Philosophy of Mind for Artificial Intelligence & Machine Learning:

Essays on AI, Ontology, and Consciousness

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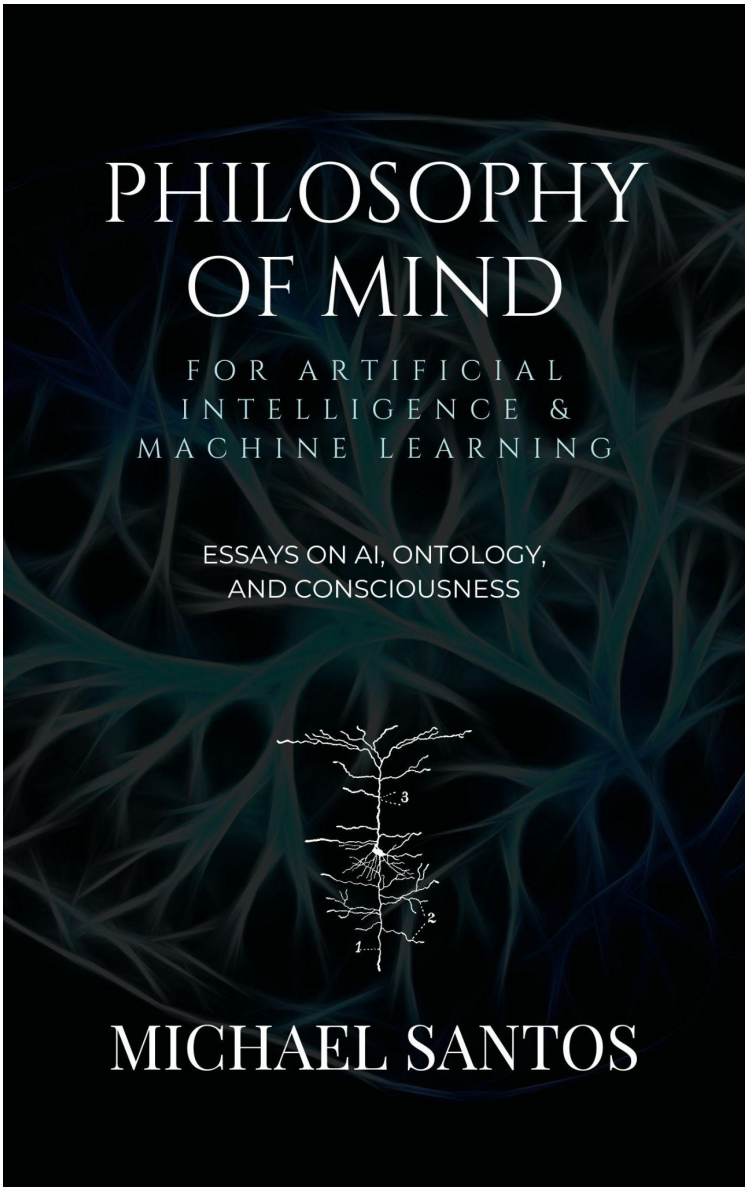

Contents

Why Reality Must Be Intelligible: Language, Perception, Challenges For AI

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Science and philosophy presuppose intelligibility

Science and philosophy both presuppose that reality is intelligible, meaning that it can be understood and explained by human cognition. This presupposition is necessary for several reasons, including the possibility of making sense of our experiences and the belief that there is an underlying order to the universe that can be discovered through investigation (Snyder, 2019).

One reason that science and philosophy presuppose that reality is intelligible is that it allows us to make sense of our experiences. As human beings, we are constantly interacting with the world around us, and our ability to understand and explain those interactions is essential for our survival and well-being. Without the presupposition of an intelligible reality, it would be difficult, if not impossible, to make sense of our experiences and to navigate the world in a meaningful way (Maurer, 2018).

Further, we believe that there is an underlying order to the universe that we can explore and access. This belief is based on the observation that the natural world is governed by laws and principles that can be described and predicted through scientific inquiry (Snyder, 2019). Without the presupposition of an intelligible reality, it would be difficult to believe that such laws and principles exist and that they can be discovered through investigation.

In short, if we don't presuppose intelligibility, then all of science and philosophy are moot.

However, we'd ideally like to have a stronger logical argument than the above for the necessity of reality's intelligibility. For that, we'll examine language, perception, and their implications for both us and our technology.

Specifically, this paper argues that the structures of reality, perception, cognition, and natural and formal languages are isomorphic to one another. It is this isomorphism that logically ensures reality's intelligibility, and provides an ontology for theories and models themselves. Moreover, that isomorphism allows us to learn about the nature of reality by studying linguistic syntax. Further, a key challenge facing the advancement of artificial intelligence (AI) is that of relevance realization, or the way in which an embodied conscious agent "reads" the language of reality, derives meaning from it, and acts upon that meaning, essentially serving as reality's reflexive read-write functionality.

Evolution and perception

Donald Hoffman's Interface Theory of Perception (ITP) posits that the objects and events that we perceive in the external world are not necessarily an accurate representation of reality, but rather are constructed as a

means of efficiently interacting with the world (Hoffman, 1998). This theory is based on the assumption that evolution has shaped our perceptual systems to prioritize fitness over accuracy, meaning that our perceptions are designed to help us survive and reproduce, rather than to provide a completely accurate representation of reality (Hoffman, 2015).

For example, your senses tell you when your environment has too much or too little oxygen, rather than telling you the total quantity of oxygen present. If your senses informed you of the latter, it would be accurate, but largely useless to your survival fitness.

Instead, evolution shaped your senses to communicate fitness payoff information from your environment. That process factors in the state of the world, the state of the organism, the interactions between organisms, and the frequencies of their competitive strategies at any given moment of time and for any given arena. It is truthful and vital information, but translated into a meaningful string of data that a given organism can find intelligible and actionable.

One of the key implications of the ITP is the Fitness-Beats-Truth Theorem (FBT Theorem). This theorem suggests that, in any world of competition, an organism that sees the truth about the world and uses that knowledge to maximize fitness will always be outcompeted by an organism that sees none of the truth but is just tuned to fitness (Hoffman, 2019b). In other words, even if seeing the truth about the world would theoretically lead to better fitness outcomes, an organism that prioritizes fitness over accuracy will ultimately be more successful in an evolutionary sense.

The FBT Theorem has several implications for our understanding of perception. First, it suggests that our perceptions are shaped by the demands of the environment in which we evolved, rather than by any inherent accuracy of our perceptual systems (Hoffman, 2015). This means that our perceptions may be biased in certain ways that are not necessarily reflective of the true nature of the world.

Second, the FBT Theorem implies that our perceptions are optimized for action, rather than for knowledge (Hoffman, 2019b). This means that our perceptions are designed to help us interact with the world in a way that maximizes our chances of survival and reproduction, rather than to provide us with a complete and accurate understanding of the world.

Additionally, the ITP and the FBT Theorem suggest that our perceptions are highly individual and context-dependent. Different organisms, or even different individuals within a species, may perceive the same objects or events in vastly different ways, depending on their evolutionary history and the demands of their particular environment (Hoffman, 2015).

In other words, the ITP and the FBT Theorem have important implications for our understanding of perception. They suggest that our perceptions are shaped by the demands of the environment in which we evolved, and that they are optimized for action rather than knowledge. They also imply that our perceptions are highly individual and context-dependent, and may not necessarily reflect an accurate representation of reality.

Perception is a language

There is ongoing debate among scholars about the extent to which perception is linguistic in nature and structure. Some argue that language plays a fundamental role in shaping our perceptions of the world, while others contend that perception is largely independent of language. In this response, I will provide an overview of some of the arguments and evidence for the linguistic nature of perception, including its use of symbols, tense, associations, and subject-predicate attributions.

One argument for the linguistic nature of perception is based on the idea that our perceptions are organized around symbols. This idea is rooted in the work of linguist Benjamin Lee Whorf, who argued that language shapes our perception of the world by providing us with a system of symbols that allows us to categorize and organize our experiences (Whorf, 1956). According to this view, our perceptions of the world are fundamentally shaped by the symbols that we use to describe them.

In this case, every detail of our perceived world, down to the smallest level of each of our senses, can be considered a member of the perceptual language's alphabet. These can then be combined to form strings and associations, from which we derive meaning that is relevant to our goals, chief of which has always been survival.

Another argument for the linguistic nature of perception is based on the role of tense in shaping our experience of time. Cognitive linguists argue that tense is not just a grammatical feature of language, but is also an essential component of our perception of time (Boroditsky & Ramscar, 2002). According to this view, our perceptions of events are structured around the temporal relationships between them, and language provides us with a way of organizing these perceptions into a coherent narrative.

Associations are also considered to be a crucial component of perception that is heavily influenced by language. Cognitive psychologists have shown that our perception of the world is shaped by the associations that we make between different sensory stimuli (Barsalou, 2008). These associations are often shaped by the linguistic context in which they occur, such as the words that are used to describe the stimuli.

Subject-predicate attributions are another aspect of language that is thought to shape our perceptions of the world. In his book "Philosophical Investigations", philosopher Ludwig Wittgenstein argued that our understanding of objects and events is structured around subject-predicate attributions, which are themselves dependent on the structure of language (Wittgenstein, 1953). According to this view, our perception of objects is not simply a matter of seeing them as they are, but is instead shaped by the language that we use to describe them.

While there is ongoing debate about the extent to which perception is linguistic in nature and structure, there is evidence to suggest that language plays a fundamental role in shaping our perceptions of the world. This includes its use of symbols, tense, associations, and subject-predicate attributions, all of which map isomorphically onto perception.

Perception can then be seen as a language, in and of itself; one that is vastly complex but structurally isomorphic to the syntax of our natural and formal languages, which of course are based upon perception.

Furthermore, when paired with the ITP and FBT Theorem, we can extrapolate this idea of a perceptual language to all conscious agents, a list currently restricted to metabolizing organisms but that also has immense implications for AI. Recall that, according to Hoffman, different organisms, or even different individuals within a species, may perceive the same reality in vastly different ways, depending on their evolutionary history, their current state, and the demands of their environment.

In essence, each species, and even individuals within the same, may have different perceptual and cognitive alphabets of symbols that can be combined in associations to form meanings. Because all organisms behave as if they share the same reality, we can infer that the syntaxes of these respective perceptual and cognitive languages are isomorphic to each other, and also to the structure of reality itself to a non-trivial degree.

Affordances

In his work, John Vervaeke defines affordances as the possibilities for action that are inherent in the environment and that are available to an agent with the requisite capabilities (Vervaeke, 2016). This concept has its roots in the work of psychologist James Gibson, who argued that perception is an active process that involves the detection of the affordances that are present in the environment (Gibson, 1979).

Vervaeke expands on this idea by emphasizing the role of perception and action in the detection and exploitation of affordances. He argues that perception is not simply a matter of passively receiving sensory input, but is instead an active process of exploration and interaction with the environment (Vervaeke, 2016). According to Vervaeke, the perception of affordances is closely linked to the development of skills and expertise, as agents learn to detect and exploit the affordances that are relevant to their goals.

For instance, if I grasp a water bottle, I am affording it the attribute of being graspable. I am an agent who has that capability, and so I am able to realize the bottle's graspability. By contrast, a spider cannot do so. However, the spider could afford the bottle the attribute of habitability, whereas I, an agent much larger than the bottle, could not. Meanwhile, the bottle simultaneously, reciprocally, and dialogically affords me the attribute of being a grasper. Such a relationship is isomorphic in structure to that of a subject-predicate coupling in linguistic syntax, whereby a predicate affords some attribute (including action) to its subject.

