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Research article

The Body, the Soul, the Robot: 21st-Century Monism

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Abstract
The thesis we will defend in the following pages is twofold. First, we indicate two linguistic-cultural turning points in the concept of the robot. The introduction of the body and the soul in the machine has paved the way towards new technical and epistemic possibilities and, thus, it has granted a new conceptual definition of robot. Second, we propose a return to Descartes as a starting point for a reinterpretation and redefinition of the concept of robot in the contemporary world. Here we will show how Cartesian dualism (in the description of humans) becomes a (material) monism in the development and construction of robots. As a result, we call on our fellow philosophers and historians of science and technology to explore, critique, reject, or further investigate the features of the 21st-century material monism proposed in this paper.

Keywords: Robotics; Descartes; Cybernetics; Robotic Monism; Cartesian Dualism

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Научная статья

Тело, душа, робот: Монизм 21 века

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Аннотация
Тезис, который мы будем защищать на следующих страницах, двоякий. Во-первых, укажем на два лингвокультурных поворота в концепции робота. Привнесение тела и души в машину проложило путь к новым техническим и эпистемологическим возможностям и, таким образом, дало новое концептуальное определение робота. Во-вторых, мы предлагаем вернуться к Декарту в качестве отправной точки для переосмысления и переопределения концепции робота в современном мире. Здесь мы покажем, как картезианский дуализм (в описании человека) становится (материальным) монизмом в разработке и конструировании роботов. В результате мы призываем наших коллег-философов и историков науки и техники изучать, критиковать, отвергать или дополнительно исследовать особенности материального монизма 21-го века, предложенные в этой статье.

Ключевые слова: Робототехника; Декарт; Кибернетика; Роботизированный монизм; Картезианский дуализм

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INTRODUCTION

In recent years, robots have shaped numerous domains of technical and scientific production. Robots are now employed in all areas of industry, medicine, architecture, and even culture. The recent proliferation of robot construction has prompted philosophers, historians, and sociologists of science to reinterrogate the concept of the robot (Riskin, 2016; Yang et al., 2018; Datteri & Tamburrini, 2007). Innovations in this field inspire a need for a new understanding of the modern use of robotics. In particular, several studies have examined the elements of continuity and rupture between bio-robotics and the use of automata in earlier centuries. Philosopher Marco Tamborini (2021), for example, speaks of a new material synthesis to describe the current paradigm of biorobotics. He highlights the material turn in robotics-inspired morphology as the main epistemic cornerstone in contemporary biorobotics. Philosopher Edoardo Datteri provides a useful philosophical taxonomy of biorobotics, comparing the epistemic claims of robots to the use of models and computer simulations. Furthermore, he defends the thesis that scientists create their possible phenomena or explananda through the use of robots in interactive experiments (Datteri, 2020; Datteri & Tamburrini, 2007).

While these studies are important for examining the knowledge claims of contemporary robotics, they have neglected important elements in their investigation of the concept of the robot. Considering and exploring the linguistic-cultural constitution of robots is an essential prerequisite to understanding robotics' practical limits and opportunities. Moreover, this is crucial for the delineation of a well-grounded philosophy of human-machine interaction.

In this paper, therefore, we will focus on two key turning points in the development of the concept of the robot as adopted in 21st-century science and technology: the introduction of the body and the soul in the machine. These two components, as well as their many permutations and hybridizations, have shaped the entire history of robotics. The introduction of the body and the soul in the machine have given rise to the central questions and issues of today's philosophy of robotics.

The presence of these two factors is even more evident in contemporary robotics. In the design and construction of exoskeletons, for example, the physicality and materiality of the machine play a fundamental role in the possible successful interaction between robot and human. The features of the body, designed through imitating organisms as in bio-robotics and materialized in the machine itself as in embodied AI, impact the very concept of the robot, defined as a material machine capable of enabling specific functions. Furthermore, in contemporary biorobotics, the ways in which robots mimic the form-structure of organisms influences, limits, and enables the potential interaction between these machines and other animals. All the experiments in interactive robotics are indeed based on robots' material and behavioral features (Romano et al. 2019; Datteri 2020).

