

**Artificial Intelligence and the Notions of the “Natural” and the “Artificial”**Justin Nnaemeka Onyeukaziri<sup>1</sup><sup>1</sup> Fu Jen Academia Catholica, Fu Jen Catholic University**ABSTRACT**

This paper argues that to negate the ontological difference between the natural and the artificial, is not plausible; nor is the reduction of the natural to the artificial or vice versa possible. Except if one intends to empty the semantic content of the terms and notions: “natural” and “artificial.” Most philosophical discussions on Artificial Intelligence (AI) have always been in relation to the human person, especially as it relates to human intelligence, consciousness and/or mind in general. This paper, intends to broaden the conversation, by discussing AI in relation to the notions of “nature” and the “artificial.” This intention is to more critically understand the artificiality in and of artificial intelligence. To achieve this, the notion of “nature” in Aristotle’s Philosophy of Nature, has been employed as an epistemological tool in interrogating the notion of the artificial and the objectives of the science and technology of Artificial Intelligence.

**Keywords:** Artificial Intelligence, Artificiality, Artefacts, Information Processing, the Natural.

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## 1. Introduction

The term “artificial intelligence” has come to stay. It is almost a household name globally. It has been employed to designate the science and technology aimed at designing and developing non-animal (or better put, non-biological) cognitive systems, in other words, smart or intelligent non-animal systems. Before the term “artificial intelligence” was coined, the idea existed. There had been the idea of “machine intelligence” by Alan Turing, who could be said to be the first to embark on a substantial and in-depth research on the possibility of designing non-human intelligent systems (See Jack Copeland 2004, 353). The term “artificial intelligence” was employed and became definite during the earliest conference on computational research (the Dartmouth Workshop held in 1956). The usage of this term has been attributed to John McCarthy (See Stan Franklin 2014, 18), who employed it during the aforementioned workshop to signify the science they intended to pursue. Herbert A. Simon (2019, 4, footnote n.2), informs us of his reservation and that of his research group during their time in Rand and Carnegie Mellon University, to the use of the term “artificial intelligence” to signify this science. He said they would rather prefer using the term(s): “complex information processing” and/or “simulation of cognitive processes.” The name has come to stay with certain categorizations, such as: “weak artificial intelligence” and “strong artificial intelligence” by John Searle. There is also the categorization into: Narrow artificial intelligence (NAI), Artificial General Intelligence (AGI) and Artificial Super Intelligence (ASI). Actually, the scope of the science of artificial intelligence, is not only narrowed to the notion of “intelligence.” It actually deals with the notions of “cognition” and “life” generally. Hence, it would be proper to say that what is actually explored in this science is rather “artificial cognition” and “artificial life.” John Haugeland (1997, 1), generally calls this intellectual endeavor: “Mind design,” which according to him “is the endeavor to understand mind (thinking, intellect) in terms of its design (how it is built, how it works).” It is in respect to this that he asserts: “the field of artificial intelligence (AI), the attempt to construct intelligent artifacts, systems with minds of their own, lies at the heart of mind design” (1997, 1).

Most discussions on AI have always been in relation to the human person, especially as it relates to human intelligence, consciousness and/or mind in general. This paper, intends to broaden the conversation, by discussing AI in relation to the notions of “nature” and the “artificial.” This intention is to more critically understand the artificiality in and of artificial intelligence. To achieve this, the notion of “nature” in Aristotle, has been employed as an epistemological tool in interrogating the notion of the artificial and the objectives of the science and technology of AI. Hence, this paper is executed thus: 1. Introduction. 2. Exposition of Artificial Intelligence. 3. The Notions of the “Natural” versus the “Artificial.” 4. Critical Evaluation. 5. Conclusion.

