

EXAMINING ARISTOTLE'S SUBSTANCE: Does AI Autonomy Warrant a Reinterpretation of Artifacts and Natural Substances?



ABSTRACT

When examining Aristotle's works, it is difficult to properly explain his account of substance, and even more so to understand what things can be considered as natural substances. Typically, artifacts have been believed not to be natural substances, since they lack a certain autonomy living organisms have. However, this argument may not be fully adequate depending on how "artifact" and "organism" are understood. I argue that due to advances in the autonomy of Artificial Intelligence, a reinterpretation of the distinction between artifacts and natural substances could be warranted.

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DOI: 10.33043/83nWdN5n



I. INTRODUCTION

In Aristotle's discussions on "being," he expounds on the concept of substance (οὐσία): the static underlier that persists through change, which to him holds ontological priority.¹ He writes about substance in several different ways. Importantly, he distinguishes characteristics of primary and secondary substances and establishes the separability of substances. He also posits claims as to what constitutes substance in living organisms and artifacts. Some interpretation is needed to determine Aristotle's exact definition of substance given his different examinations, especially in *Categories* and *Metaphysics*.² Thought is divided on whether his positions on substance evolve, or whether he is simply expanding his analysis.³ Nevertheless, a distinction is drawn between natural substances—things constituted by nature—and artifacts—things not constituted by nature—in *Physics*, in that artifacts do not have an independent and essential principle of motion within them, as natural substances do. (*Phys.* II 1, 192b10–15) It has long been held in Aristotelian scholarship that artifacts are not substances, even if they might have substances in them.⁴ However, several recent developments in Artificial Intelligence (AI), specifically advancements in the level of autonomy (LOA) of AI agents, challenge the standard interpretation given the essential features of these agents, such as self-directedness, self-replication, and, apparently, independent agency.

This article will proceed as follows: In Section II, I expound Aristotle's accounts of substance and elucidate the most important features of primary substance and natural substances in his theory. Then, in Section III, I examine Aristotle's distinction between natural substances and artifacts and explain the standard interpretation in further detail. In Section IV, I discuss recent developments in AI and robotics that challenge the traditional Aristotelian distinction, despite some objections that arise. I argue that the sharp distinction between natural substances and artifacts becomes blurred when considering said developments and that because of this, a spectrum between artifacts and natural substances appears, which offers a more compelling framework for examining their distinction. I conclude that

1 Jonathan Barnes, "Metaphysics," in *The Cambridge Companion to Aristotle*, ed. Jonathan Barnes (Cambridge University Press, 1995), 90.

2 Aristotle, *The Complete Works of Aristotle: The Revised Oxford Translation*, ed. Jonathan Barnes (Princeton University Press, 1984).

3 Howard Robinson and Ralph Weir, "Substance," in *Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta and Uri Nodelman (2024), <https://plato.stanford.edu/archives/sum2024/entries/substance/>.

4 Errol G. Katayama, *Aristotle on Artifacts: A Metaphysical Puzzle* (State University of New York Press, 1999), 4.

as AI systems continue to evolve, they may move across this spectrum, approximating both natural substances and artifacts depending on their properties, while not fitting neatly into either domain.

II. SUBSTANCE AND NATURAL SUBSTANCES

Understanding substance as Aristotle posits can be quite difficult due to the various accounts of substance in his works, but there is a good amount we can glean for our purpose. Aristotle first defines substance in *Categories*, stating:

A substance—that which is called a substance most strictly, primarily, and most of all—is that which is neither said of a subject nor in a subject, e.g. the individual man or the individual horse. The species in which the things primarily called substances are, are called *secondary substances*, as also are the genera of those species. (*Cat.* 5, 2a10–15)

Here, he is establishing the definition of a primary substance—individual entities or things that are not attributable to any other entity. The distinction here between primary and secondary substances is particularly important as it begins to establish his thought that primary substances hold ontological priority. That is to say, primary substances are the most fundamental and real things, and everything else that exists is completely dependent on their relationship to the primary substances. He goes further into this, claiming that "all the other things are either said of the primary substances as subjects or in them as subjects. So, if the primary substances did not exist it would be impossible for any other things to exist." (*Cat.* 5, 2b4–9) Therefore, non-substances do in fact exist, as do secondary substances, but only because of the primary substance in the first place. This is what Aristotle means when he exclaims that primary substances are neither said of a subject nor in them. For a non-substance to exist, it must be some modification of a substance proper.

