, with the advent of artificial intelligence, seems to be moving towards the construction of an "extended cognitive machine", within which the body, the social environment and all those cognitive, linguistic and cultural devices that man uses on a daily basis coexist and interact. In order to read the nature of these transformations, the authors refer to the media universe and the thought of scholars such as Marx, Vygotsky, Clark and others, hypothesizing that in the very near future the development of artificial intelligence will lead us into an increasingly less corporeal dimension, governed by a general intellect that, in order to express all its potential for social cooperation, will however necessarily have to free itself from the capitalist grip.

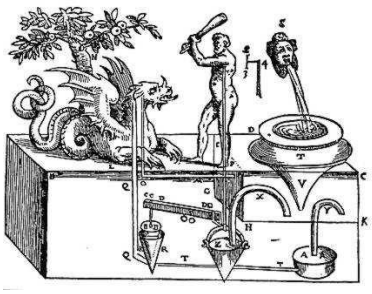
Keywords: Artificial Intelligence; General Intellect; Post-Human.

1. From automaton to robot

The aim of this paper is to briefly review the relationship between humans and machines in the light of the relevance it has assumed with the advent of artificial intelligence. As we shall see, this is not a subject confined to the present day, but a process that developed as far back as antiquity. The first to venture into the construction of mechanical devices with human features was in fact Heron of Alexandria (285-222 B.C.), who designed and built complex machines, powered by hydraulic or pneumatic force and which included figures capable of moving and rotating on themselves.

[1] The contribution is the result of joint work by the authors. For the attribution of the individual parts, however, it should be noted that paragraph 1 is by Sofia Boi, paragraph 2 and the conclusions are by Martina De Castro and paragraph 3 by Umberto Zona.

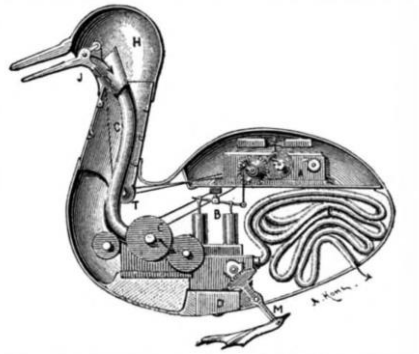
Figure 1. Reconstruction of one of Heron of Alexandria's automata, "Hercules and the Dragon", by Giovanni Battista Aleotti (1589). When Hercules struck the dragon, it sprayed water on his face.



In *Pneumatica* (Giorgi, 1592), Heron illustrates some devices, such as that of Hercules and the Dragon.

Moving to more recent times, the 18th century can be considered the century in which the development of technology, combined with craftsmanship, led to the birth of increasingly sophisticated machines, such as the first automata. Among the most famous builders of this period is certainly Jacques de Vaucanson, known for his *automata*, devices designed to realistically reproduce biological functions, such as the so-called *Digestive Duck*, composed of 400 moving parts, whose peculiarity was its apparent ability to ingest, digest and expel grains of corn, although no real digestive process obviously took place inside the automaton.

Figure 2. Digestive Duck by Vaucanson



INTERIOR OF VAUCANSON'S AUTOMATIC DUCK.
A, clockwork; *B*, pump; *C*, mill for grinding grain; *F*, intestinal tube; *J*, bill; *H*, head; *M*, feet.

The anthropomorphic turning point in the construction of mechanical devices came with what we would today call humanoid robots, artificial beings with human features. Examples of this are the creations of Jacquet-Droz, such as *The Writer*, an automaton reproducing a three-year-old child capable of writing short sentences and following the writing of words with his eyes in an extremely realistic way, or *The Musician*, whose fingers moved individually on the harpsichord by a complex system of levers and gears. Also belonging to the same typology is the *Joueuse de Tympanon*, made by the Germans Roentgen and Kintzing for Queen Marie Antoinette, capable of performing a piece of music by Gluck.