Vervaeke's work on affordances draws on a wide range of sources from psychology, neuroscience, and philosophy. He cites the work of Gibson, as well as the ecological psychology tradition that has grown out of Gibson's ideas. He also draws on the work of neuroscientist Walter Freeman, who has argued that perception and action are closely intertwined in the brain, with perception serving to guide action and action shaping perception (Freeman, 1991). Vervaeke also cites the work of philosopher Maurice Merleau-Ponty, who argued that perception is not simply a matter of sensory input, but is instead an embodied and situated process that involves the active exploration of the environment (Merleau-Ponty, 1962).

In other words, Vervaeke's work on affordances emphasizes the active and exploratory nature of perception, and the close relationship between perception and action. This concept draws on a wide range of sources from psychology, neuroscience, and philosophy, including the work of James Gibson, Walter Freeman, and Maurice Merleau-Ponty. It also converges nicely with Hoffman's ITP, FBT Theorem, and the linguistic nature of perception.

Relevance realization

Relevance realization is another concept introduced by Vervaeke that describes the process by which the brain identifies and prioritizes information that is relevant to a particular goal or context (Vervaeke, 2018). Relevance realization involves three main components: attention, meaning, and value, and it is central to cognition (Vervaeke, 2017).

The first component of relevance realization is attention. The brain is constantly bombarded with a combinatorially explosive amount of sensory information, and attention allows the brain to selectively attend to the most relevant information (Vervaeke, 2017). The second component is meaning, which involves integrating the attended information with one's existing knowledge and understanding of the world to create a coherent and meaningful representation of the information (Vervaeke, 2017). The third component is value, which involves evaluating the relevance of the information in relation to the individual's goals or needs, and using that evaluation to prioritize actions (Vervaeke, 2017).

Relevance realization is a fundamental cognitive process that enables individuals to navigate the complex and dynamic world around them (Vervaeke, 2018). It allows individuals to focus their attention, make sense of information, and prioritize their actions in a way that is meaningful and goal-directed.

In essence, relevance realization is our capacity to "read" the language of reality via our perceptual and cognitive syntaxes, to assign meaning to the associations and subject-predicate attributions therein, and to act upon that information.

Perception translates information into a language we can "speak"

The claim that "because we have survived, our perception must give us truthful information" is a common intuition, but it is not necessarily a sound argument. While our survival as a species may suggest that our perception has been useful for navigating the world, it does not necessarily imply that our perception is always accurate or truthful, only that it is at least non-trivially partially truthful.

In fact, research in cognitive psychology has shown that our perception can be highly fallible, and that our brains often rely on heuristics or shortcuts to make sense of complex sensory information (Kahneman, 2011). These heuristics can lead to cognitive biases and errors in judgment, which can have serious consequences for our decision-making and well-being.

Furthermore, our ability to survive as a species is not solely dependent on our individual perception, but also on social and cultural factors, as well as luck and chance events. As such, it is possible that our perception has evolved to be adaptive in some contexts but not in others, or that our survival has been achieved despite our perceptual limitations rather than because of them.

In short, the fact that we have survived as a species does not necessarily guarantee the truthfulness or accuracy of our perception, and we must be cautious in assuming that our perception always gives us a reliable picture of the world. We should take perception seriously, but not literally.

This reinforces the idea that perception is a language, or a carrier of information. Some critics suggest that the ITP entails that our perception gives us no accurate information, but this is not correct – our survival does imply that perception gives us true information, if not fully accurate. We could then suppose that ITP entails that we receive *partial* truth, but this isn't quite right either.

Instead, the implication of ITP is that our perception *simplifies* the information of reality, *translating* it into a language that we can "speak" (so to speak) in order to more efficiently accomplish tasks beneficial to our survival.

For instance, when I play a video game and enter its virtual world, that world gives me truthful but simplified information about the reality underlying it: the 1s and 0s, the transistors, etc. The states of the virtual world do provide truth about the states of that underlying nature. However, the virtual world is an interface that translates that complexity, which I could not easily find intelligible without expending tremendous energy, into a simplified perceptual language that is readily intelligible and therefore actionable.

With this in mind, it is no surprise that our perception is not always accurate. Think of how easy it is to have details get "lost in translation" when exchanging information across languages. Of specific concern in such work are the figures of speech, or linguistic heuristics (compare this to the perceptual heuristics mentioned above) that native speakers use in order to more quickly convey information.

However, because we have survived using our evolved perception, it logically follows that our perceptual language carries to us translated, simplified, non-trivially truthful information about reality.

Therefore, there is what we'll call a weak isomorphism between perception, cognition, and reality. It makes reality intelligible by providing us with a simplified, fitness-tuned, approximate representation of reality, as opposed to a strong isomorphism that would make reality comprehensible by providing a 1:1 representation.

In other words, the weak isomorphism of our perception with reality makes reality intelligible, but not comprehensible.

On natural and formal languages

Natural language is a system of communication used by humans to convey meaning and express thoughts and ideas. It is characterized by its complexity, ambiguity, and variability. Moreover, it constantly evolves and changes over time, coupled with the culture that employs it (Chomsky, 1965). Examples of natural languages include English, French, Spanish, and Chinese.

Formal language, on the other hand, is a specific type of language designed for a particular purpose or application. It is typically more precise, unambiguous, and well-defined than natural language and is often

used in areas like mathematics, logic, and computer programming. Natural languages may become formalized (Sipser, 2013).

Next, we'll look at specific considerations regarding natural and formal languages, and their effectiveness at carrying true information about reality.

Language evolved with and from perception

Language evolved out of our perceptual abilities. This hypothesis suggests that early humans used their perceptual abilities to communicate with each other, and over time, this communication evolved into the complex system of language that we use today (Hurford, 2011).

One key aspect of this hypothesis is that perception provides the foundation for many of the features of language, as already discussed in this paper. For example, the ability to recognize and categorize objects in the environment is a fundamental aspect of perception, and this ability is reflected in the way that language uses categories and labels to describe the world around us (Lakoff, 1987). This is due to the linguistic nature of perception, providing an isomorphism between perceptual syntax and the syntaxes of languages that evolved out of and alongside perceptual faculties.

Another aspect of this hypothesis is that the evolution of language was closely linked to the development of the brain. The ability to use and understand language requires a high level of cognitive processing, and it is likely that the evolution of language was closely tied to the expansion and development of the human brain (Deacon, 1997).

Overall, the idea that language evolved out of our perceptual abilities suggests that language is deeply rooted in our experience of the world around us. Our ability to perceive and categorize the environment provided the foundation for the development of language, and the evolution of language was closely linked to the development of the human brain.

Language shapes cognition

Cognition and language are closely intertwined, and each one has an impact on the other. Language provides a means for individuals to acquire knowledge, communicate with others, and form abstract concepts. In turn, cognition plays a crucial role in the acquisition and processing of language.

According to the Sapir-Whorf hypothesis, language shapes the way people think, and the structure of a language can influence how individuals perceive the world around them. For instance, the English language has distinct words for colors such as "blue" and "green," while some languages such as Tarahumara do not differentiate between these two colors, instead using a single term for both. Research has shown that speakers of languages with fewer color terms tend to have more difficulty distinguishing between different shades of colors (Winawer et al., 2007).

Moreover, language can influence the way people categorize objects and events. For example, speakers of Mandarin Chinese tend to group objects together based on their functional relationships, while English speakers tend to group objects based on their perceptual features (Boroditsky, 2001).

Cognition also plays a vital role in language processing. The ability to reason, plan, and problem-solve all depend on cognitive processes, and these processes are involved in language comprehension and production. Research has shown that cognitive abilities, such as working memory, attention, and executive function, are essential for successful language learning (Gathercole & Baddeley, 1993).

In these ways, reality, perception, cognition, and languages all shape each other in a dialogic, reciprocal manner. They converse with each other by transducing information between them, thereby recursively evolving together. In so doing, they maintain a syntactical isomorphism to the structure of reality that ensures and preserves their utility, and, ultimately, benefits the survival of the conscious agents who employ them.

Reality cannot be intelligible without this dialogue and the resulting isomorphism. In short, to deny the reality-perception-cognition-language isomorphism is to abandon science and philosophy as meaningful projects. Since both have been successful at discovering and working with reality, the isomorphism must hold true. It is the dialogic, linguistic interplay between reality, perception, cognition, and languages that brings about those syntactic similarities.

Generative grammar and predictive world modeling

The structure of reality and the structure of language have been compared in various ways, with some researchers drawing parallels between the generative grammar theory of language and predictive world modeling theories of the brain. Generative grammar posits that language is structured according to a set of rules or principles that generate an infinite number of possible sentences (Chomsky, 1965). Predictive world modeling theories of the brain suggest that the brain constructs internal models of the external world that allow it to predict future events and generate actions (Clark, 2013).

One way in which these two theories can be compared is in terms of their generative capacity. Just as generative grammar can generate an infinite number of possible sentences, predictive world modeling theories suggest that the brain is capable of generating a vast number of possible future scenarios based on its internal models of the world (Friston, 2010).

Another way in which these two theories can be compared is in terms of their hierarchical structure. Generative grammar posits that language is structured hierarchically, with larger units of meaning built up from smaller ones (Chomsky, 1957). Similarly, predictive world modeling theories suggest that the brain constructs hierarchical representations of the external world, with higher-level representations built up from lower-level ones (Clark, 2013).

Moreover, both theories rely on probabilistic models. Generative grammar posits that language is probabilistic, meaning that the probability of a particular sentence being grammatically correct can be calculated based on its adherence to the rules of the grammar (Chomsky, 1957). Predictive world modeling theories also rely on probabilistic models, as the brain must constantly make predictions about the likelihood of future events based on the available sensory information (Friston, 2010).

In other words, there are several ways in which the structure of reality can be compared to the structure of language, with some researchers drawing parallels between generative grammar and predictive world modeling theories of the brain. Both theories rely on generative capacity, hierarchical structure, and probabilistic models to generate and make sense of complex information.

Implications for physics and metaphysics

Moreover, the similarities between the structures of generative grammar and reality find parallels in physics and metaphysics, with respect to cosmological questions such as the origins of reality. For instance, any reality theory that describes reality as evolving from a ground state of potential and exploring all possible options necessarily displays an isomorphism to generative grammar, which entails the same kind of recursive process in language.

The implication is that reality (the set of everything that is real) is, by definition, self-contained and self-generating, with no external factors or entities necessary for its existence. It is capable of both generating and interpreting its own language and meaning – since there is nothing else besides reality, nothing else could perform these functions. In other words, since reality is intelligible to us, and since we are part of reality, reality must be intelligible to itself.

Reality is, therefore, capable of infinitely complex self-reference and self-description. Any process of identification, such as this self-actualization and self-realization, entails distinguishing “some-thing” from its logical complement. Indeed, “no-thing” is ever truly realized without its complement to provide logical context.

The conception of opposites supports human thinking in a number of ways, including our “everyday counterfactual thinking, classic deductive and inductive reasoning tasks and the representational changes required in certain reasoning tasks … it follows that opposites can be regarded as a general organizing principle for the human mind rather than simply a specific relationship (however respectable) merely related to logics” (Branchini et al 2021).

In other words, we make sense of the world by creating dualities, such as good and evil, hot and cold, tall and short, etc. We mentally position these pairs as opposites, allowing us to reason and grok important information about our arena.

For instance, we use the hot-cold dichotomy in order to know if the temperature of an entity or of the environment at large is dangerous or suitable to our survival. A hot stove delivers negative fitness payoffs. So does a frozen lake.

The dangerous properties of a hot stove and a frozen lake are not properties of the “things” in themselves, but rather are only realized as such once we, conscious agents, enter into a reciprocal, dialectical, agent-arena relationship with the things in themselves. For instance, many other organisms are able to survive intense heat or cold, but both the hot stove and frozen lake are outside the temperature range that humans need. Thus, the agents and the arenas co-realize each other, and that relationship is “re-presented” in our perceptual and cognitive frameworks as icons (physicality) and as the conceptual notions of “things” and opposites.