The soul has a similar key role in defining the contemporary concept of the robot. Following recent findings in cognitive and information sciences, the soul should not be understood here as a metaphysical entity (Langerlund & Yrjönsuuri, 2002) but rather as a complex set of operations that enable organismal reasoning and feedback with the

environment. For example, in robotics and architectural design, the machine and the engine, i.e., the soul, merge with the natural material to be imitated. The machine becomes intelligent, as do the materials, which can move freely. The same can be observed with embodied AI. In evaluating whether a machine is or is not a robot, the machine's ability to act and the degree to which it has freedom and autonomy characterize the concept, status, and identification of a possible robot. The potential of realizing and defining robots for geriatric applications, termed geriatronics, is contingent on the construction of robots that have a soul. Only a thinking-machine, armed with some type of programmed empathy, can be truly helpful in alleviating the painful loneliness experienced by older adults living in relative isolation (Weidner & Karafillidis, 2018). Therefore, the soul embodied within thinking machines can be defined as a programmed form of empathy. Lastly, in soft robotics, scientists speak of intelligence without a brain. That means the robot has a soul despite not having a traditional brain; the intelligence – or the soul – is distributed throughout the body (Sadeghi et al., 2017; Gravish & Lauder, 2018; Romano et al., 2019; Xiloyannis et al. 2021; Ghazi-Zahedi et al. 2017).

The introduction of the body and the soul into robotics was framed within the classical ontological paradigm supported by French philosopher René Descartes. In the next few pages, we will depart from the classical Cartesian distinction between *res cogitans* and *res extensa* to see how this was implemented in the linguistic-cultural construction of the concept of the robot. Famously, Descartes postulated the existence of two mutually exclusive substances. The first is the extended support unique to bodies; the second is the non-extended, thought-support, proper to the functions of the soul. These two substances are ontologically different and are grounded in quite distinct parts of reality: the form and function of bodies (Westphal, 2016).

Taking this distinction as a starting point, we will bring attention to the two main turning points in the evolution of the concept of the robot mentioned above. The first turning point concerns the inclusion of the body into the machine and the transition from automata built for entertainment to those designed to perform work activities. The second decisive moment involves the introduction of the soul in the machine through the imitation of the functioning of the human brain and the agency of other organisms.

The thesis we will defend in the following pages is twofold. On the one hand, we will highlight the two major linguistic-cultural turning points in the construction of the robot; on the other hand, we will propose a return to Descartes as a starting point for a reinterpretation and redefinition of the concept of robot in the contemporary world. Here we will show how Cartesian dualism (in the description of humans) becomes a (material) monism in the development and construction of robots. As a result, we call on our fellow philosophers and historians of science and technology to explore, critique, reject, or further investigate the features of the 21st-century material monism proposed here.

THE BODY IN THE MACHINE

Since antiquity, the human being has been described as both a body and a machine. This conflicting pattern of interpretation between life and technology was radicalized in the 18th century with the advent of a comprehensive quantification and mechanization of

man as a bodily being. In the dispute between materialism and idealism, the human being is conceived, on the one hand, as a quantifiable and thus determined automaton and, on the other, as an autonomous spirit (Liggieri, 2020).

In his *Treatise on Man*, Descartes famously wrote that the human body is nothing less than a machine. All the functions that can be attributed to machines, such as "the digestion of food, the beating of the heart and arteries, the nutrition and growth of the members, respiration, waking and sleep" (Descartes, 1662/1972), can also be detected in the human being. Inspired by Descartes' description of animals as autonoma, French physician Julien Offray de La Mettrie worked within this framework to define the human being as an "excellently equipped machine" (La Mettrie, 1960; Liggieri and Tamborini, 2021). The machine became the most important interpretative pattern for understanding, exploring, and reproducing the human and animal body (Schatzberg 2018). In fact, in the 17th and 18th centuries, contemporary techniques such as clockworks and hydraulics were used to explain the body. Descartes, for example, described the heart as a hydraulic pump, the blood vessels or nerve cords as a system of tubes, and the functioning of the body as analogous to a clock (Riskin, 2016).