## 2. Exposition of Artificial Intelligence

In the term “Artificial Intelligence,” the term “artificial” is used as an adjective to describe

the term “intelligence” which is a noun. Thus, intelligence (better put cognition in general) is the main subject matter of the science of AI. The different paths followed in the history of the research and development of AI and the models of AI produced, have been marked by a given notion of “intelligence” or “intelligent behaviour,” that is, it has been marked by what the researchers in AI considered to be what constitutes intelligence or intelligent behaviour in the human person. The two main divides have been, whether intelligence constitutes problem solving or whether it constitutes learning. The symbolic AI (or classical) models, largely consider intelligence as the capability to solve problems, while the neural network or Connectionist models consider intelligence largely as the capability to learn. Allen Newell and Herbert Simon are passionate examples of AI researchers who hold problem solving as the main end of intelligence and as what should define AI. This view, they elaborately expounded in their magnum opus entitled “Human Problem Solving” (2019). This view had been nurtured and initiated earlier in their essay entitled “Computer Science as Empirical Enquiry: Symbols and Search,” originally published in 1976, of which the citation from this essay will be from its republication in Margaret A. Boden (1990). On the other hand, the pioneer work on the Neuron network model is attributed to Warren S. McCulloch and Walter H. Pitts. See for example their work entitled “A Logical Calculus of the Ideas Immanent in Nervous Activity,” originally published 1965, republished in Margaret A. Boden (1990). Another pioneer opus on connectionist models is the two-volume work on Parallel Distributed Processing by David E. Rumelhart, James L. McClelland and the PDP Research Group (1986). What is common to both models and hybrids of both models, is that they deal with information processing or computation.

Hence, to understand the science of AI, is to understand the nature of information processing. Most AI researchers, consider thinking and computing as identical, by which, thinking becomes information processing, and the human person is a computing system or information processor. For example, Allen Newell and Herbert Simon (2019, 5), assert that “thinking can be explained by means of an information processing theory.” They go further to maintain that this theory of thinking “views a human as a processor of information.” John Haugeland (1989, 2), in respect to his book, also submits: “That idea—the idea that thinking and computing are radically the same—is the topic of this book.” If what defines the human person as Rene Descartes famously asserted is, “cogito ergo sum,” that is, if it is thinking that defines the human person, then, the human person is a computer in simpliciter. If the human person is a computer, it would follow that fundamental to the study of computer science, is the study of the human person, especially the study of human thinking or intelligence. AI therefore, is the aspect of computer science that explores thinking or intelligence in general (see Margaret A. Boden (1990, 1). Newell and Simon (2019, 6), describe AI as “the part of computer science devoted to getting computers (or other devices) to perform tasks requiring intelligence.” And according to Boden (1990, 1): AI “is sometimes defined as the study of how to build and/or program computers to enable them to do the sorts of things that minds can do.” While for John

Haugeland (1997, 1), AI is “the attempt to construct intelligent artifacts, systems with minds of their own.”

What is at the heart of information processing? Before attempting to respond to this question, it is important to say why the question is important. If the act of thinking or intellection is “information processing,” which the human person and AI systems have in common, as claimed by most AI researchers, then the question of artificialness or the naturalness in or not in AI, will be better understood and explicated by the understanding of what “information processing” is. For instance, Newell and Simon (2019, 19) unequivocally assert: “Our theory of human thinking and problem solving postulates that the human operates as an information processing system.” If this is the case, then it will be important to ascertain whether “information processing” in itself, in respect to humans, non-human animals and in AI is a natural process. But in order to answer this question, the notion of the “natural” or “natural process” needs to be expounded. This will be the task of the next section. Before then, the understanding of information processing needs to be pursued.

In a general sense, information processing is symbolic representation and manipulation. Any system, animal or not, that executes information processing must be able to represent and manipulate symbols. According to Newell and Simon (2019, 20) an information processing system (IPS), “is a system consisting of a memory containing symbol structures, a processor, effectors, and receptors.” Hence symbols are at the heart of information processing. Processor, effectors and receptors make the architecture of a system, but without symbols there cannot be information processing. It is to this effect that Newell and Simon (1990,107), contend: “Symbols lie at the root of intelligent action, which is, of course, the primary topic of artificial intelligence. For that matter, it is a primary question for all of computer science.” What are symbols or symbol structures that lie at the root of intelligence—information processing? Symbols are abstract (formal) and discrete (digital) tokens that mean or signify something (See Haugeland (1989;1997). Symbols could be types or tokens, hence there are symbol types and symbol tokens. A simple example to explain the difference between types and tokens, is: In the name “Nnaemeka,” there are five “types” of letters of the English alphabet (n, a, e, m and k), while there are eight tokens of letters (n, n, a, e, m, e, k and a). These eight letters of the English alphabet are the tokens used to manipulate the spelling of the name, “Nnaemeka.” Whether the letter “n” is used in the capital or small letter it makes no difference to the spelling or the meaning of the name, “Nnaemeka.” According to Newell and Simon (2019, 24): ‘The importance of distinguishing symbol types from symbol tokens becomes obvious if we consider symbol structures such as (-, -, -), in which several tokens of the same type appear. The question, “How many symbols appear in (-, -, -)?” is ambiguous until one knows whether types or tokens are meant.’ Haugeland (1989, 48) submits: ‘The tokens of a formal game are just the “pieces” (“markers,” “counters,” or whatever) with which the game is played.’ Hence, according to Newell and Simon (2019, 23): “Symbol tokens are patterns that can be compared by the IPS and judged equal or different. A class of all tokens that are judged to be identical is called a symbol type. Thus, tokens of the same symbol type differ from each other only in