In 1821, Bruguier built a series of dolls that could walk realistically, swim or crawl. At the same time, the spread of *marotte*, porcelain dolls produced mainly in French and German factories, inspired the construction of increasingly well-kept, elegant and sophisticated automata such as those made by Lambert, Vichy and Decamps. Towards the end of the 19th century, Thomas Edison himself tried his hand at creating talking dolls that could recite rhymes and short speeches through a phonograph inserted into their chests. In the wake of Edison's invention, dolls capable of singing were produced in later years thanks to wax cylinders engraved and inserted into the torso.

In the United States, too, valuable specimens were built, such as the *Autoperipatetikos*, a doll patented in 1862 by Morrison that could walk. In the 19th century, even literature did not remain insensitive to the fascination of automata or, at any rate, artificial creatures, as witnessed by Mary Shelley's novel *Frankenstein* (2013), and, more generally, the Gothic vein (Stoker's *Dracula* (2016), Hugo's *Notre-Dame de Paris* (2019), Stevenson's *The Strange Case of Dr Jekyll and Mr Hyde* (2022)).

The introduction of the term "robot", deriving from the Czech word robota ("forced labour"), is instead due to the playwright Karel Čapek (2015), the first to narrate, in a 1921 play, the exploits of an artificial being with human features.

But it was in the 20th century that robots, in science fiction contexts – think of Isaac Asimov's novels (2021), starting with *I, Robot* – in the context of mass production, took on the appearance of modern devices. In the mid-1970s, General Motors financed a development programme thanks to which Victor Scheiman, an American engineer and entrepreneur, developed the PUMA (Programmable Universal Machine for Assembly) robot, a motorised mechanical arm capable of performing a wide range of tasks, including the assembly of components, welding and material handling, and therefore widely used in automotive industry.

While in the first phase robots were designed primarily to replace the human element within the assembly line, they later became increasingly "intelligent", especially through the use of advanced electronic components such as microprocessors, laying the foundations for the creation of more complex artificial creatures such as androids.

2. From humanoid robots to androids

In recent years, progress in the field of humanoid robotics has become astounding, both in terms of features, motor skills and agility, and the ability to interact with the environment, enhanced by increasingly sophisticated sensors. But a real qualitative leap forward was undoubtedly AI, which enabled natural language processing and the development of advanced computer vision. Boston Dynamics, Apptronick, Agility Robotics, Sanctuary AI and, of course, Tesla are just some of the companies that have made huge investments in robotics and are now mainly involved in training these machines. It has caused quite a stir that Elon Musk is recruiting people, paying them $6,000 a month, to teach Optimus the robot to walk. They will have to march eight hours a day, wearing a motion capture suit and a virtual reality helmet, to enable Optimus to take on "natural" movements, walk on uneven terrain,

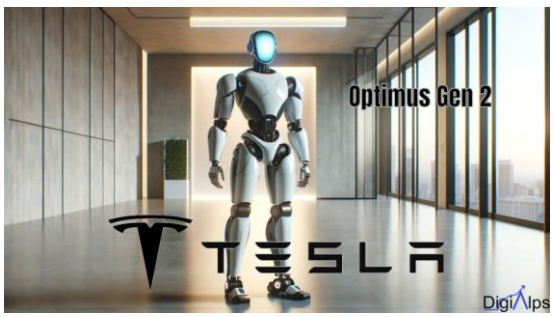
manoeuvre in confined spaces, and perform particularly complex actions, such as sitting and handling small, fragile objects like an egg, without damage it.

To distinguish between robots and androids, we could say that the element they have in common is their increasingly "human" appearance, while the difference lies in the fact that humanoid robots are predominantly made of metal, while androids are also made of synthetic materials that mimic the human skin. Robots, moreover, are destined in the very near future to completely replace human beings in low-skilled, fatiguing or risky jobs – from industrial production to battlefield employment – whereas androids, by virtue of their particularly realistic features and the massive use of artificial intelligence, appear to be designed to interact and relate with humans, to interact and "empathise" with them (think, for instance, of their use in care work).