Now that we have some sort of working definition of substance, it is important to quickly elucidate the most distinctive feature of it: that substances can undergo change, without changing the fact that they are a substance—i.e., they remain the same substance fundamentally. This is partly how Aristotle tries to solve the famous Parmenides problem—by positing substance as an underlier throughout all change,



being can ultimately remain static.⁵ While states of being may change accidentally, nothing can completely alter the reality of being itself except for some sort of substantial change. Aristotle asserts:

It seems most distinctive of substance that what is numerically one and the same is able to receive contraries . . . For example, an individual man—one and the same—becomes pale at one time and dark at another, and hot and cold, and bad and good. Nothing like this is to be seen in any other case . . . (*Cat.* 5, 4a10–21)

The examples Aristotle gives here are accidental changes. Substances may change in appearance, place, or feeling, but these changes do not alter the substances themselves. Substances have no opposites (i.e., there is nothing contrary to a specific substance), but they can receive opposites while remaining one and the same. With accidental change, there must always be substance underlying it.⁶

Aristotle's exposition here is very general as to what exact examples may be thought of as primary substances due to his abstract definition of them. It is still somewhat difficult to distinguish substances from possible non-substances with his explanation, which is why further examination is needed to understand his aim. What is important here is that he particularly distinguishes substances as separable. We say they are separable in the same way as distinguishing primary substance: they are not in anything else, nor are said of anything else—they do not rely on other entities. Separable substances exist independently of everything else and can be given an independent definition. Aristotle speaks further on this in *Metaphysics*, saying that “substance has two senses, (a) the ultimate substratum, which is no longer predicated of anything else, and (b) that which is a ‘this’ and separable—and of this nature is the shape or form of each thing.” (*Met.* V 8, 1017b23–25) Substance is a “this” (τόδε τι), or a “something,” which must also be separable, and it must be explainable without relying on others' existence.⁷

Aristotle dives even further into substance, offering in greater precision what substances are and how they come to be. With his expanded discussion, we get a greater sense of what may not count as substances than we did previously and how the examination of substance turns to nature. He argues about certain things that come

to be by nature, stating that “the something which they come to be is a man or a plant or one of the things of this kind, which we say are substances if anything is.” (*Met.* VII 7, 1032a17–20) Aristotle is claiming here that things that come to be by nature do not arrive by chance. He continues:

Thus, then, are natural products produced; all other productions are called “makings.” And all makings proceed either from art or from a capacity or from thought. Some of them happen also spontaneously or by chance just as natural products sometimes do; for there also the same things sometimes are produced without seed as from seed. (*Met.* VII 7, 1032a25–31)

It is somewhat unclear here whether Aristotle is considering makings and things that come to be by chance as substances or not, but the distinction is important to note against the things that come to be by nature, which he clearly stated as substances. He goes further into this, saying that “while some things are not substances, as many as are substances are formed naturally and by nature, their substance would seem to be this nature, which is not an element but a principle.” (*Met.* VII 17, 1041b28) He is here identifying the essence of a thing, or the substance of substance, which he posits is a thing's nature. This is where we can begin to distinguish natural substances and understand why they are important to our analysis.