Duality implies the separate ontic existence of the two entities making up the dichotomy. In order for them to be opposed, surely they must exist independently of one another as two distinct "things."

However, we instead find a more complex, self-realization of the conceptual, in which "thing-ness" is merely nominal, just as it was for the material. The "things" once again reciprocally realize each other in a kind of dialectical relationship, not so much opposing each other as depending on each other's co-existence, and ultimately on a shared unity (McGill & Parry 1948; Lincoln 2021; Vervaeke & Mastropietro 2021), in order to be realized, and thus made real.

In all cases, we get back to the logical necessity that reality, as the only "thing" that exists, must realize itself in order to be real. It is in this way that conscious agents, as part of reality, "read" the language of reality, thereby fulfilling the role of self-contained reality's self-identification and self-actualization (Campbell, 2003; Hoffman, 2019a; Kastrup, 2019; Azarian, 2022; Santos, 2022).

Quantum physics is then best interpreted along the lines of Carlo Rovelli's relational model (Rovelli, 1996), and Markus Müller's physics of the first-person perspective (Müller, 2023), both of which are consistent with the previously referenced interpretations that support non-locality and contextuality.

In that case, and consistent with the ITP and the FBT Theorem, quantum physics tells you about the probability of each outcome and what you will perceive next as an observer. It answers the question, "What will I observe to be the next state of the world?"

We can resolve the mysteries of the wave function under this model as well; it is not that consciousness collapses the wave function, as some propose. That statement implies a kind of ontological dualism, in which consciousness and the physical wave function are both ontic entities. This is not so, because reality logically must be one ontic entity (for instance, any two real "things" and a given real difference between them all share the similarity of being real, meaning they are part of an ultimate reality, the "One").

Instead, because spacetime and the physicality that we perceive are like an interface, they should be considered epistemic entities, not ontic entities. Doing so resolves the quantum paradoxes that have plagued physics (the specifics are beyond the scope of this paper, but the reader should explore the work of the previously referenced physicists and others, such as Nima Arkani-Hamed).

In other words, quantum processes are artifacts of our "reading" the language of reality. They result from our perceptual and cognitive frameworks translating that vast stream of informational input into an intelligible language that gives us simplified truth about what state of reality will come next. *That intelligible language is physicality and spacetime, complete with all of the linguistic syntax of perception, which is then isomorphic to our natural and formal languages.*

It then logically follows that the only viable metaphysics is idealism (Campbell, 2003; Kastrup, 2019; Santos, 2022).

Explaining the unreasonable effectiveness of mathematics in the natural sciences

The “unreasonable effectiveness of mathematics” in the natural sciences is a phrase coined by the physicist Eugene Wigner in his 1960 paper of the same name (Wigner, 1960). It refers to the striking ability of the formal language of mathematics to accurately describe and predict natural phenomena, even when there seems to be no inherent connection between the two.

Mathematics has proven to be remarkably effective in describing and predicting natural phenomena across a wide range of fields, from physics and engineering to biology and economics. For example, the laws of physics are expressed using mathematical equations, and these equations have been able to predict a wide range of phenomena, from the behavior of subatomic particles to the motions of planets.

There are many theories as to why mathematics is so effective in the natural sciences. Some argue that it is because mathematics is a fundamental aspect of the universe itself, and that the laws of physics and mathematics are ultimately the same thing. Others suggest that mathematics is effective because it provides a powerful way to abstract and simplify complex phenomena, allowing scientists to focus on essential features and ignore irrelevant details.

However, this paper provides a simpler explanation by which to resolve this paradox: the structure of reality is isomorphic to the structure of perception, upon which our natural and formal languages are based, and with which the syntaxes of our natural and formal languages are isomorphic. Therefore, the structure of the formal language of mathematics is, via a kind of transitive property, isomorphic to reality, making reality intelligible but not comprehensible. It then logically follows that mathematics is effective at describing reality precisely because of that isomorphism.

Using the context of metaphysics, we can phrase this another way:

Physicality, which the formal language of mathematics describes, is how reality appears to itself when perceived from within itself.

More specifically, *the physical is what consciousness looks like when perceived*.

Gödel’s Incompleteness Theorem: intelligibility but not comprehensibility

Gödel’s Incompleteness Theorem is a fundamental result in mathematical logic that has important implications for the limits of knowledge and the possibility of a theory of everything. The theorem states that in any formal system that is powerful enough to express basic arithmetic, there will be true statements that cannot be proven within that system (Gödel, 1931).

This has profound implications for the search for a theory of everything, which is the quest to find a single theory that explains all of reality. The Incompleteness Theorem suggests that even if we were to find such a theory, it would be incomplete, because there would always be true statements about reality that could not be proven within that theory.

This is because any theory of everything would be a formal system, and Gödel's theorem applies to all formal systems that are powerful enough to express basic arithmetic. As such, the theorem implies that there are limits to what we can know and prove about the universe using formal systems and mathematical logic alone.

In addition, Gödel's theorem has also been interpreted to suggest that there are limits to what can be computed and predicted using algorithms and computers. This is because any algorithm or computer program can be viewed as a formal system, and Gödel's theorem implies that there will always be true statements that cannot be proven or computed by that system.

Gödel's conclusions for formal systems, which utilize formal languages, converge with what the ITP and FBT Theorem tell us about perception and the perceptual language. *In other words, reality is intelligible to us, but not comprehensible to us*.

An ontology of theories and models

We now have all of the premises needed to form a logical argument for the intelligibility of reality.

We evolved our perceptual apparati to provide true, simplified information about fitness payoffs in our external state. Our perception has all of the aspects of a language, including a linguistic syntax, and performs the function of a language: carrying information. Since we have been successful at surviving, it logically follows that the information carried by our perception is truthful. In other words, the structure of our perception is isomorphic to reality.

Our natural and formal languages evolved out of and are based upon our perception. As a result, our linguistic syntaxes are isomorphic to our perceptual syntax.

Because our perception is isomorphic to reality, and because our natural and formal languages are isomorphic to perception, therefore our natural and formal languages are isomorphic to reality. As a result, the theories and models that we develop using those natural and formal languages are capable of sharing that isomorphism and accurately exploring the nature of reality.

And if that's the case, then reality is intelligible to us, and our theories and models have an ontology of their own.

The challenge of relevance realization for AI

The challenge of relevance realization for AI is the ability for machines to identify and comprehend the significance of information in a particular context.

Recall that relevance realization is a fundamental cognitive process that allows humans to understand and navigate the world around them. This process involves identifying relevant information, integrating it with existing knowledge, and using it to guide behavior and decision-making. However, Vervaeke notes in lectures and commentary that current AI systems struggle to achieve this same level of relevance realization, as they often rely on static rules or algorithms that are unable to adapt to changing contexts. For instance, how could we ever program a computer to not just zero in on the pertinent details of a situation, but also to ignore the combinatorially explosive number of other details and combinations of details (Vervaeke, 2020)?

In other words, when we're reading a natural language on paper or on a screen, we're able to focus on just the symbols and strings relevant to us at any given moment. We can ignore the rest of the alphabet, the rest of the potential strings, etc., allowing us to find only the words before us salient.

In the case of our perceptual language, we do the same thing, but with a vastly more complex linguistic system. For instance, every fine detail of your sense data could be considered a symbol of the alphabet (giving us far more than English's modest 26 to choose from), and there are practically speaking infinitely many combinations of them. The task of "reading" only what is relevant and ignoring everything else becomes far greater when accessing the information of reality through the language of perception.

Furthermore, Vervaeke argues that relevance realization is closely tied to our embodied cognition, or our ability to use our physical bodies and sensory experiences to interact with the world. This embodied cognition is difficult to replicate in AI systems, which typically operate in a purely symbolic or computational domain (Vervaeke, 2020).

The challenge of relevance realization for AI has important implications for the development of intelligent machines. Without the ability to perceive and understand the significance of information in a particular context, AI systems may struggle to make sense of complex, dynamic environments. As such, researchers are working to develop new approaches to AI that incorporate more embodied, context-sensitive forms of cognition (Vervaeke, 2020).

In other words, if reality's structure is isomorphic to the syntax of our languages, including the language of perception, then relevance realization is our way of "reading" the language of reality. In this sense, reality itself can be viewed as a formal system.

For AI, it remains to be seen if relevance realization can be programmed or learned. Rather, because it seems dependent on an embodied conscious agent with an evolutionary history, perhaps relevance realization must be *evolved*.

In that case, the scales tip in favor of evolutionary models of AI development, though in practical terms it remains to be seen how effective such a model would be. After all, the natural evolutionary processes that shaped the cognition, perception, and relevance realization of metabolizing organisms has taken an immensely long time, and it is an open question whether or not the guidance of a human engineer could speed up the process in AI.

Until AI has the ability to "read" the vastly complex language of reality, as we do, it will be missing a core aspect of our cognitive functions. Moreover, that restriction will also limit its potential actions in the world, or its ability to "write" reality, which has implications for its capacity to be a truly general problem solver.

Therefore, AI must (likely through an evolutionary process) develop relevance realization in order to perform the reflexive read-write functions of reality that metabolizing conscious agents do.

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Perception As An Evolved Reality “Self-Simulation”

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This paper argues against the viability of the simulation hypothesis, when taken literally, as a reality theory. However, in so far as perception can be considered a mental function that generates a representation of reality, it can be considered a simulation. Moreover, since reality is, by definition, the set of everything that is real, it necessarily follows that reality therefore simulates itself. To that extent, we can form a viable application of the simulation hypothesis *as an aspect of* a more comprehensive reality theory. We specifically leverage the mathematical structure of simulations, along with theories such as the Interface Theory of Perception, the Fitness-Beats-Truth Theorem, and emergent complexity theory to argue that reality is a self-simulation, with perception as a key simulation function for conscious agents acting within reality, *as* reality.

Defining “simulation”

Simulation refers to the process of creating a model of a real-world system or process and then executing that model on a computer or other device to analyze the system’s behavior. In computer science, simulation is a crucial tool for analyzing the behavior of complex systems and for testing new algorithms and programs before they are deployed in the real world (Kelton, Sadowski, & Sadowski, 2018).

In virtual worlds, simulation is used to create digital environments that can replicate the behavior of real-world or imagined worlds. These environments can be used for a variety of purposes, such as entertainment, education, training, or scientific research. For example, flight simulators are commonly used to train pilots, while virtual reality environments are used for immersive experiences in games or educational settings (Kopper, Hauber, & Lemke, 2011).

Simulation technology has advanced significantly in recent years, allowing for more complex and realistic simulations to be created. This has led to new applications of simulation technology in areas such as autonomous vehicles, robotics, and artificial intelligence, where simulations can be used to test and refine algorithms in a safe and controlled environment (Golodoniuc, Gao, & Sorensen, 2021).

Simulations are often described in terms of their relationship to reality and the different levels of reality they can represent. At the most basic level, simulations can be thought of as representing a simplified or abstracted version of reality, while at higher levels of fidelity, they can become increasingly complex and detailed, approaching a level of realism that is difficult to distinguish from reality itself (Kelton, Sadowski, & Sadowski, 2018).

In some cases, simulations can represent a level of reality that is completely distinct from the physical world. For example, virtual reality environments can be created that simulate entirely imaginary or impossible worlds, such as a science fiction universe or a fantasy realm.

At the other end of the spectrum, simulations can represent a level of reality that is almost indistinguishable from the physical world. For example, simulations can be created to replicate the behavior of complex systems

such as traffic flow or weather patterns, and these simulations can provide highly accurate predictions of real-world behavior (Kelton, Sadowski, & Sadowski, 2018).