A separate issue concerns *cyborgs*, living beings whose bodies have been enhanced or supplemented with artificial elements, such as prostheses, implants or other technologies that can improve an individual's physical, sensory or cognitive capabilities, or replace compromised biological functions. The term was coined in 1960 by the Americans Clynes and Kline, as part of their studies on the possibility of adapting humans to live in inhospitable extraterrestrial environments. In the cinematic sphere, the cyborg has been immortalised by famous films such as *Terminator*[2] and *Robocop*[3].

At the level of the imagination, the figure of the android, made famous in the literary sphere above all by the novels of P. K. Dick[4], Neal Stephenson[5], William Gibson[6] and, more recently, Mariko Ohara[7], is more disturbing by virtue of its increasingly indistinguishable appearance from that of human beings and the tasks entrusted to it, no longer limited to the factory sphere, but extended to areas such as medicine and services.

Figure 3. Tesla Optimus Gen 2



[2] *Terminator* (1984), directed by James Cameron, stars Arnold Schwarzenegger.

[3] *Robocop* (1987) is a film by Paul Verhoeven.

[4] P. K. Dick (1928-1982) is the author of *Do Androids Dream of Electric Sheep?* on which Ridley Scott's film *Blade Runner* (1982) was based.

[5] Neal Stephenson (1959) is an American science fiction writer best known for the novel *Snow Crash* (1992).

[6] William Gibson (1948) is an American writer and the father of the cyberpunk literary genre. The protagonists of his novels and short stories are often equipped with grafts and cybernetic implants that enhance their abilities, as in *Neuromancer* (1984), *Count Zero* (1986), *Burning Chrome* (1986), *Mona Lisa Overdrive* (1988).

[7] Mariko Ōhara (1959) is a Japanese science fiction writer, best known for her novel *Hybrid Child* (1990).

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3. From general intellect to extended mind

As is well known, Marx deals with the relationship between machines and workers' labour in particular in the *Fragment on Machines* (in *Fundamentals of the Critique of Political Economy - Grundrisse*[8]) and in unpublished *Chapter Six* of *Capital*[9]. These two texts appear to us as a formidable anticipation of our present because they teach us, on the one hand, that technology is not a neutral product of science but an immediately productive force, and, on the other, that machines, in their technical progress, gain their own autonomy, becoming a system that comes to subsume not only living labour but life itself into capital.

In the words of Marx (1970):

Once taken into the productive process of capital, the medium of labour undergoes various metamorphoses, the last of which is the *machine*, or rather an *automatic system of machines*, set in motion by an automaton, a motive force that moves itself; this automaton is made up of numerous mechanical and intellectual organs so that the workers themselves are determined only as conscious organs of it (p. 389).

Thus, if in pre-capitalist times the tool of labour was essentially a means of acting on nature, «in capitalism the relationship undergoes a shift: the labour becomes a mediation between the machine and nature. The pervasiveness of technology at work becomes total» (ibid.).

The Marxian automaton, in essence, in its emancipation from the dimension of mere "tool", incorporates living labour, transmutes it and returns it in the form of a machine. The humanoid robot, we might say, is the product of this process: a "creature" that performs the function of capitalist command device over production, from which living labour is expelled as superfluous, surplus. This outcome at least has the merit of doing justice to certain simplifications that still dwell in the public debate on technology and that lead to identifying the "tool" as a mere "medium" at the service of its user. This vision, in essence, reduces the tool to utensil, whose function changes depending on the benevolent or malicious, moderate or immoderate use made of it. In reality, a tool, even the most primordial one, is first and foremost a cognitive artefact, the result of social knowledge located in time and space, but it is also a cultural construct, an expression of the customs and traditions of a given community.

Let us read Vygotsky and Lurija (1987):

The whole existence of the Aboriginal Australian depends on his boomerang, just as the whole existence of modern England depends on its machines. Take away the Australian's boomerang, make him work the land and he will, by necessity, change his

[8] In these writings, Marx explores the concept of the 'general intellect', the ability of society as a whole to produce knowledge and technological innovation. Marx argues that the general intellect becomes a fundamental productive force in capitalism, but that its development is contradictory: on the one hand it creates new possibilities for production and development, on the other hand it also leads to unemployment and the polarisation of wealth.