being distinct occurrences or instances.” AI being a formal system is designed to employ symbol tokens. For as Haugeland (1989, 48), maintains: “A formal system is like a game in which tokens are manipulated according to rules, in order to see what configurations can be obtained.” This follows that information processing is the manipulation of tokens that signify something. According to Newell and Simon (1990,109): “A physical-symbol system consists of a set of entities, called symbols, which are physical patterns that can occur as components of another type of entity called an expression (or symbol structure). Thus a symbol structure is composed of a number of instances (or tokens) of symbols related in some physical way (such as one token being next to another).” On the adjective “physical” in the term “physical-Symbol Systems”, Newell and Simon (1990, 109) explain: ‘The adjective “physical” denotes two important features: 1. Such systems clearly obey the laws of physics—they are realizable by engineered systems made of engineered components; 2. although our use of the term “symbol” prefigures our intended interpretation, it is not restricted to human symbol systems.’ According to Simon (2019, 22): “Symbol systems are called “physical” to remind the reader that they exist as real-world devices, fabricated of glass and metal (computers) or flesh and blood (brains).” Physical symbol systems, according to Herbert Simon (2019, 21), are artefacts, that is to say, they are artificial entities, of which the computer (AI) is a prominent example. Though, the human mind and brain are not artefacts, he classifies them alongside computers as physical systems. By the means of symbol tokens, symbol structures are built. “Symbol structures are built up from symbol tokens and relations” (Newell and Simon 2019, 23). Symbol structures are sequences of symbol tokens being represented and manipulated in an information processing system. Symbol structures in information processing systems designate not only objects in the real world but also symbol structures within an information processing system.

Hence, the whole processes of symbolic representation and manipulation (encoding and decoding) in information processing have to do with designation of symbols and symbolic structures. For representation and manipulation of symbols and symbol structures, all that is needed is a well-defined schema of relations of symbol tokens in an information processing system. This schema could be linguistic, logical and/or mathematical in the form of primitive symbols. Symbols and symbol structures which are at the heart of information processing, both in humans and in computers, are considered artifacts by Simon. According to Simon (2019, 22): “Symbol systems are almost the quintessential artifacts, for adaptivity to an environment is their whole *raison d’être*. They are goal-seeking, information-processing systems, usually enlisted in the service of the larger systems in which they are incorporated.” It has to be maintained that though the human mind and brain manipulates symbols, however, the claim that symbolic systems in human mind and brain are artifacts is arguable. Symbolic representation and manipulation by the mind and/or the brain are operations proper to the mind and brain. Though the arts of education and socio-cultural cultivations could improve the capacity of the mind/brain in the representation and manipulation of symbols, it would be incorrect, as a result of these human inventions, to maintain that the human mind and brain are

symbolic system artifacts as argued by Simon (see 2019, 21).

### 3. The Notions of the “Natural” versus the “Artificial”

Aristotle (Physics 184a10-15) begins his work on Nature, by asserting that “we do not think that we know a thing until we are acquainted with its primary causes or first principles, and have carried our analysis as far as its elements.” Aristotle (194b15-20) also makes a similar assertion, when he opines: ‘Knowledge is the object of our inquiry, and men do not think they know a thing till they have grasped the “why” of it (which is to grasp its primary cause).’ Also he holds a similar position on knowledge as the grasping of the causes of a thing in *Metaphysics* 994b25-30. Hence, the object of this section is to investigate the first principle(s) of the notion “Nature.” The guiding question, thus, is: What is Nature? The term “nature” has several significations. Here, it does not signify the *ousia* (essence) of an *hupostasis* (substance). And it does not signify the property or properties of a *substratum*. For example, in respect to the human being, it is not in the following sense in the proposition: rationality is the nature of humans—here “nature” is used in respect to the essence of humans. And also, it is not in the sense, when it is said: speech or the ability to speak is in the nature of humans—here “nature” is used in respect to the property of humans. Rationality and speech, that have defined the essence of the human person (especially in Western Philosophy) and as main distinguishing properties of the human person, have marked and defined the enterprise of the researchers of Artificial Intelligence. And which is to create and design artifact that has the capacity for rationality and the capacity for the utilization of ordinary human language (speech). Hence, the investigation of the natural, will aid us to understand if these two senses of the term “nature” in respect to human beings can be made artificial or whether they are by nature artificial in themselves.