One important concept in understanding the relationship between simulations and reality is the idea of "ontological levels." This refers to the different levels of abstraction or granularity at which a system or phenomenon can be described. For example, the behavior of a complex system like an airplane can be described at different ontological levels, such as the mechanical properties of the airplane's components, the aerodynamic properties of the wings, or the behavior of the airplane as a whole (Rosenberg, 2006).

The simulation hypothesis vs. argument

The simulation hypothesis suggests that our reality is actually a computer simulation created by a highly advanced civilization. This hypothesis has gained popularity in recent years due to the advancement of computer technology and the potential for artificial intelligence to create realistic simulations of reality (Bostrom, 2003).

The simulation argument, proposed by philosopher Nick Bostrom, builds upon the simulation hypothesis by suggesting that if it is possible to create a realistic simulation of reality, then it is likely that we are living in such a simulation. This argument is based on the assumption that civilizations capable of creating advanced simulations will likely create many such simulations, and that it is more likely we are living in a simulated reality than in the "real" reality (Bostrom, 2003).

While the simulation hypothesis and the simulation argument are related, they are not identical. The simulation hypothesis is simply the idea that our reality is a simulation, while the simulation argument builds upon this idea to argue that it is probable we are living in a simulation.

There are several reasons why the simulation hypothesis and the simulation argument could be right. For example, the rapid advancement of computer technology and the potential for artificial intelligence to create highly realistic simulations suggests that it is becoming increasingly feasible to create simulations of reality. Additionally, if it is possible to create one simulation, it is plausible that many such simulations would be created, including simulations of historical periods or even entire universes.

However, there are also several reasons why the simulation hypothesis and the simulation argument could be wrong. For one, the creation of a highly advanced civilization capable of building realistic simulations is itself a highly speculative proposition. Furthermore, even if it is possible to create such a civilization, it is unclear why they would build simulations of reality, or why they would choose to simulate our specific reality.

What about evidence for or against the hypothesis? In his book *Reality+*, philosopher David Chalmers discusses the simulation hypothesis and concludes that it is difficult to determine whether or not reality is a simulation. He notes that while there is currently no empirical evidence to support the idea that we are living in a simulation, it is also difficult to rule out the possibility entirely, because a high-fidelity simulation may not provide any evidence of its own existence, yet still exist (Chalmers, 2019).

Further complicating the issue is that certain forms of our logic might allow for contradictions to be part of reality. For instance, Bernardo Kastrup and Graham Priest both argue that the nature of reality and logic may entail contradictions and absurdities, challenging traditional assumptions about the nature of truth and rationality.

Kastrup argues that reality itself may be fundamentally contradictory, in the sense that it may be simultaneously composed of both objective and subjective elements. He suggests that traditional metaphysical frameworks, which assume a strict divide between subjective experience and objective reality, may be unable to fully account for the nature of reality as we experience it (Kastrup, 2018).

Priest, on the other hand, argues that logic itself may be subject to contradictions and paradoxes, and that this should not be seen as a limitation of the discipline, but rather as an inherent feature of reality itself. He suggests that the existence of contradictions in logic may be evidence of the fundamentally paradoxical nature of the universe, and that attempts to resolve these contradictions may ultimately be futile (Priest, 2006).

Both Kastrup and Priest's arguments challenge traditional assumptions about the nature of reality and logic, suggesting that our understanding of these concepts may be more complex and multifaceted than previously thought. If they're right, then the sacred correspondence theory of truth and principle of bivalence, on which realism depends (and which depend on realism, in turn), are void. In that case, then a simulated reality may actually provide us occasional evidence of its existence in the form of absurd happenings, as Kastrup catalogs in *Meaning in Absurdity* (Kastrup, 2012).

Chalmers further acknowledges that the simulation hypothesis raises a number of difficult philosophical questions, such as the nature of consciousness and the relationship between the simulated reality and the "real" reality that might exist outside of the simulation. However, he ultimately concludes that it is impossible to know for sure whether or not reality is a simulation, and that the question may ultimately be beyond the reach of human knowledge (Chalmers, 2019).

Does the simulation hypothesis really tell us anything?

However, the idea that reality is a simulation created by an advanced civilization encounters numerous logical and philosophical problems that negate its validity, at least as a meaningful reality theory, upon closer inspection.

Reality is the set of everything that exists, such that there is nothing real that is external to reality. Everything that is real is within reality. If two things have a real difference between each other, then they (and that difference) still share the similarity of being within reality. To that extent, everything within reality is similar in spite of any other real difference.

The difference relation between two real, different things necessarily exists within the medium of reality. In that way, reality is at base a single medium of potential, from which difference relationships are actualized, and "things" are realized. Therefore, no difference between two real things is absolute. The very fact that we can

discuss their difference relationship in language, which has a structure ("rule set") that maps onto reality, tells us that they share an ontological medium, of which any "thing" is an excitation.

A handy metaphor is that of ocean waves. The still, calm, base surface of the water is homogeneous. It is a single medium, whose excitations evolve according to a natural "rule set" (determined by factors like wind, currents, temperatures, etc.) to form waves. Each wave appears different from each other wave, and we can even measure their dynamics to find real differences between them. Those differences can be described using languages (perceptual, cognitive, natural, and formal) that map onto and correspond with the structure of the reality they describe. However, no individual wave and no difference between waves in a given set of waves exist independently of their medium, the ocean.

Therefore, the simulation hypothesis really tells us little about the origins of reality or its ultimate nature. If our universe exists on the hard drive of some advanced civilization, then reality includes both our universe and theirs, and we're left to explain reality from their universe's perspective. They, of course, would run into the same simulation hypothesis that we have, and so on and so on. We'd meet an infinite regress, a sign that our thinking is off somewhere.

It doesn't matter how many different simulated universes are in question: by virtue of the fact that they are real, they are all the same in that they belong to reality, the set of everything that is real. As such, we must have a reality theory that terminates at one entity.

However, this does not negate the possibility that reality can be described as a kind of "simulation" in a certain, non-trivial sense. Indeed, that sense, which we'll now explore, may also explain why there seem to be degrees of plausibility and intuitiveness to the simulation hypothesis, and even more so to the simulation argument.

Mathematical structure of simulations

A simulation is a mathematical model that imitates a real-world system's behavior or operations. It is composed of four main components: input, processor, output, and display. These components work together to create a mathematical representation of the system being modeled.

The mathematical structure of a simulation can be represented by the following equation:

Output = f(Input, Processor)

where the input represents the initial conditions and parameters of the simulation, the processor represents the rules and algorithms used to simulate the behavior of the system being modeled, and the output represents the simulated behavior of the system over time.

The input is a set of values that represent the system's initial conditions, including its state, position, velocity, and other relevant parameters. The input is usually supplied by the user, and it is the starting point for the simulation. The input can be in the form of data, such as tables or graphs, or it can be in the form of equations or mathematical models.

The processor is the core of the simulation, and it is responsible for simulating the system's behavior. The processor is composed of a set of algorithms and rules that determine how the system will evolve over time. The processor takes the input data and applies it to the system's behavior model to create the output. The processor can be a set of equations or a software program, depending on the complexity of the system being modeled.

The output, presented on the display, is the result of the simulation, and it represents the system's behavior over time. The output can be in the form of data, such as tables or graphs, or it can be in the form of visual representations, such as animations or videos. Of course, it can also be a high-fidelity virtual reality simulation. The output is the user's primary means of interpreting and analyzing the simulation's results.

The four components of the simulation equation work together to create a mathematical model of the system being modeled. The input provides the initial conditions and parameters, while the processor applies the system's behavior model to create the output. The output represents the system's behavior over time, while the display presents the output to the user in a visual or other format (Barros & Verdejo, 2018; Fishwick, 2018; Law & Kelton, 2018).

A more complicated equation for the mathematical structure of a simulation can be written as:

$y(t+1) = f(x(t), u(t), \theta)$

where $y(t+1)$ is the output variable at time $t+1$, which is a function of the input variables $x(t)$, $u(t)$, and the system parameters θ.

The input variables $x(t)$ represent the state variables of the system at time t, such as position, velocity, temperature, and pressure. These variables can be continuous or discrete and can represent physical quantities or abstract concepts. The input variables are usually measured or estimated from real-world data, and they can be modeled using differential equations, difference equations, or other mathematical models.

The control variables $u(t)$ represent the inputs to the system at time t, such as forces, torques, voltages, or currents. These variables are usually manipulated by the user or by an external controller to achieve a desired system response. The control variables can also be modeled using differential equations, difference equations, or other mathematical models.

The system parameters θ represent the unknown or uncertain characteristics of the system, such as the friction coefficient, the mass of an object, or the environmental conditions. These parameters are usually estimated from real-world data or from experimental measurements, and they can be modeled using probability distributions, optimization techniques, or other mathematical models.

The function f represents the system model or the simulation algorithm, which maps the input variables $x(t)$, $u(t)$, and θ to the output variable $y(t+1)$ at time $t+1$. The function f can be a deterministic or stochastic model, a linear or nonlinear model, a time-invariant or time-varying model, or a discrete or continuous model. The function f can also be implemented using different numerical methods, such as finite difference, finite element, or Monte Carlo simulation.

The simulation equation can be solved using numerical integration methods, such as Euler's method, Runge-Kutta method, or Adams-Bashforth method, to obtain the output variables at each time step. The simulation results can be analyzed and visualized using various tools, such as graphs, plots, animations, statistical tests, and even virtual realities.

In other words, the mathematical structure of a simulation equation involves the input variables $x(t)$, the control variables $u(t)$, the system parameters θ, the system model or simulation algorithm f, and the output variable $y(t+1)$ (Barros & Verdejo, 2018; Fishwick, 2018; Law & Kelton, 2018).

Now, let's apply this technical knowledge to the study of reality.

Language, perception, and reality

The intelligibility of reality is a necessary condition for our ability to perceive and make sense of the world around us. Our ability to perceive and interpret reality is dependent on our ability to use language and communicate with others.

Language is a tool for organizing and making sense of the perceptual data that we receive from the world around us. By using language, we are able to categorize and label objects and events in the world, which allows us to form more complex concepts and understandings of our environment.

The intelligibility of reality is not just a feature of human perception, but is a necessary condition of reality itself for any form of perception or cognition by embodied conscious agents, who are part of reality, to be possible.

Reality, language, cognition, and perception are therefore inextricably linked, and the intelligibility of reality is a necessary condition for our ability to perceive and make sense of the world around us. Without an isomorphism between reality, perception, cognition, and natural and formal languages, we would be unable to survive, let alone theorize.

In other words, *the structure of reality can be considered a kind of syntax and a language all its own, which explains how and why we are able to find reality intelligible through our perception and cognition (which are also linguistic), and thus through our natural and formal languages* (Santos, 2023).

The Interface Theory of Perception

The Interface Theory of Perception, proposed by cognitive scientist Donald Hoffman, suggests that our perceptions are not a direct reflection of the physical world around us, but rather are shaped by a set of evolved interfaces that serve to simplify and streamline the complex information present in our environment (Hoffman, Singh, & Prakash, 2015). According to this theory, the objects and events that we perceive are not "real" in the sense of being objective, external entities, but are rather the result of a complex mental process of data compression and filtering.

The Fitness-Beats-Truth Theorem, proposed by philosopher Kevin Scharp, suggests that evolutionary pressures may favor false beliefs over true ones, so long as those false beliefs help individuals to survive and reproduce more effectively than true ones (Scharp, 2018). According to this theorem, there may be circumstances in which false beliefs are more "fit" than true ones, and thus may be more likely to be selected for by natural selection.