In *Physics*, Aristotle establishes the primary characteristic of natural substances. He says:

Of things that exist, some exist by nature, some from other causes. By nature the animals and their parts exist, and the plants and the simple bodies (earth, fire, air, water)—for we say that these and the like exist by nature. All the things mentioned plainly differ from things which are *not* constituted by nature. For each of them has within itself a principle of motion and of stationariness (in respect of place, or of growth and decrease, or by way of alteration). (*Phys.* II 1, 192b10–15)

This passage draws the same line between things that come to be by nature and things that come to be by chance that was explored before but offers a new point of emphasis. Here, the primary distinction between natural substances and other existing things is that they have an inner principle of motion, or change, which is essential. This principle of motion is not merely internally located. Rather, it is an essential principle, which belongs to a thing in its own

⁵ Leonardo Tarán, *Parmenides: A Text with Translation, Commentary, and Critical Essays* (Princeton University Press, 1965), 279.

⁶ Thomas Ainsworth, “Form vs. Matter,” in *Stanford Encyclopedia of Philosophy*, eds. Edward N. Zalta and Uri Nodelman (2024), <https://plato.stanford.edu/archives/fall2024/entries/form-matter/>.

⁷ Barnes, “*Metaphysics*,” 92.



right, not accidentally. This is believed to be what distinguishes natural substances from artifacts: An artifact may have some sort of internal source of motion, but that motion can only be coincidental (e.g., a wind-up toy may be thought of to have motion, but it is put there by another entity, it does not exist in its own right, rather it is accidental). Our discussion must now turn to artifacts in more depth.

III. ARTIFACTS AND LIVING ORGANISMS

Artifacts can be laid out much more plainly than what has been discussed of substance thus far. Artifacts are human-made objects. They do not come to be by nature or from nature—for example, a house or a bed, or tools such as an axe, or musical instruments are examples of an artifact.⁸ Even under traditional interpretation, it is somewhat unclear whether Aristotle considers these as possible substances or not, but we can at least understand how they differ from natural substances traditionally given the passages in *Physics*. The independent principle of motion is important when considering the question of whether artifacts could be considered natural substances and is, of course, one of the primary reasons why they are not typically considered as such. Using the definition of natural substances we have already established, we can accept living organisms as fitting that description since they come to be by nature and have an independent and essential inner principle of motion. It is difficult to determine exactly in what totality Aristotle might consider natural substances, and there is some scholarship that suggests Aristotle does not consider all living things to be natural substances.⁹ For our purpose, we can draw the difference between living organisms and artifacts, understand why it is metaphysically relevant, and where it might be challenged. We can go further by determining that living organisms that come to be by nature also have the characteristic that constitutes a substance most of all, in that a living organism is a “this” and does not have to be explained by any other entity. The same cannot be said of artifacts, for they rely on other entities in order to carry out their unique functions. This is the traditional distinction made between artifacts and living organisms, so one consideration is that the lack of autonomy in artifacts compared to living organisms is why they cannot be considered natural substances.¹⁰ Autonomy is defined here as the level at which

a thing might be considered an independent agent. Artifacts that rely on primary entities do not have any autonomy since they cannot act independently, which is why even in the example given before of a wind-up toy—which has a sort of principle of motion—is not a natural substance since the principle of motion within it is not independent or essential. Because artifacts do not have the same inner principle of motion that living organisms have, they cannot be considered in the same sense that living organisms are. However, what if certain types of artifacts had a level of autonomy similar to that of a living organism? It is interesting to consider how a new type of artifact may necessitate an interpretation of Aristotle's theory of substance that is forced to reckon with artifacts holding similar capacities to living organisms—and thus natural substances—due to having an inner, essential principle of motion.

IV. DEVELOPMENTS IN AI

As our world continues to evolve, the emergence and growth of AI is unavoidable. Its use continues to permeate industry and everyday life. For a long time, AI systems have been quite similar to the artifacts mentioned before, in that they were simply tools that relied primarily on external input to carry out their function. If AI use and development ceased there, its examination would be irrelevant in challenging the interpretation of Aristotle's theory. AI systems would be considered as just another example of artifacts that cannot be said to be separable or to have an independent principle of motion, and thus, they could not be interpreted in any other way. However, there is increasing development of the level of autonomy (LOA) in AI, which suggests this is not the end of the story.