Furthermore, machines were built to mimic organisms. The famous automata of the French designer Jacques de Vaucanson (the "flute player") and the Swiss watchmaker family Jaquet-Droz (the "scribe", the "draughtsman", and the "piano player") were modeled on the human body and its movements (especially in the "flute player") (Fryer & Marshall, 1979). Not only was the human being thus technically analyzed, but also the automaton, the machine, was based on the imitation of the human in bodily appearance and expression. Although technology at the time was still far from being able to imitate organic modes of functioning or even the cognitive performances of humans, a certain epistemic shift in the conception of the body and technology is observable in the period of the European Enlightenment. Physiologists, biologists, and scholars from different fields expressed themselves as being in favor of human-machine hybrids and artificial humans from the middle of the 18th century onwards. At first sight, 18th-century automata could be considered the forerunners of 20th-century robots: they are hybrid systems that move and look like natural humans (Chapuis & Droz 1949/1958; Westermann, 2016).

As a result, the human being – with its spirit, its "soul", its peculiar materiality – was placed in opposition to the artificial-technical world. At the same time, the human being was made artificial and, thus, reproducible. This juxtaposition also enabled a departure from the features of the human body. Therefore, the human being became the counterpoint to which the technical-artificial could be developed. The human body was the reference point for constructing automata that looked like humans and could perform specific and productive work. In fact, starting in the middle of the 19th century, the notion of corporeality was central in the construction of robots capable of manual labor.

The introduction of the body into the machine was accompanied by a further ontological and practical change in the concept of automaton. With the advent of working and transport machines, the perception of 17th- and 18th-centuries gaming and court machines meant as amusement engines for the nobility was also transformed. The steam engine was not built to amuse the public but rather to bolster physical labor. Accordingly,

machines were designed for cost-cutting and time-saving goals and no longer for playful diversion.

Within the encounter between materiality and practical goal, the term "robot" was coined in Karel Čapek's 1922 play "R.U.R." – Rossumovi Univerzální Roboti. The artificial humans ("robots") represent cheap workers whose unregulated and prolific use throughout industry changes the entire world economy (Čapek, 1970). At the same time, they embodied a strong materiality that enabled them to be perceived as automata, as being capable of motion.

THE SOUL IN THE MACHINE

From the 1940s on, the emergence of information theory and cybernetics added another layer to the conceptualization of the robot (Galison, 1994; Kline, 2015, Mindell, 2002; Pickering, 2010; Kay, 2000; Rid, 2016). In this transition from work-performing, purely mechanical devices to information-processing machines (Rabinbach, 1992), a further linguistic-cultural shift can be detected: the ghost was put in the machine. German philosopher Gotthard Günther (1976) describes this transition as follows:

> [T]o date, man has conceived two fundamentally different ideas of the machine in his technical development. The first is the classical Archimedean machine whose purpose is to produce work. Next to this has come the idea of the 'second' machine, from which one no longer expects work, but information. The 'first' machine is designed by analogy with the human arm (and hand); the second is expected to be a technical reproduction of the human brain, for only the brain processes information (p. 97).

Here, Günther has further expanded the original definition of machine to emphasize the different meanings (and uses) of machines in the 20th century. As is well known, the name for the work machine comes via Latin from Doric Greek *makhana*. In its original Greek, it first meant "to be able to, to have power" and then came to signify a device or tool. In Latin, a further meaning was added to the notion of machine. It also signified a contrivance, cunning, trick, or device acting creatively or with wisdom (*cum ingenium* in Latin). The second machine described by Günther refers to this second definition of machine, and then expands upon it.

The second machine produced by cybernetics, which represents the "general theory of a [...] non-Archimedean mechanism" (Günther, 1976, p. 95), put creativity and wisdom at the center of its agency. To do that, scientists took inspiration from the operational and functional proprieties of the brain, the Cartesian *res cogitans*. According to Günther and the cyberneticists, the brain is the only organ that functions "non-classical-mechanically" but "according to trans-classical principles" (ibid.). The 'computer man' replaced the 'motor man' as the model for the robots.

The self-regulating classical machine models should no longer be understood as mere automata that follows an input-output system but as a complex device in analogy to the functioning of the brain. Movement, as with the mechanical doll, is no longer in the

foreground; the focus is now on the possible behavior, wisdom, and functionality of the machine (Heßler, 2018/2019).

Furthermore, cyberneticists understood their machines primarily as scientific tools for knowledge production. Due to the strong focus of the original cybernetics group on modes of human brain functioning, most cybernetic machines were thus interpreted as being 'biologically inspired brain-like devices' (Husbands, Wheeler & Holland, 2008, p. 19). Even the well-known cybernetic 'turtle' was initially conceived as a contribution to the sciences of the brain (Pickering, 2010).