[9] The unpublished Chapter Six is an 1864 manuscript that Marx intended to include in his main work, 'Capital'. The text deals with the formal and real subsumption of labour to capital and, in this context, the role of machines as a means of intensifying the exploitation of labour and increasing productivity is analysed.

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whole way of life, his whole habits, his whole way of thinking, his whole nature (pp. 54-55).

In both Marx's and Vygotsky's vision, therefore, the tool subsumes knowledge accumulated during the process of human development and transfers it from generation to generation; in this sense, it is closely interrelated with the processes of civilization, as Michael Tomasello (2010) points out, according to whom the ability to learn from others and to transmit knowledge and skills is fundamental to human cultural evolution because this cumulative process allows cultures to progress and develop over time.

Already Spinoza, in *Ethica* (2017), particularly in the second part, states that the tool is not simply an inert object used to achieve an external end, but rather a medium through which the *potentia* of a thing is manifested. It is therefore not something external to the being that uses it, but rather an extension of its power. For example, a plough is not simply an object used to plough the fields but is a tool that enhances the farmer's ability to cultivate the land and produce food.

The automaton, despite being a highly technological anthropomorphic machinic assemblage, is a prisoner of the servile – colonial, one might say – relationship that binds it to the human being who, in using it, does not aim to increase his own power but to free himself of those more onerous material tasks necessary for his survival. It is, in essence, a *device*, however evolved, conceived, designed and constructed by combining different parts together in a functional manner in order to fulfil certain purposes. It is not, therefore, an extension of the human body, nor is it an enhancement of it (as Iron Man's[10] suit, which gives Tony Stark a range of extraordinary abilities, might be), but simply a faithful servant and, in some respects, an expression of the Hybris[11] of the human being, who likes to measure his own greatness through the command exercised over beings deemed inferior. Humanoid robots, above all, pay the toll of not being able to disregard their materiality, on pain of being useless, while both machines, understood as human extensions, and technological products travel swiftly towards incorporeality[12]. Already many years ago, Andy Clark (2003) vaticinised that the very concept of cyborg would divorce itself from the material dimension:

Pretty soon, and still without the need for wires, surgery or bodily alterations, we shall all be kin to the Terminator, to Eve 8, to Cable… just fill in your favorite fictional cyborg. Perhaps we already are. For we shall be cyborgs not in the merely superficial sense of a combining flesh and wires but in the more profound sense of being human-technology symbionts: thinking and reasoning systems whose minds and selves are spread across biological brain and nonbiological circuitry (p. 3).

In other words, our relationship with devices, in the course of history, has become so close that we have incorporated them into our physical and, above all, mental

[10] Iron Man is a Marvel character, created by Stan Lee, Larry Lieber, Don Heck and Jack Kirby in 1963.

[11] In Greek culture, the term 'hybris' indicates an excess of pride and arrogance, a pride that leads man to defy the limits imposed by the gods and nature.

[12] In the field of science fiction, there are numerous examples of this shift from cyborgs to bodiless artificial intelligences that end up merging with the cognitive structure of humans. Among them is the Samantha from the film Her (Spike Jonze, 2013) and the Joi from Blade Runner 2049 (Denis Villeneuve's 2017 film).

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structure, giving rise to an "extended cognitive machine" – mindware, in Clark's sense – within which knowledge is constructed through the mental and bodily interaction of subjects with the environment. According to Clark (2003), therefore, we are transforming ourselves into cyborgs, not as a mixture of machine and human material, but as repositories of knowledge that also encompasses the out-of-body. Bringing this discourse back to the present day, we could say that artificial intelligence applications can expand human cognitive potential provided they extend the mind *beyond* bodily boundaries. In other words, it will no longer be the sole seat of knowledge but will be distributed between the body, the social environment and all those cognitive, linguistic and cultural devices that man uses on a daily. The most striking example is that of chatbots and large linguistic models, such as Chat GPT and other applications of generative artificial intelligence, capable of producing, from a textual prompt, increasingly complex cultural artefacts, such as images, videos, and music. Many wonder about the impact that these machines will have on human creativity, others, more prosaically, simply fear that it will be impossible to distinguish the copy from the original (forgetting that Benjamin (2014) posed the problem almost a century ago when reasoning about the technical reproducibility of the work of art). For our part, we will try to tackle the problem starting, once again, from Marx and Vygotsky.