Hence, in reference to the subject matter of this investigation, the question would be better framed as: What constitutes the natural? Nature or the natural is not identical with existence or reality—what is real. Nature or the natural is an aspect of existence; it is a part of what is real. Aristotle makes two references on the use of the term “nature”, of which both senses are neither that intended in this investigation nor that which he intends to explore in his philosophy of nature. According to him: “This then is one account of nature, namely that it is the primary underlying matter of things which have in themselves a principle of motion or change. Another account is that nature is the shape or form which is specified in the definition of the thing” (Physics 193a25-35). While the former is the primary substance (*substructum*) the pre-Socratic philosophers investigated, the latter is what has been discussed above as the *ousia* or quiddity of a thing. The real as ontologically different from the natural, is what Bartholomew Abanuka, calls the “ultimate contraries.” The ultimate contraries are the ontological properties of reality as a whole. According to him, the ultimate contraries are “reality (being) and becoming, spirit (mind) and matter, eternity and time, necessity and contingency, actuality and potentiality, immutability and change, immediate and mediate, transcendence and immanence” (Abanuka, 2014,100). As will be expounded below via Aristotle’s physics, the natural, ontologically

exists within the realm of the following ends of the ultimate contraries: becoming, matter, time, contingency, potentiality, change, mediate and immanence. To this end, the other ontological realm of the ultimate contraries, are not within the realm of the natural or nature. They are within the realm of the super/supra-natural. Change or motion therefore, is a defining principle of the natural. It is not merely physical motion of things, but it is the change or motion that deals with generative contrariety, that is the contrariety of birth and death, generation and decomposition or degeneration. All things natural have intrinsic in them the principles of being able to be born and of being able to die, generated and decomposed.

Aristotle (Physics 188b20-25) asserts: “everything that comes to be or passes away comes from, or passes into, its contrary or an intermediate state. But the intermediates are derived from the contraries [...]. Everything, therefore, that comes to be by a natural process is either a contrary or a product of contraries.” It seems this quotation from Aristotle, has a key that can help us to unlock the definition of the natural, that is to say, a natural process. That key is the notion of contrary. For as Aristotle’s assertion above suggests, all natural existence, that is things that exist by the means of a natural process have some form of contrariety. Contrariety is simply the opposite of the properties of a thing. For example, good and bad; tall and short; excess and defect; act and potency, being and becoming, are contraries. In between contraries there are gradations of intermediaries. For example, an act or a thing, can be neither good nor bad, but fair. One fundamental nature of contrariety is change or motion. It is in the nature of all contraries to change—becoming is in the very nature of all contraries. It follows, therefore, that all things natural or that exist by natural process, are in the state of becoming, that is to say, they are in the state of potency—they experience generation and decay by interior ontological mechanisms. Aristotle (Physics 192a 25-30) explains the relationship between the coming to be and the ceasing to be of matter as it relates to potentiality and privation, thus:

The matter comes to be and ceases to be in one sense, while in another it does not. As that which contains the privation, it ceases to be in its own nature; for what ceases to be—the privation—is contained within it. But as potentiality it does not cease to be in its own nature, but is necessarily outside the sphere of becoming and ceasing to be. For if it came to be, something must have existed as a primary substratum from which it should come and which should persist in it; but this is its own very nature, so that it will be before coming to be. (For my definition of matter is just this—the primary substratum of each thing, from which it comes to be, and which persists in the result, not accidentally.) And if it ceases to be it will pass into that at the last, so it will have ceased to be before ceasing to be.