Here, we can see again that the main aim of scientists and engineers was to mechanize the *res cogitans*. This mechanization was intended to be a strategic move to design a machine capable of producing creative solutions and action. In the second linguistic-cultural shift, the ghost re-entered in the machine. Rather, an imitation of the brain was used to construct bio-inspired robots, which, in turn, fully materialized the classical definition of a machine. In imitating the human body, the robot becomes a working machine; in imitating thought, it becomes AI. As historian Jan Müggenburg (2018, 2019) has aptly pointed out, cybernetics is concerned with the creation of living artifacts[1]: again, the Cartesian ghost was put in the machine.

OUTLOOK

As many scholars have argued, Descartes had a decisive impact on the development of cybernetics, AI, and neurosciences (Riskin, 2016; Bates, 2013). In this paper, while expanding on this line of thought, we have pursued another goal. First, we have indicated two linguistic-cultural turning points in the concept of the robot. The introduction of the body and the soul in the machine has paved the way towards new technical and epistemic possibilities and, thus, it has granted a new conceptual definition of robot. Second, we have shown that these turning points were based on Cartesian dualism.

Ironically, the introduction of the soul in the machine prompted the overcoming of the Cartesian ontology. In fact, cybernetics brought out a deeper ontological dimension. Although they departed from Cartesian dualism, they ended up defending a strong monism. They supported the thesis that robots (and, broadly speaking, living artifacts) were machines, i.e., devices in which both materiality and intelligence are fused together.

[1] These mechanistic analogies evoked a critical as well as positive response from the research community and the public and continue to shape our notions of "robots" as hybrid beings of artificial corporeality and intelligence. Fictional literature and film can be seen as a decisive factor in their popularization. Cultural products in a variety of media have offered various cybernetic scenarios as a space of possibility, touching on themes of 'thinking machines' and 'electronic brains' as well as hybrid beings such as 'cyborgs' (cybernetic organisms) and autonomous robots. Not without reason, Günther (1952) wrote that "[t]he profound changes in the metaphysical history of man" are "indicated in man's fantasy life long before they develop into actual realities" (p. 223). In light of this, science fiction, as a "literary form of mythic fairy tale" that playfully explores new possibilities for thought and transformation, anticipates and helps prepare discourses about robots in and for the public sphere. Working and thinking robots are already located in present day reality both physically and in the public discussion, but the dystopias (fear of replacement, loss of self, unemployment) are predominantly present on a fictional level (Heßler & Hitzer, 2019).

This deeper ontological dimension is a feature of 21st-century bio-robotics. As Tamborini and Datteri have pointed out, the design and production of concrete robots that interact with their environment through a feedback loop enables biologists to create and access an *explanandum* (the form-function complex of an extinct animal such as the *Plesiosaurus* or the *Orobates pabsti*, which would be otherwise non-manipulable and non-researchable – this 4-legged vertebrate went extinct about 300 million years ago (Datteri, 2020; Tamborini, 2021)). This is also the case for interactive robotics. The corporeality of the robot is fused with its possible action and sociality. The body becomes the soul of the automata; the soul embodies the body (Nyakatura et al. 2019; Tamborini, 2020, 2021). Soft robots are intelligent devices; the properties of their bodies influence what they can do, achieve, and perform (Kim, Laschi, & Trimmer 2013; Sadeghi, Mondini, & Mazzolai, 2017). This supports a new monism, which echoes Haeckel's technical and artistic investigations of the forms of nature. Again: the ghost permeates the machine since the machine is both intelligence and materiality.

Post-cybernetic monism, however, must be regarded as peculiar. Indeed, our brief genealogy has shown how the materiality of the machine underlies its functioning both in robotic integration processes (fish recognize the robot fish as part of its community on the basis of the robot fish's functional and material properties) and in those considered more creative such as, for example, embodied AI. Here, *res extensa* becomes *res cogitans*, and the latter becomes *res extensa* once again. In a dialectical process, the two substances overcome each other while preserving themselves.

Hence and to conclude, by pointing out two linguistic-cultural turning points in the concept of robots, our analysis has called attention to the monism of contemporary robotics. We thus invite and have hopefully provoked our fellow philosophers and historians of science and technology to expand upon, reject, or define differently the features of 21st-century robotic monism.

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