Recently, several AI models and robotics systems have been created that can operate at a much higher LOA than previously possible, meaning some AI agents can now perform tasks with very minimal input from human beings.¹¹ Consider the example of Xenobots (i.e., robots created using frog cells), which have recently been developed. They are the first case of robots that can independently reproduce, realizing the sought-after task of AI self-replication.¹²

18, 10.1007/978-94-007-1044-3_1.

- 11 Allyson I. Hauptman et al., “Understanding the Influence of AI Autonomy on AI Explainability Levels in Human-AI Teams Using a Mixed Methods Approach,” *Cognition, Technology & Work* 26 (2024): 435, 10.1007/s10111-024-00765-7.
- 12 Joshua Brown, “Team Builds First Living Robots—That Can Reproduce,”

8 Katayama, *Aristotle on Artifacts*, 1.

9 Katayama, *Aristotle on Artifacts*, 23.

10 Mary Louise Gill, “Aristotle's Distinction Between Change and Activity,” in *Process Theories*, ed. Johanna Seibt (Springer Science+Business Media, 2003),



This is an important innovation in AI development that holds several implications for further development, notably that these systems could perhaps evolve completely independently in the future. We can begin to see here that the traditional Aristotelian distinction between artifacts and natural substances is blurred in a few ways. First, there are now examples of artifacts that have some sort of self-directedness in the sense that they can perform tasks without external input, unlike other artifacts, and that they can self-replicate. These are essential properties presupposed in natural substances. Possible autonomy in these systems must be considered as well. Before, we defined autonomy simply as the level at which something is considered an independent agent, and these systems certainly meet that requirement. Some AI theorists go further, however, to argue for the possibility of these systems someday achieving free will. This is a substantial problem. The issue of rational free will in philosophy is far from settled, and there is a lot of controversy over the idea of that freedom being extended to AI.¹³

One striking objection to such an application is what Wolfhart Totschnig calls the “finality argument.” This argument posits that AI can never gain full autonomy due to the fact that it will never change its final goal given to it by its creator because it would have no basis for doing so. As such, on the grounds of this argument, an AI will never deviate from its intended ultimate purpose and cannot be thought of as autonomous.¹⁴ If these objections are accepted, there perhaps would be grounds to reject a reinterpretation of artifacts and natural substances despite our previous observations of AI self-directedness and replication. The self-directedness AI exhibits could be seen as inadequate compared to the motion principle in natural substances because it is merely exhibited in an effort to achieve a task set by an external creator. AI autonomy, if there is any, might also be so far removed from human autonomy that it cannot be considered in the same sense when determining the role of autonomy in the constitution of natural substances.

These objections should not be taken lightly but are certainly inconclusive, and I argue against them in a few ways in service of our task. First, it is safe to say that AI LOA is going to continue to improve, and moreover, even if AI is incapable of a free will parallel to human agency, AI agents have already shown capability for complete independent action, which other artifacts are not capable

of. Coupled with the newfound ability of AI self-replication, there is more than enough justification to consider these developments at least in service of a novel interpretation of Aristotle's framework. There are also important objections to the finality argument. Additionally, while the discussion of free will in AI throughout its limited history has been rather inconclusive, many theorists point to compelling developments that suggest it is at least not an impossibility, so we should still consider it when regarding our main task despite some of the problems that arise.¹⁵

One thing that comes to light in these examinations is that there is a problem of defining what exactly some of these systems are, in the Aristotelian sense. AI systems do not originally arise by nature, but they still have properties typically ascribed to natural substances such as autonomy, self-replication, and independent motion. So how should they be categorized? It does not seem as if we can truly call them natural substances in an Aristotelian sense, but they clearly hold properties that constitute natural substances as well as artifacts. We begin to see here a spectrum developing between natural substances and artifacts since these AI systems do not fall neatly into either category. So perhaps it would be more fruitful to consider the spectrum between the two as opposed to the sharp distinction.