Simply put perishability is in the essence of the natural (see Aristotle Physics 192b1). Becoming or coming to be, have different senses. Paul Grenet (1960, 3), in explaining the notion of change in the Aristotelian-Thomistic cosmology, asserts:

Everything in this corporeal world is subject to birth and death; and from birth onward, to variation. Some changes remain external to the thing considered. They fail to affect it intimately, changes of place (i.e., extrinsic changes). Other changes affect the thing in itself

(i.e., intrinsic changes), and among these some are superficial, concerning only its states or modes of being; others are profound, they touch the very identity of the being.

As Aristotle (Physics 190a20-35) maintains: there are things that come to be from an underlying principle or substance, and there is coming to be without qualification from what is not. He submits “in all cases other than substance it is plain that there must be something underlying, namely, that which becomes. For when a thing comes to be of such a quantity or quality or in such a relation, time, or place, a subject is always presupposed, since substance alone is not predicated of another subject, but everything else of substance” (Physics 190a30-35). Hence, he concludes that “everything comes to be from both subject and form” (Physics 190b20-25). To this effect, Aristotle (see Physics 191a1-20) argues that there are three principles in all things in nature: two contraries of a thing and that underlying principle that remain unchanged in the thing.

Having established these principles present in all things in nature, Aristotle clearly states the things that exist by nature. According to him: “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” (Physics 192b1-10). What natural things have in common according to him is that “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)” (Physics 192b10-15). For Aristotle, therefore, the following realities constitute the natural: animals, plants, and the four elements: earth, fire, air and water. These natural things he distinguishes from the products of art, which for him “have no innate impulse to change. But in so far as they happen to be composed of stone or of earth or of a mixture of the two, they do have such an impulse, and just to that extent—which seems to indicate that nature is a principle or cause of being moved and of being at rest in that to which it belongs primarily, in virtue of itself and not accidentally” (Physics 192b10-15). One may wonder if (or how) the four elements: earth, fire, air and water, have self-motions. Besides arguing from the historical context of philosophy of nature—whereby the elements possess a sort of divine vitality—that formed the thought of Aristotle, from the standpoint of a naïve naturalism, one will not doubt that the four elements are in constant manifestations of motion and rest. Paul Feyerabend (2018) exposition on the philosophy of nature from the art and mythology of the stone age through the ancient Greek philosophers to the modern and contemporary science, and the notion of the four elements in the astronomy of the ancient thinkers and could help to understand how it influenced Aristotle’s philosophy of nature. Another important point to note about the natural, is that, as much as it is motion that defines the natural, the motion of the natural is not eternal—there is a pattern of motion and rest (potency and act) in the natural. The properties and attributes of a natural thing by extension are also said to be natural or operate according to nature. So, it is said that, “speech” and “rationality” is natural to the human person. According to Aristotle (Physics 192b35): ‘The term “according to nature” is applied to all these things and also to the attributes which belong to them in virtue of what they are, for instance the property of fire to be carried upwards—



which is not a nature nor has a nature but is by nature or according to nature.’

What makes the non-natural or say the artificial, then, for him is not merely because they are products of art or craft, but more importantly it is because they “have no innate impulse to change.” Hence, Aristotle (Physics 192b25-30) asserts that no artificial product “has in itself the principle of its own production.” For every production requires motion, when production takes place there is always a change in causes or principles (for a concise understanding of Aristotle’s description of the four causes or principles of things, see Physics 194b20-35 and Metaphysics 994a1-994b30). The intrinsic capacity for self-motion becomes the quiddity of the natural. Thus, just as art imitates nature, so the artificial imitates the natural. Besides the nature of the artificial as imitator of the natural, art or the artificial could also complete or complement nature or the natural. As Aristotle (Physics 199a15-20) affirms “generally art in some cases completes what nature cannot bring to a finish, and in others imitates nature. If, therefore, artificial products are for the sake of an end, so clearly also are natural products.” This point on art or the artificial being in the service of completing or complementing the natural is worth noting. Herbert A. Simon (2019, 3), though critiquing Aristotle’s notion of the “natural” as not as deep as the knowledge we have of it today, seems to make similar submission, when he claims “those things we call artifacts are not apart from nature. They have no dispensation to ignore or violate natural law. At the same time they are adapted to human goals and purposes [...]. As our aims change, so too do our artifacts—and vice versa.” He (see 2019, 3) makes this claim based on his position that one should not understand the “biological” and the “natural” as identical. He maintains that the biological can be artificial. He gives an example of farm and forest, that though, a farm contains biological substance, plant, but since they are products of human art, they are rather artificial not natural. Hence, Simon’s notion of the artificial, is broadly understood as artifact—what is produced by the human person. This understanding is not as philosophical as Aristotle’s notion exposed above, who intends to delimit the quiddity of the natural, which for him is the capacity for intrinsic motion or change, which implies the property of contrarities.