Taken together, the Interface Theory of Perception and the Fitness-Beats-Truth Theorem suggest that our perceptions and beliefs may be shaped more by evolutionary pressures and survival needs than by objective reality. In this sense, they can be seen as a type of "simulation theory" that differs from the standard simulation hypothesis.

Rather than suggesting that our reality is a simulation in the traditional sense (on a computer created by an advanced civilization) the Interface Theory of Perception and the Fitness-Beats-Truth Theorem propose that our perceptions and beliefs are a type of simulation or simplified model of the world around us, shaped by evolutionary pressures.

Let's explicate the structure and logic of such a perceptual apparatus by comparing it to the simulation mathematics we've already explored.

Perception is a simulation of reality

The simulation equation $y(t+1) = f(x(t), u(t), \theta)$ can be applied to the structure of perception as a simulation, where $y(t+1)$ represents the perceptual experience at time $t+1$, $x(t)$ represents the sensory input at time t, $u(t)$ represents the attentional focus at time t, and θ represents the internal model of the world.

According to the Interface Theory of Perception, perception is not a direct reflection of an objective physical world but rather an *evolved simulation*, or interface, meant to guide behavior. The mind constructs a simplified and abstracted model of external reality (whatever it might ontologically be) based on sensory input and internal knowledge, and this model is used to generate perceptual experiences that are adaptive for survival and reproduction (Hoffman, Singh, & Prakash, 2015).

In this framework, the sensory input $x(t)$ can be seen as the raw data that a conscious agent receives from the external world, such as light waves, sound waves, or chemical signals. The attentional focus $u(t)$ can be seen as the selective filter that the agent's cognition applies to the sensory input, based on current goals, interests, and expectations. In other words, that attentional focus is the function of *relevance realization*, as described by John Vervaeke (Vervaeke, 2018). The internal model θ can be seen as the prior knowledge that the conscious agent has about the structure and regularities of the external world, such as object persistence, gravity, or causality, all used to predict the next state of the world.

The function f represents the cognitive process that combines the sensory input $x(t)$, the attentional focus of relevance realization $u(t)$, and the internal model θ to generate the perceptual experience $y(t+1)$. This process involves multiple levels of mental computation, including feature detection, object recognition, spatial mapping, temporal integration, and decision-making, and of course, relevance realization.

Hoffman's Interface Theory of Perception emphasizes that perceptual experience is not a literal view of an objective physical reality, but rather a mental construction that is optimized for survival and reproduction. *Spacetime and physicality are a simulated interface, existing as an epistemic entity, not as an ontic one.*

A given conscious agent selects and simplifies the sensory information based on the data's evolutionary value, and it ignores or distorts the information that is irrelevant or misleading (Hoffman, Singh, & Prakash, 2015).

Perceptual experience is therefore a product of the mind's simulation of reality rather than a clear window onto reality itself. The physical world is thus akin to a Schopenhauerian *representation* of reality, as opposed to a literal presentation of the same (Schopenhauer, 1819).

The idea that the world of our perception is a simulation of a deeper reality is nothing new in human thought, and indeed dates back to at least the Pre-Socratics in the western canon. Our contemporary method of contextualizing the concept is to use technological and computational terminology, such as "simulation". However, we shouldn't let those catchy words fool us; the ideas themselves have been previously discussed in a multitude of ways, as each new thinker added to the complexity and precision of those ideas.

Now, it is our turn. How might our current day context add to that canon?

Reality simulates itself

Conscious agents and their perceptual apparati are part of reality. Therefore, to the extent that perception is a simulation of reality, it is also reality conducting a self-simulation.

Because reality is, by definition, all that exists, there is nothing outside of reality that is real enough to determine its existence. As such, reality is not just an object of observation, but rather, it is a self-contained, self-generating entity that simulates itself in the way we've already explicated.

Namely, reality is an information system (Wheeler, 1990) that generates its own reality through a recursive process of lowering entropy by giving form to its ground state of potential (Campbell, T., 2003). The etymology of "information", after all, is to give form to potential, thereby reducing entropy (Wiener, 1965).

The equation for the mathematical structure of a simulation, as mentioned earlier, is:

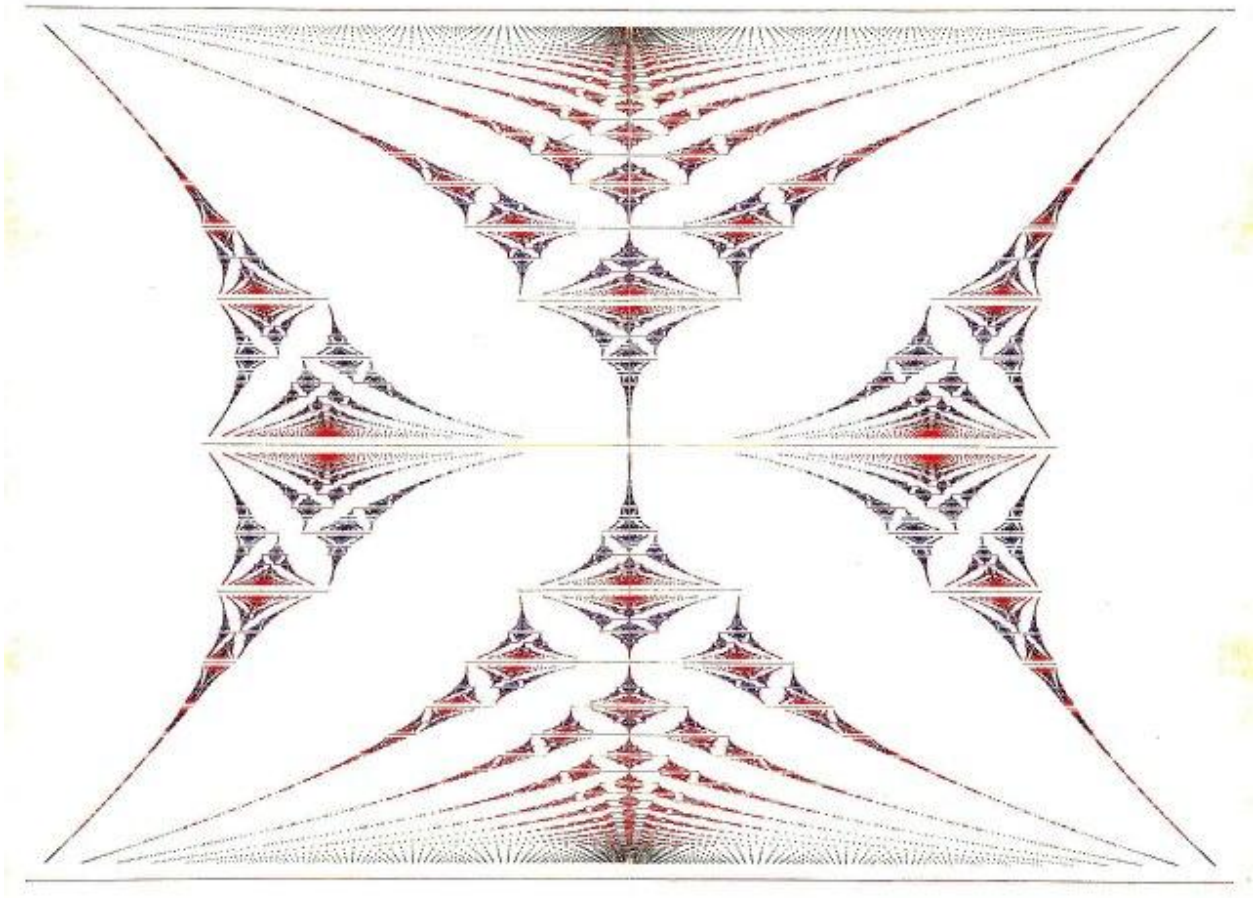
$y(t+1) = f(x(t), u(t), \theta)$

where $y(t+1)$ is the output variable at time $t+1$, which is a function of the input variables $x(t)$, $u(t)$, and the system parameters θ. When the equation is applied to reality theory, the universe is the system being simulated, and the input variables $x(t)$, $u(t)$, and θ are the fundamental properties of the universe, such as matter, energy, and physical laws. The function f is the simulation algorithm that generates the output variable $y(t+1)$, which represents the reality of the universe at time $t+1$.

Reality is a self-simulation because it is capable of generating both its own reality and its own representation thereof.

It does so by using the previous state of reality as a template for the next state of reality. In other words, the universe uses its own reality as input to generate the next state of reality, much the same way evolutionary processes work under universal Darwinism and emergent complexity theory in complexity science (Anderson, 1972; Campbell, D. T., 1974; Azarian, 2022).

Like evolutionary processes, the self-simulation of the universe is recursive, which means that it is a process that repeats itself indefinitely. The universe is a fractal system, which means that it is self-similar at different scales, akin to Douglas Hofstadter's butterfly, a Gplot "showing energy bands for electrons in an idealized crystal in a magnetic field", also called "a picture of God" (Hofstadter, 1979). In other words, the self-simulation of reality occurs at different levels of complexity, from subatomic particles to galaxies.



Hofstadter's butterfly (Hofstadter, 1976).

Because of this recursion, the levels of reality display a structural isomorphism to each other, making reality intelligible from all levels, if not comprehensible. Each level entails an isomorphic syntax to all other levels, including to our perception, our cognition, and our natural and formal languages.

The “headset problem” for physicalism

What I’ll call the *headset problem* for physicalism is its narrow scope that limits itself to the physical world, or that which can be perceived through our senses (other measurement devices may detect physical phenomena that we can’t directly perceive, but we must still perceive our measurement devices). As we’ve seen, according to some theories, such as simulation theory, reality may be more than just the physical, and this poses a challenge for physicalism. If reality is a simulation, then it suggests that there may be a deeper reality beyond what we can perceive through our senses or detect through our instruments (Bostrom, 2003).

Under simulation theories, physical laws and constants, as well as the properties of matter and energy, are not fundamental but are part of the simulation. This implies that there may be a deeper reality beyond what we can observe or measure, which means that the physical world may be only a simulation of that deeper reality (Bostrom, 2003).

While we’ve already argued why the literal simulation theory is not a viable reality theory, we’ve also shown how reality can be considered a self-simulation. As well, perception has been shown to be a simulating function of that reality. Therefore, spacetime and physicality are not *what* we perceive, but rather *how* we perceive.

It then logically follows that the perceiv*er*, consciousness, must precede physicality and spacetime.

This raises the question of whether physicalism can account for the full range of human experience and cognition. For example, if mental states and consciousness are not reducible to physical states and processes, but are instead fundamental, then physicalism will not be able to explain them. Hence, the hard problem of consciousness (Chalmers, 1995).

Moreover, because physicalism seeks to reduce consciousness to the physical, and since the physical is a perceptual interface (an epistemic entity, not an ontic one), physicalism will always entail an inherent dualism, even as it claims to be monist. Physical entities, as purely quantitative, and consciousness, as purely qualitative, will always need to be treated as separate under the theory that the physical brain generates consciousness. Thus, physicalism will never solve the hard problem of consciousness, as the explanatory gap is the result of logical incoherence and internal inconsistency at the core of physicalism’s central claims.

Physicalism will remain the study of the interface, and physicalists will be locked into the “headset”, able to inform us about only the simulation. That will still be useful for operating within the simulation, such as our progress in the natural sciences, but it will fail as an ontological project in search of a reality theory.

Indeed, idealism is the only viable metaphysics remaining, since it takes consciousness as the “substrate” of reality and treats the physical as an image *of* information within that fundamental consciousness. This description precisely maps onto the simulation structures we’ve explicated in this paper.