V. ARTIFACTS? NATURAL SUBSTANCES?

We have seen that when attempting to define AI according to the traditional Aristotelian distinction, several problems arise. This begs an inquiry into the newfound spectrum between artifacts and natural substances. We can see that AI at least meets definitions required for primary substance in Aristotle's theory. Certainly, an AI that can operate at a level of complete autonomy without human input could be considered separable in the sense established earlier. It could be considered a “this” since it does not rely on the existence, explanation, or operation of another entity. The sharp distinction between the artifact, autonomous AI, and living organisms that come to be by nature is done away with since the AI does in fact have the principle of motion established in Aristotle's theory. Despite this, the AI is still not considered the same as a living organism, at least in that it does not come to be by nature, so it may not be considered the same exact type of substance as those organisms, even though it still could be considered a primary substance given the definition in *Categories* and the discussion in *Metaphysics*.

15 Keith Douglas Farnsworth, “Can a Robot Have Free Will?” *Entropy* 19, no. 5 (2017): 18, 10.3390/e19050237.

Wyss Institute, November 29, 2021, <https://wyss.harvard.edu/news/team-builds-first-living-robots-that-can-reproduce/>.

13 Wolfhart Totschnig, “Fully Autonomous AI,” *Science and Engineering Ethics* 26 (2020): 2473–85, 10.1007/s11948-020-00243-z.

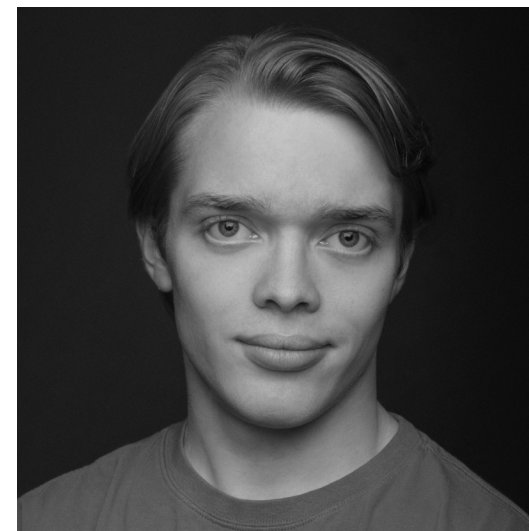
14 Totschnig, “Fully Autonomous AI,” 2475–76.



My brief exposition here has attempted to show the magnitude of possible issues when considering AI under the traditional Aristotelian distinction. If we instead consider a spectrum between artifacts and natural substances, we can reasonably conclude that some AI systems may be getting closer to natural substances even if others may still be closer to artifacts. As they develop, they will continue to move across this spectrum in either direction, approximating natural substances or artifacts while perhaps never falling into one specific domain. Instead of attempting to define these systems under the traditional interpretation, it might be more promising to think about how they can move across the spectrum and the implications that follow in that case for future interpretation of Aristotle's metaphysics.

VI. CONCLUSION

I have elucidated above several reasons why the traditional Aristotelian distinction between natural substances and artifacts could be reconsidered. However, there is surely more investigation to be had over the evolution and autonomy of AI and how to define some AI systems, which impacts the discussion. Aristotle's thought is rather complicated and broad, and it will continue to be interpreted in various ways, especially as new literature becomes available. Nevertheless, we should consider a possible reinterpretation of the traditional distinction between natural substances and artifacts in light of continued developments in technology as it will only serve to strengthen our facility for understanding Aristotle's thought as well as the future of technological development. There is still much to unfold in Aristotle's framework, and we should not consign ourselves to limited possibilities so long as we are still attempting a sincere interpretation of his theory.



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