Today with the research in AI, the artificial is being taken as seriously important to humans in the world as it is with the natural. Herbert A. Simon (2019, 2) even claims that the artificial is even becoming more important than the natural, when he contends:

The world we live in today is much more a man-made, or artificial, world than it is a natural world. Almost every element in our environment shows evidence of human artifice. The temperature in which we spend most of our hours is kept artificially at 20 degrees Celsius; the humidity is added to or taken from the air we breathe; and the impurities we inhale are largely produced (and filtered) by man.

It is therefore, to this end that he advocates the need for a “science of the artificial,” of which he makes the title of the work from which the above references on his notion of the

artificial and the natural are made. He (2019, 13) claims: “Artificiality connotes perception similarity but essential difference, resemblance from without rather than within...we may say that the artificial object imitates the real by turning the same face to the outer system, by adapting, relative to the same goals, to comparable ranges of external tasks.” For him the differences or the gap between the natural and the artificial is not as much as many tend to think. This is because, for him the natural and the artificial have in common goal-oriented behaviour. Both the natural and the artificial are employed by humans to achieve a goal or attain an end. In order to achieve a desired goal, both the natural and the artificial, have an inner and outer environment that enables the achievement of the desired goal. The inner environment deals with rational operation—mechanisms of the natural sciences, while, the outer environment deals with external embodiments of the system, natural or artificial. For example, he claims that both birds and airplanes, though having different outer environment, however, their ability to achieve their goal to fly could be explained in the same rational laws of physics (see Herbert 2019, 8). According to him (2019, 8), “the first advantage of dividing outer from inner environment in studying an adaptive or artificial system is that we can often predict behavior from knowledge of the system’s goals and its outer environment, with only minimal assumptions about the inner environment.”

#### **4. Critical Evaluation.**

For practical purposes, in the well-being of the human person the natural and the artificial are important and useful. Since as opined above the artificial helps to complete and complement the natural. To this intent and purpose, the research and development of artificial intelligence is helpful and should be encouraged. The problem lies in the theoretical ends in the research and development of artificial intelligence, especially when the end is a claim that intends to negate or eliminate the ontological difference between the natural and the artificial or to scientifically reduce the artificial to the natural or the reduction of the natural to the artificial. This paper argues that to negate the ontological difference between the natural and the artificial, is not plausible; nor is the reduction of the natural to the artificial and vice versa possible. Except if one intends to empty the semantic content of the terms and notions: “natural” and “artificial.”

Besides the conceptual implausibility of arguments on the level of whether or not there are semantic differentiation in the terms “natural” and “artificial”, a critical evaluation could be given on the substantial claim of the research project of artificial intelligence. This has to do with the notions of intelligence or the theories of cognition in general. Hence the question is: Is intelligence or cognition a natural or an artificial phenomenon or is it both? The researchers in AI and AI informed cognitive sciences operate on the ontological presupposition and epistemological framework that intelligence or cognition is both natural and artificial. Some even go to the extent to maintain that intelligence or cognition is artificial in simpliciter. It is claims like these that make the philosophical analysis and exposition of the notion of the natural as against the artificial not only important but pertinent.

It has been established above that information processing is at the heart of artificial intelligence, because it is the essential nature of intelligence or cognition in general. It was also maintained above that what is common to all models of AI or all architectures of cognitive science, is that they all deal with information processing or computation. Opinions may differ on whether or not information processing is necessarily representational or not, but there is a general consensus that all AI or cognitive science models are computational (for detail discussions on question on representation in AI models and Cognitive Architectures see the works of: Paul M. Churchland (1989) and Jay F. Rosenberg (1990) and Jerry A. Fodor and Zenon W. Pylyshyn (1988)). Hence, as expounded above, most AI researchers, such as Newell and Simon, posit thinking and computing as an identical operation. Which means for them: To say that a person thinks is to say that the person computes and to say that a machine computes is to say that the machine thinks. It is one and the same cognitive operation, different only in terms. Hence the question to investigate is: Is information processing per se necessarily an ontological property exclusively within the realm of the natural? Putting the question differently, is to ask: Is it only the natural that can process information per se? Since following Aristotle it has been established that the natural are human beings, other animals and plant (Aristotle includes the four elements), then the question could thus be reframed as: Is it only human beings, animals and plants that intrinsically have the power for information processing? To this question, all zealots of AI research and development will definitely answer No. For the business of AI research is to create and develop artificial systems that are capable of executing information processing.