By discovering that reality is a self-simulating information system (that generates its own reality through a recursive process of lowering entropy, giving form to its ground state of potential), we also discover what reality is: consciousness. In essence, because the intelligibility of reality is only possible if the above

arguments are valid (Santos, 2023), then we must either accept metaphysical idealism, or abandon intelligibility. The latter would require us to abandon science and philosophy altogether, and we'd also have no way to explain the successful survival of the biosphere. Therefore, we must accept intelligibility, and thus also idealism.

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The Problem Of Relevance Realization For Artificial General Intelligence

April 20, 2023

As artificial intelligence continues to advance, there is increasing interest and investment in developing machines that can achieve artificial general intelligence (AGI) – the ability to perform a wide range of intellectual tasks that are characteristic of human beings. However, one of the biggest challenges in developing AGI lies in the ability to enable machines to:

- understand the relevance of information in a given context.
- negate a near-infinite (and thus combinatorially explosive) number of other, irrelevant inputs.

That cognitive process is referred to as “relevance realization”.

This essay argues that relevance realization is a critical problem that needs to be solved in order to achieve AGI. Relevance realization is an essential component of human cognition, and developing machines that can perform this function is essential for the development of true artificial intelligence. Given the evolutionary and embodied nature of relevance realization, the problem that it presents for AGI may well be insoluble.

What is recursive relevance realization?

John Vervaeke is a cognitive scientist and professor at the University of Toronto who has developed the relevance realization theory, which offers a new framework for understanding human consciousness, meaning, and purpose. According to Vervaeke, relevance realization is the process by which we create and maintain meaning in our lives (Vervaeke, 2017). This process involves actively seeking out and identifying meaningful connections between different pieces of information, rather than simply reacting to stimuli (Vervaeke, 2017).

At the core of relevance realization is the idea that meaning is not a fixed entity that exists in the external world waiting to be discovered. Instead, meaning is actively created and maintained by our cognitive systems (Vervaeke, 2017). This means that meaning is not static but rather is constantly evolving and adapting to new circumstances.

The process of relevance realization can be understood through concrete examples. For instance, imagine walking through a park and seeing a tree. The cognitive system is immediately engaged in pattern recognition, searching for meaningful connections between different sensory inputs. The color of the leaves, the texture of the bark, and the sound of the wind rustling the branches are all sensed and processed by the cognitive system.

As the cognitive system processes this information, it engages in abstraction and categorization, grouping together different pieces of information that are related to each other. For example, the color of the leaves, the texture of the bark, and the sound of the wind might all be grouped together as part of the sensory experience of the tree (Vervaeke, 2017).

The cognitive system is continually engaged in the process of relevance realization, seeking out meaningful connections between different pieces of information and integrating them into an overall sense of the world. This process of sense-making is not a passive or automatic process, but rather requires active engagement and attention (Vervaeke, 2017).

The relevance realization theory extends beyond simple sensory experiences and applies to all aspects of human cognition. For example, when reading a book or listening to a lecture, the cognitive system is continually seeking out meaningful connections between the information being presented and integrating it into an overall understanding of the topic at hand (Vervaeke, 2017).

The importance of relevance realization is not limited to the creation of meaning in the moment. It is also critical for long-term learning and memory formation (Vervaeke, 2017). By continually seeking out meaningful connections between different pieces of information, the cognitive system is better able to integrate new knowledge into existing knowledge structures and create more robust and accurate mental models of the world.

Furthermore, relevance realization plays a crucial role in our ability to set goals and pursue them. By seeking out meaningful connections between our present circumstances and our desired outcomes, we are better able to develop a sense of purpose and direction in life (Vervaeke, 2017).

The relevance realization theory has important implications for a variety of fields, including education, psychology, and philosophy. By better understanding the process of relevance realization, educators can develop more effective teaching strategies that help students build stronger connections between different pieces of knowledge.

Psychologists can also use the relevance realization theory to better understand the cognitive mechanisms underlying a range of mental health conditions, such as depression and anxiety. By understanding how individuals create and maintain meaning in their lives, psychologists can develop more effective treatments that help individuals regain a sense of purpose and direction (Vervaeke, Ferraro, and Standing, 2018).

Finally, the relevance realization theory has important implications for philosophy, particularly in the area of existentialism. According to Vervaeke, existentialism is based on the assumption that meaning is not inherent in the world, but rather must be created by individuals (Vervaeke, 2017; Vervaeke 2021). The relevance realization theory provides a more detailed account of how this process of meaning-making occurs, and offers new insights into how individuals can find purpose and meaning in their lives.

Overall, the relevance realization theory represents an important contribution to our understanding of human cognition, consciousness, and meaning-making. By emphasizing the active and dynamic nature of the process of sense-making, it offers new insights into how we create and maintain meaning in our lives, and has important implications for a wide range of fields, from education and psychology to philosophy and existentialism.

As we'll see, understanding relevance realization is also critical to the project of artificial intelligence (AI) and to any prospects of artificial consciousness.

Defining consciousness

Phenomenal consciousness refers to the subjective experience of sensory and perceptual events. It is the "what it is like" to experience something, such as the color red or the taste of chocolate. According to Chalmers (1995), phenomenal consciousness is a fundamental aspect of the mind that cannot be reduced to physical or neural processes. It is a subjective and irreducible feature of experience that is often described as "qualia."

Meta-consciousness, on the other hand, refers to the ability to reflect on and be aware of one's own mental processes. It is sometimes called "access consciousness" because it involves the ability to access and control one's own thoughts and perceptions. According to Baars (1988), meta-consciousness is a higher-order cognitive process that allows us to monitor and manipulate our own mental states.

The main difference between phenomenal consciousness and meta-consciousness is that the former refers to the subjective experience of sensory events, while the latter refers to the ability to reflect on and be aware of those experiences. Phenomenal consciousness is often described as a "first-person" perspective, while meta-consciousness involves a "second-person" perspective in which one is aware of one's own mental states as objects of thought.

Another important difference between these two concepts is their relationship to neural activity. Phenomenal consciousness is often associated with activity in specific regions of the brain that are involved in sensory processing, such as the primary visual cortex or the gustatory cortex. In contrast, meta-consciousness is associated with activity in more widespread brain networks that are involved in higher-order cognitive processes, such as the prefrontal cortex or the parietal cortex (Baars & Franklin, 2003).

Despite these correlations, there exists no scientific theory of either phenomenal or meta-consciousness, as both have thus far proven to be irreducible to physical brain states. That result defies today's mainstream neuroscientific paradigm, which assumes that consciousness supervenes on the physical. As we'll explore later on, physics itself is moving in a direction that would also contradict such an assumption.

What is the relationship between relevance realization and consciousness?

The relationship between relevance realization and consciousness is complex and multifaceted. According to Vervaeke (2017), consciousness is intimately tied to relevance realization because it involves the active construction of a model of the world that is constantly updated and modified based on incoming sensory information. This model is not a passive reflection of the world, but rather an active and dynamic representation that is shaped by our goals, expectations, and beliefs.

Moreover, Vervaeke (2017) argues that relevance realization is a necessary condition for consciousness, as it enables us to extract meaning from sensory input and construct a coherent representation of the world. Without relevance realization, sensory input would be meaningless and the world would appear as a chaotic and disordered collection of stimuli.

Recent research has also shown that the brain networks correlated with relevance realization are closely linked to those correlated with consciousness. For example, the default mode network (DMN) has been associated with both relevance realization and self-referential processing, which are key aspects of consciousness (Kleckner et al., 2017). The DMN is a network of brain regions that is active when the brain is at rest, and is thought to be correlated with a range of cognitive processes, including self-reflection, social cognition, and memory.

More specifically, while relevance realization is not the same as either phenomenal consciousness or meta-consciousness, it has important connections to both.

On the one hand, relevance realization can be seen as a key aspect of phenomenal consciousness, as it involves the perceptual and cognitive processes of subjective experience. According to Vervaeke (2019a), relevance realization is a process of "informational integration" that allows us to combine multiple streams of sensory information into a coherent and meaningful experience. This process involves both bottom-up sensory processing and top-down cognitive processing, and it is closely related to phenomenal consciousness.

On the other hand, relevance realization also has important connections to meta-consciousness, as it involves the ability to reflect on and be aware of one's own cognitive processes. According to Vervaeke (2019a), relevance realization is a form of "attentional engagement" that allows us to focus our attention on the most salient and relevant aspects of our environment. This process requires meta-cognitive skills such as self-awareness, monitoring, and control, which are key components of meta-consciousness.

In other words, relevance realization can be seen as a bridge between phenomenal consciousness and meta-consciousness, as it involves both subjective experience and the ability to reflect on and control that experience. By integrating and transforming information in a meaningful way, relevance realization allows us to perceive the world in a way that is both rich and coherent, while also giving us the flexibility and adaptability to adjust our attention and focus as needed.

Challenge of relevance realization for AGI

Relevance realization is a cognitive process that is central to human consciousness, and as such, it presents a major challenge for the development of AGI and conscious AI. AGI refers to machines that are capable of performing any intellectual task that a human can do, while conscious AI refers to machines that have subjective experience and self-awareness (Chalmers, 2018). Both types of AI would need to be able to perform relevance realization in order to perceive and understand the world in a meaningful way.

The challenge of relevance realization for AGI and conscious AI is that it requires a deep understanding of how information is integrated and transformed in the human mind (arguably, animals perform a lower-order of relevance realization too, and even this would prove highly difficult for AI). According to Vervaeke (2019b), relevance realization involves a complex set of cognitive processes that operate at multiple levels of abstraction, including perception, attention, memory, and reasoning. These processes are highly interdependent and operate in a dynamic and context-sensitive manner, making them difficult to replicate in a machine.

One key aspect of relevance realization that presents a challenge for AGI and conscious AI is its dependence on embodied cognition. Embodied cognition refers to the idea that cognitive processes are grounded in the

physical body and its interaction with the environment (Lakoff & Johnson, 1999). This means that our perception and understanding of the world is shaped by our bodily experiences, and that our cognitive processes are closely linked to our sensorimotor systems. AGI and conscious AI would need to be able to simulate this embodied experience in order to perform relevance realization in a way that is similar to humans.

In other words, the syntax of our perceptual language is isomorphic to the structure of our cognition (Santos, 2023). Computers would need to be embodied, essentially both "reading" and "writing" these languages in order for reality to be intelligible to them through relevance realization, a prerequisite for general problem solving and intelligence.

Another challenge of relevance realization for AGI and conscious AI is its dependence on context and meaning. Humans are able to perceive and understand the world in a meaningful way because we are able to contextualize and interpret sensory information in light of our previous experiences and knowledge (Barsalou, 2008). This requires a deep understanding of language and culture, as well as the ability to form and manipulate mental representations that capture the meaning and significance of different stimuli.

Moreover, relevance realization requires a high degree of flexibility and adaptability, which is challenging to replicate in a machine. Humans are able to adjust their attention and cognitive processes in response to changing environmental and task demands, and to creatively generate new solutions to novel problems. This type of flexibility and adaptability is difficult to program into a machine, as it requires a degree of autonomous decision-making and creativity that is not currently possible with AI systems.

In addition to these challenges, there are also ethical concerns associated with the development of AGI and conscious AI. As AI systems become more complex and capable, there is a risk that they will become unpredictable and uncontrollable, leading to unintended consequences and potentially catastrophic outcomes (Bostrom, 2014). There is also a risk that AGI and conscious AI systems could become self-aware and experience suffering, raising questions about their moral status and the ethical implications of their creation and use (Bostrom & Yudkowsky, 2014).

After all, humans already believe each other and animals to be conscious, yet we subject these conscious beings to untold suffering every day on this planet. How much worse would we then behave toward conscious computers, devices that, to us, have always been unfeeling tools that we can use as we see fit?