In the aforementioned *Fragment on Machines*, Marx formulates the concept of *general intellect*, using the following definition:

> The accumulation of knowledge and of skill, of the general productive forces of the social brain, is thus absorbed into capital, as opposed to labour, and hence appears as an attribute of capital, and more specifically of fixed capital, in so far as it enters into the production process as a means of production proper. [...] as machinery develops with the accumulation of society's science, of productive force generally, general social labour presents itself not in labour but in capital (1973, p.616).

And further on:

> Nature builds no machines, no locomotives, railways, electric telegraphs, self-acting mules etc. These are products of human industry [...] They are organs of the human brain, created by the human hand; the power of knowledge, objectified. The development of fixed capital indicates to what degree general social knowledge has become a direct force of production, and to what degree, hence, the conditions of the process of social life itself have come under the control of the general intellect and been transformed in accordance with it (1973, pp. 625 – 626).

This passage is astonishingly topical: the general intellect, says Marx, is general social knowledge, in that scientific knowledge and technological knowledge are no longer the prerogative of individuals but have become the collective patrimony of society and are incorporated by machines which, in Marx's words, are now *objectivised scientific thought*. This means, to return to the present day, that when we question an artificial intelligence application, it responds to us by drawing on the enormous amount of linguistic flows with which it has been trained – not counting the manipulations that companies put in place to condition and direct the work of the algorithms for commercial or political purposes (Zona & De Castro, 2020) – and, therefore, it loses all sense to question the nature of the knowledge that is used to

satisfy our requests: it is, in any case, general, collective intelligence, an expression of the increasingly close interrelationship between machines and humans.

Reference to the concept of creativity in Vygotsky (2010) can perhaps further clarify this passage. According to the Soviet scholar, creativity is not a mysterious or innate process, but rather an activity in constant flux that springs – to a large extent – from a process of recombination of pre-existing knowledge and social experience. Behind every creative act, even the most seemingly original and innovative one, such as the one triggered by an *insight*, lies a awesome collective heritage of experimentations, reflections, contaminations, interactions made available today by the Web and from which both machines and humans draw. If an AI application can generate an "unreleased" music track at our request in a few seconds, it is because it has been able to "creatively" manipulate millions of globally produced compositions. If we think about it, the same thing happens to that group of youngsters who, in their basement, try their hand at composing their first songs which, consciously or unconsciously, will be the result of the influence exerted on their musical tastes by listening to thousands of songs produced by other musicians in the past or present. In both cases, we are faced with the power of general social intelligence.

4. Conclusions

We can read and condense this process of dematerialisation of bodies by referring to the three phases identified by Antonio Caronia (1996). In the first phase, that of industrial society, it is the *replicated body* that predominates, extending from the golem to the robot to the replicant. These are figures that, albeit in a problematic form, express faith in science and modernity but which, at the same time, by virtue of their otherness and non-conformity, are perceived as a threat to the human race and its survival. The second phase is that of the *invaded body*, in which it undergoes a metamorphosis generated by the symbiosis with technology, is colonised and turns into a cyborg. In this new condition, our body houses artificial artefacts, which become, to all intents and purposes, new organs. The last phase is that of the *disseminated body*, in which the distinction between natural and artificial loses its meaning, our bodies and minds become an integral part of a homeostatic system that extends our physical and cognitive faculties into the environment. The post-human condition thus seems to be increasingly distant from corporeality, and this may foreshadow dystopian scenarios or opportunities for social cooperation that were simply unimaginable only a few years ago, provided we intercept and sabotage the power dynamics that have so far stifled them.

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