If as established above, Aristotle posits the three principles in all things in nature as: two contraries of a thing and that underlying principle that remains unchanged in the thing, information processing shall be considered in relation to contrariety and the underlying principle behind information processing. In order to include all that has been mentioned according to Aristotle that constitute the natural, cognition shall be used rather than intelligence in dealing with information processing. This is because while human beings have intelligence per se, other animals and plant could only be said to be intelligent metaphorically. But it is agreed that like humans, animals and plants are cognitive systems. Animals have perceptions, imaginations and memories, while plants have only perceptions. Perceptions, imaginations, memories and intelligence (strictly speaking only present in humans) are all manifestations of cognition. Cognition could be said to be a contrariety, since a natural subject could be said to be of these contraries: cognitive and uncognitive. In between the two contraries are intermediaries of degrees or ranges of cognitive operations. Between the contraries and the intermediaries of contraries of a cognitive operation is the underlying principle that remains unchanged in the thing that carries out cognitive operations. The unchanging underlying principle as argued by Aristotle is the form or essence and the prime matter of the thing that carries out cognitive operations. Arguing from Aristotelian metaphysics, it will not be proper to say that an artifact has form (as in ousia or essence, not as in the structure of a thing). For

what all artificial intelligent systems have in common is computation, but there are many non-artificial intelligent machines that also carry out computations. Therefore, ontologically speaking artificial intelligence has no essence, it only has a structure.

It could be argued, that information processing is a natural property of the natural. It is a natural property of the natural, not only because of the biological constitution of the natural, humans, non-human animals and plants, but more so, because of their ontological underlying principles and metaphysical intrinsic contrarities that the natural have the property of information processing. This is because information processing in the natural operates within the intrinsic metaphysical contrarities of act and potency that are the principle of change, generation and degeneration, in the natural. It follows that in the natural, information processing is not merely a psycho-epistemological phenomenon, it is more so a metaphysical phenomenon because information processing in the natural causes a metaphysical change in the properties (not merely the behaviour) of the natural. Information processing in the natural is integral, in the sense that the entire being of the natural experiences transformation by the operations of information processing that occur in the natural. Hence, information processing in the natural begins from birth and continues in such a manner that it intrinsically leads to and informs the death or the degeneration of the natural. The experiences of birth and death, therefore, become intrinsic kinds of information processing that can only be experienced by the natural. Therefore, this makes information processing an intrinsic part in the ontological existence of the natural. Information processing in the natural has something to do with the existence, life and death, of the natural. This cannot be said of information processing in AI. Information processing in AI has nothing to do with the life and death of AI systems, for AI systems neither can experience life nor death. In AI, information processing deals squarely with computation, the representations and manipulations of symbols with the ultimate aim of solving problems. It follows in sum, that information processing in AI is not intrinsic to it, but it is derived as an extension of the information processing in the natural. To this extent, AI as an artefact, will remain in the service of complementing and completing the natural.

## **5. Conclusion.**

In conclusion, this paper discusses artificial intelligence in relation to the notions of “nature” and the “artificial.” Of which the primary intention is to critically understand the artificiality in and of artificial intelligence. The notion of “nature” in Aristotle’s philosophy of nature has been employed as an epistemological tool in interrogating the notion of the artificial and the objectives of the science and technology of Artificial Intelligence. It emphasizes the metaphysical principles of contrarities and change as the intrinsic properties that underline the natural. Arguing by the means of these underlying principles, it contends that information processing, which AI researchers posit as the common nature in both humans, non-human cognitive systems and artificial systems, is an intrinsic ontological property of the natural. To which effect, it submits that information processing in AI is not an intrinsic ontological property. Rather it claims that in AI information processing is an extension of the information

processing in the natural. This leads to the concluding affirmation of the Aristotelian position on the good of art and artefacts in general, that AI as artefact, will remain in the service of complementing and completing the natural.

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