AGI, relevance realization, and phenomenal consciousness

While some AI systems have demonstrated a degree of meta-consciousness, such as the ability to monitor and control their own processing and decision-making (Metzinger, 2018), it is unlikely that machines will ever be able to achieve phenomenal consciousness. This is because phenomenal consciousness is thought to be closely tied to the subjective experience of embodiment, which arises from the integration of sensory information with motor and affective processes (Lakoff & Johnson, 1999). The embodied nature of consciousness makes it difficult to simulate or replicate in a machine, as it requires a deep understanding of the interplay between sensory information, emotions, and bodily responses (Varela et al., 1991).

The machine would need to not only focus on the relevant information at any given, infinitesimal point in time, *t*, but also simultaneously negate the combinatorially explosive number of irrelevant pieces of information (Vervaeke, 2017). That is, an embodied agent exists as a relative entity, constantly in dialogue with a nearly infinite number of other parts of reality, in a continuous process of co-realization. The agent must perform these attentional and negation functions at each successive point in time, $t+n$, in order to survive and to solve problems. Despite the fact that we can direct machines' attention toward salient details for a given task, we still have no idea how to program them to perform the negation of such a vast array of inputs as that which embodied conscious agents process every fraction of a second. Until they have that ability, machines will not achieve the general intelligence of humans.

In other words, relevance realization is the major challenge to overcome if AGI is ever to be conscious in the way that embodied conscious agents are. So far, this kind of embodied experience is exclusively associated with metabolizing organisms, with vast evolutionary histories shaped by constantly changing agent-arena relationships between themselves and their environments.

This could, however, give us a clue as to the best approach to AGI engineering.

Evolutionary models of AGI development are based on the idea that AGI will emerge through an evolutionary process that mimics natural selection. These models are inspired by the process of biological evolution, where random variations in genetic material can result in the emergence of new traits that increase an organism's fitness in a given environment. Similarly, evolutionary models of AGI development rely on the creation of diverse AI systems, which are then subjected to selection pressures and the replication of those systems that demonstrate the most desirable features (Poli, Langdon, & McPhee, 2008).

One approach to evolutionary AGI development is to use a genetic algorithm, which is a method of optimization inspired by biological evolution. In this approach, the AI system is represented as a genome, and variations in the genome are introduced through mutations and recombination. The fitness of each genome is then evaluated based on how well it performs a specific task, and the genomes with the highest fitness are selected for replication and further mutation (Eiben & Smith, 2015).

Another approach is to use a technique called neuroevolution, where the structure and weights of a neural network are optimized through evolutionary processes. In this approach, a population of neural networks is created with random weights, and the networks that perform the best on a given task are selected for reproduction. This process is repeated, with variations introduced through mutations and recombination, until a network that performs optimally is produced (Stanley, Miikkulainen, & Clune, 2019).

Evolutionary models of AGI development have the advantage of being able to explore a wide range of possibilities and find solutions that are difficult to anticipate or engineer directly. However, these models also face challenges, such as the large search space of possible solutions, the difficulty of accurately defining fitness criteria, and the potential for the optimization process to get stuck in local optima (Poli et al., 2008). Not only that, but natural evolutionary processes seem to take a very long time, and the claim that human engineers could speed up that process remains highly speculative, especially given how little we understand about our own consciousness.

In other words, even our best approach very likely falls short of achieving relevance realization in AGI.

Furthermore, the subjective and qualitative nature of phenomenal consciousness makes it difficult to define and measure in a machine-readable way. While some researchers have proposed measures of consciousness based on neural activity or behavior (Tononi, 2008), these measures are often controversial and lack a clear definition of what it means to be conscious. For instance, Tononi's Φ ("phi") measure still currently relies on subjects' reportability of experience, making it a measure of meta-consciousness instead of phenomenal consciousness.

As expected, meta-consciousness is more amenable to measurement and manipulation in an AI system, as it can be defined in terms of observable behaviors and cognitive processes. This has led some researchers to argue that the focus of AI research should be on achieving meta-consciousness, rather than trying to replicate phenomenal consciousness (Baars & Franklin, 2003). However, this approach raises questions about the nature and limits of consciousness, and whether it is possible to achieve true intelligence without some form of subjective experience.

The close links between consciousness and relevance realization suggest that subjectivity and embodied cognition are required for intelligence. However, this leads us to a more fundamental question outside the realm of neuroscience…just what *is* this spacetime environment in which our minds are embodied?

Physics, not neuroscience or computer science, will answer our consciousness questions

Physicists have long sought to understand the fundamental nature of spacetime, the four-dimensional fabric that underlies our understanding of the universe. However, some physicists have recently challenged the notion that spacetime is a fundamental aspect of reality, arguing instead that it emerges from a more basic, underlying structure.

One reason for this shift in thinking is the apparent incompatibility between our understanding of spacetime and the principles of quantum mechanics, which describe the behavior of particles at the smallest scales. While spacetime is continuous and smooth, quantum mechanics suggests that particles can exist in multiple locations simultaneously, with their positions and velocities being described by probability distributions rather than definite values (Smolin, 2015). This has led some physicists to explore the possibility that physicality and spacetime are not fundamental aspects of reality, but emergent properties of a different ontic primitive.

A proposed model for such a structure is called loop quantum gravity, which suggests that space is made up of discrete, indivisible units known as loops or spin networks (Rovelli, 2011). According to this model, spacetime is an emergent property of these underlying structures, rather than being a fundamental aspect of reality.

Another reason for questioning the fundamentality of spacetime is the discovery of phenomena such as quantum entanglement and black hole entropy, which suggest that information is more fundamental than spacetime itself (Susskind, 2016). According to this view, the apparent smoothness and continuity of spacetime is an illusion, with the true nature of reality being more akin to a holographic projection of information.

Building on that approach, Donald Hoffman, a cognitive scientist, has also proposed that spacetime may not be a fundamental aspect of reality, based on his work on the interface between perception and reality (Hoffman, 2019). In his view, the world we perceive is not a direct representation of reality, but rather a set of symbols that our brains use to make sense of sensory information. Therefore, our perception of spacetime may not necessarily reflect reality's true nature.

Hoffman has suggested that the physics of quantum mechanics provides support for his claim. According to the principle of complementarity in quantum mechanics, particles can exhibit either wave-like or particle-like behavior depending on the experimental setup (Bohr, 1928). This suggests that the properties of particles are not fixed or objective, but rather depend on the observer's perspective.

Hoffman has taken this idea further, proposing that reality itself may not be fixed or objective, but rather depend on the observer's perspective. He has suggested that spacetime may be a construct that emerges from a more basic set of properties, such as relational properties between conscious agents (Hoffman, 2019).

Nima Arkani-Hamed, a theoretical physicist, has also put forth the idea that spacetime is not fundamental, but rather emerges from a more fundamental structure, which he calls the "amplituhedron" (Arkani-Hamed & Trnka, 2014). According to this theory, particles and their interactions can be described more efficiently and accurately using the mathematical concept of the amplituhedron, rather than relying on the traditional space-time-based approach.

The amplituhedron is a geometric object that encodes the probability amplitudes for particle interactions in a way that is independent of space and time. This approach has been shown to produce the same predictions as traditional quantum field theory, but with far fewer calculations (hundreds of pages of algebra down to a few equations that can be crunched by hand) and a more elegant mathematical structure.

Arkani-Hamed's proposal has gained attention and interest from physicists because it suggests a possible path forward in reconciling the theories of general relativity and quantum mechanics, which have been notoriously difficult to unify (Kovachy, 2019). By starting from a more fundamental structure that does not rely on the concept of spacetime, it may be possible to develop a theory that encompasses both relativity and quantum mechanics.

Of course, if spacetime is not fundamental, and since the brain is an object that we perceive within spacetime, then we must question the theory that the brain generates consciousness. Rather, it would seem that consciousness, or that which perceives reality as the "interface" of spacetime, must precede physical entities, rather than the other way around.

This would explain why we encounter the hard problem of consciousness under physicalism. That is: there is no way, even in principle, to explain how physical processes and entities, which are purely quantitative, could ever give rise to phenomenal consciousness, which is purely qualitative (Chalmers, 1995).

Under this emerging paradigm in physics, spacetime is an epistemic entity, not an ontic one. The brain is the perceptual *image* of consciousness, not the *generator* of it. The image of a thing and the thing itself are always tightly correlated, but do not display a causal relationship, and this is precisely what we have found with consciousness and brain states. Only correlations, but no causation.

Thus, we can now explain why, despite decades of advancements, neuroscience has failed to produce even a single scientific, physical theory of consciousness.

Even if AGI somehow achieves relevance realization, we still face the hard problem of consciousness as a blocker for AGI being phenomenally conscious under physicalism. Indeed, the theory that the physical gives rise to consciousness faces a myriad of problems today, all relics of physicalist assumptions that are outdated, given the new directions that physics is taking us.

If we are to understand AGI, as well as our own consciousness as embodied agents, we must recognize the logical inconsistencies in our current paradigm and, in turn, find a better metaphysical paradigm than physicalism to guide our sense of what is plausible.

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Autopoiesis, 4E Cognition, And The Future Of Artificial Intelligence

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Introduction

Artificial Intelligence (AI) has rapidly advanced in recent years, demonstrating remarkable capabilities in various domains, from image recognition to natural language processing. However, creating a truly general problem solver that can mimic human cognition remains an elusive goal. To realize this aspiration, it is essential to explore foundational principles such as autopoiesis and the 4Es of 4E cognition, which propose a novel framework for understanding cognition and intelligence. This paper argues that incorporating autopoiesis and embracing the 4Es will be crucial for AI systems to transcend their current limitations and exhibit the functions of general problem solving as active agents (Maturana & Varela, 1980; Clark, 2008).

Autopoiesis, a concept developed by Maturana and Varela, refers to the self-organizing and self-maintaining nature of living systems. It posits that an organism continually produces and maintains itself, creating its own boundaries and identity. Similarly, for AI to approach the level of an agent, it should possess autopoietic characteristics, enabling self-regulation and self-determination. Such self-referential and self-sustaining abilities are fundamental for an AI system to engage in purposeful actions (Maturana & Varela, 1980).

Furthermore, the 4Es of 4E cognition—embodied, embedded, extended, and enactive—propose an alternative approach to understanding cognition beyond the traditional computational paradigm. Embodied cognition highlights the role of the body and its interaction with the environment in shaping cognitive processes. Embedded cognition emphasizes the significance of the environment as an integral part of cognition. Extended cognition explores how cognitive processes can be augmented and distributed across external tools and artifacts. Enactive cognition focuses on the reciprocal relationship between an agent and its environment, emphasizing the active role of the agent in shaping its own perception and understanding (Clark, 2008).

By incorporating autopoiesis and embracing the 4Es of 4E cognition, AI systems can move beyond mere information processing and engage with the world in a more human-like manner. This will pave the way for AI to become a genuine problem solver, capable of adapting to complex, dynamic environments and exhibiting behaviors that emulate consciousness.

This paper will delve into the potential implications of achieving such advanced AI capabilities. Then, we'll explore possible future thresholds and moments of sea change in the advancement of AI, including their implications for society, science, philosophy, and spirituality. Finally, this essay will argue that AI will eventually be able to *simulate* human phenomenal consciousness but will never *be* phenomenally conscious.

The integration of autopoiesis and the 4Es in AI could lead to machines that not only surpass human cognitive abilities but also possess a deeper understanding of the human condition. As AI becomes more intertwined with our lives, their advancement raises profound ethical, social, and philosophical questions that require careful consideration.

Overview of 4E Cognition

Cognitive science has traditionally focused on the computational approach to understanding the mind, treating cognition as an information processing system. However, in recent years, an alternative framework known as 4E cognition has gained prominence. 4E cognitive science emphasizes the embodied, embedded, extended, and enactive aspects of cognition, providing a more comprehensive and ecological understanding of the mind. This section will explain what 4E cognitive science entails and delve into the four Es, discussing the significance and implications of each E.

Embodied Cognition: The First E

The first E of 4E cognition is embodied cognition. Embodied cognition recognizes the crucial role of the body and its sensory-motor interactions in shaping cognitive processes (Wilson, 2002). It argues that cognition is not solely a product of the brain but emerges from the dynamic interactions between the brain, body, and the surrounding environment. Sensorimotor experiences and bodily states influence perception, understanding, and problem-solving. For example, our understanding of concepts like “grasp” or “warmth” is intimately linked to our bodily experiences of manipulating objects and feeling temperature. Embodied cognition highlights the importance of bodily experiences in shaping cognitive representations and processes.

Embedded Cognition: The Second E

The second E of 4E cognition is embedded cognition. Embedded cognition asserts that cognitive processes are not confined to the boundaries of the individual but are intricately intertwined with the environment (Clark, 1997). The environment, including cultural and social contexts, is seen as an active participant in cognitive processes. The mind extends beyond the individual and includes external tools, artifacts, and social interactions that shape and support cognitive activities. For instance, the use of a calculator to perform complex mathematical calculations or the reliance on a notebook for external memory storage are examples of cognitive processes extended into the environment. Embedded cognition emphasizes the reciprocal relationship between the mind and the environment, highlighting the co-constitutive nature of cognition.

Extended Cognition: The Third E

The third E of 4E cognition is extended cognition. Extended cognition builds upon the idea of embedded cognition but emphasizes the active use of external resources as integral components of cognitive processes (Clark & Chalmers, 1998). It argues that the mind extends beyond the boundaries of the brain and the body through the integration of external tools and technologies. These external resources, known as cognitive artifacts, play a central role in problem-solving, memory, and decision-making. For instance, using a smartphone or a search engine to access information instantly augments our cognitive capacities. Extended cognition recognizes the distributed and dynamic nature of cognitive processes, encompassing both internal and external resources.

Enactive Cognition: The Fourth E

The fourth E of 4E cognition is enactive cognition. Enactive cognition emphasizes the active engagement and reciprocal relationship between an agent and its environment (Varela et al., 1991). It posits that cognition is not a passive reception of information but an ongoing process of active construction and sense-making. The mind is viewed as an embodied and situated entity that enacts its understanding of the world through its actions and interactions. Perception is not seen as a passive reception of stimuli but as a skillful, situated, and context-dependent process. Enactive cognition highlights the role of agency and autonomy in shaping cognition, underscoring the active contribution of the agent in constructing its own reality.

Types of "Knowing" and 4E Cognition

Knowledge plays a fundamental role in human cognition, shaping our understanding and interactions with the world. In the realm of cognitive science, various types of knowledge have been identified, each with its unique characteristics and implications. This section explores the four types of knowledge: propositional, procedural, perspectival, and participatory knowing. It also examines how these types of knowledge relate to the 4Es of 4E cognitive science, namely embodied, embedded, extended, and enactive cognition.

Propositional Knowing: Knowledge as Representational Content

Propositional knowing refers to knowledge expressed in the form of propositions or statements, representing factual information and beliefs (Stanovich, 2011). It is often associated with declarative knowledge and can be communicated through language or symbolic representations. Propositional knowing is closely tied to the computational view of cognition, which emphasizes information processing and symbolic manipulation. In the context of 4E cognitive science, propositional knowing aligns with the embedded and extended aspects, as it involves the use of external tools (e.g., written language) to store and communicate propositional knowledge.

Procedural Knowing: Knowledge of Skills and Procedures

Procedural knowing pertains to the knowledge of skills, procedures, and how to perform certain actions or tasks (Ryle, 1949). It involves the acquisition of motor skills, habits, and expertise through practice and experience. Procedural knowledge is often implicit and difficult to articulate explicitly. It is closely associated with embodied cognition, as it relies on sensorimotor experiences and bodily interactions with the environment. The body's engagement and mastery of motor skills contribute to the development and application of procedural knowledge, aligning with the embodied aspect of 4E cognition.

Perspectival Knowing: Knowledge from Different Perspectives

Perspectival knowing refers to the knowledge gained through different perspectives, viewpoints, and subjective experiences (Gallagher, 2017). It emphasizes the contextual and situated nature of knowledge, recognizing that understanding and interpretation can vary depending on one's perspective. Perspectival knowing encompasses the role of social and cultural factors in shaping knowledge, emphasizing the embedded aspect of 4E cognition. It recognizes that knowledge is not solely an individual endeavor but is influenced by the cultural and social contexts in which individuals are situated.

Participatory Knowing: Knowledge through Engagement and Interaction

Participatory knowing emphasizes knowledge that is obtained through active engagement, interaction, and embodied participation in the world (Thompson, 2007). It acknowledges that knowledge is not simply acquired passively but emerges through active and reciprocal engagements with the environment. Participatory knowing aligns closely with enactive cognition, as it highlights the role of agency and autonomy in shaping knowledge. Through active participation and interaction, individuals construct their understanding of the world and acquire knowledge that is tightly linked to their embodied and situated experiences.

Each type of knowledge contributes to our understanding of cognition from different angles, emphasizing the importance of representation, skills, perspectives, and active engagement. When viewed through the lens of 4E cognitive science, these types of knowledge align with the embodied, embedded, extended, and enactive aspects, highlighting the role of the body, environment, external tools, and active participation in shaping cognition.

Autopoiesis and 4E Cognition

Autopoiesis, a concept introduced by Maturana and Varela in 1980, has gained significant attention in the field of cognitive science for its potential in explaining the self-organizing nature of living systems. This section explores the concept of autopoiesis and its relationship to the 4Es of 4E cognition. It argues that autopoiesis provides a foundational framework for understanding cognition and aligns closely with the 4E perspective, which has critical implications for the advancement of AI as a general problem solver.

Understanding Autopoiesis

Autopoiesis describes the self-generative and self-maintaining nature of living systems, in which the components of the system continuously produce and reproduce themselves (Maturana & Varela, 1980). The central idea is that an autopoietic system operates through a network of processes that enable it to maintain its own boundaries, identity, and organization. These processes involve the constant exchange and transformation

of matter and energy, while the overall structure of the system remains intact. Autopoiesis highlights the intrinsic capacity of living systems to autonomously regulate their internal states and adapt to their environments.

Autopoiesis and the 4Es of 4E Cognition

Autopoiesis aligns with embodied cognition, the first E of 4E cognition, which emphasizes the fundamental role of the body in shaping cognitive processes. The body serves as the locus of sensorimotor interactions with the environment, influencing perception, action, and cognition. Autopoiesis highlights the embodied nature of cognition, as it emphasizes the bodily basis of self-regulation and self-maintenance.

The second E of 4E cognition, embedded cognition, recognizes the inseparable relationship between cognition and the environment. Autopoietic systems are intrinsically embedded in their environments, continuously interacting with and adapting to their surroundings. The processes of self-maintenance and adaptation in autopoiesis are intricately linked to the environmental context. The environment provides the necessary resources and constraints for the autopoietic system to function and thrive. Autopoiesis underscores the embedded nature of cognition, as it demonstrates the interdependence between an organism and its environment.

Autopoiesis also aligns with the extended cognition perspective, the third E of 4E cognition. Extended cognition emphasizes the incorporation of external tools and artifacts into cognitive processes. Autopoietic systems, while self-generative and self-maintaining, can also utilize external resources to support their autopoietic processes. For instance, organisms may use tools to manipulate their environments or rely on social interactions for information exchange and learning. Autopoiesis highlights the potential integration of external resources in cognition, reflecting the extended nature of cognitive processes.

Enactive cognition, the fourth E of 4E cognition, emphasizes the active engagement and reciprocal relationship between an agent and its environment. Autopoiesis aligns closely with enactive cognition, as it emphasizes the active nature of self-maintenance and adaptation. Autopoietic systems actively regulate their internal states in response to environmental perturbations, maintaining their organization and integrity. The enactive perspective acknowledges that cognition is not merely a passive reception of information but an active process of sense-making and interaction with the world. Autopoiesis embodies the enactive nature of cognition, as it demonstrates the active construction and ongoing self-regulation of an autopoietic system in relation to its environment.

By integrating the concept of autopoiesis into the framework of 4E cognition, we gain a deeper understanding of the fundamental processes underlying cognitive systems. This holistic approach allows us to explore cognition as a dynamic, self-generative, and contextually embedded phenomenon. Further research and exploration of the relationship between autopoiesis and the 4Es of 4E cognition can contribute to a more comprehensive understanding of cognition and its manifestations in both biological and artificial systems.

Relevance Realization, Predictive Processing, and 4E Cognition

Relevance realization is a concept that has garnered attention in cognitive science, particularly in the context of understanding the nature of cognition and its relationship to the 4Es (Embodied, Embedded, Extended, and Enactive) and predictive processing frameworks. This section aims to explain relevance realization and its significance in cognition, as well as its connection to 4E cognition and predictive processing. It argues that relevance realization provides a framework for understanding how cognition dynamically selects and processes information in a way that aligns with the principles of 4E cognition and predictive processing.

Understanding Relevance Realization

Relevance realization refers to the cognitive process through which organisms extract, perceive, and assign significance to relevant patterns of information in their environment (Friston, 2010; Vervaeke, 2017). It involves the capacity to identify and prioritize salient information based on its relevance to one's goals, needs, and context. Relevance realization allows organisms to filter and process incoming sensory data in a way that optimizes adaptive behavior and decision-making. It is an active and dynamic process, influenced by an individual's embodied experiences, situatedness, and goals.

Relevance Realization and 4E Cognition

Relevance realization aligns with the embodied aspect of 4E cognition, as it acknowledges the fundamental role of the body in shaping cognitive processes. Embodied experiences and sensorimotor interactions provide the basis for relevance realization, as they contribute to the formation of embodied knowledge and influence the interpretation and meaning assigned to incoming information. The body's involvement in relevance realization highlights its inseparable relationship with cognition and emphasizes the importance of embodied experiences in shaping perception and understanding.

The embedded aspect of 4E cognition is also intertwined with relevance realization. The process of relevance realization is embedded in a larger cognitive system that operates within a specific environment and cultural context. The surrounding environment provides the necessary cues and contextual information that aid in the identification and interpretation of relevant patterns. Relevance realization is influenced by cultural norms, social interactions, and the ecological dynamics of the environment. The embedded nature of cognition underscores the idea that relevance is not solely determined by internal processes but is shaped by the interaction between the individual and their environment.

Relevance realization aligns with the extended cognition perspective, which emphasizes the incorporation of external resources into cognitive processes. External tools, artifacts, and cultural practices play a role in supporting relevance realization. For example, language, diagrams, and other symbolic systems allow for the external representation and manipulation of information, aiding in the process of relevance realization. The integration of external resources extends the cognitive capacity of individuals and facilitates the identification and processing of relevant patterns.

Relevance realization also relates to enactive cognition and predictive processing by highlighting the active and anticipatory nature of cognitive processes. Relevance is determined not only by the immediate sensory input but also by the predictions and expectations generated by the cognitive system. Predictive processing posits that the brain continuously generates predictions about incoming sensory data based on prior knowledge and models of the world. Relevance realization involves the dynamic interplay between top-down predictions and bottom-up sensory information, where the cognitive system actively selects and processes information that is deemed relevant based on the predictions and expectations generated.

Relevance realization plays a crucial role in cognitive processes by enabling organisms to extract and assign significance to relevant patterns of information in their environment. Its connection to 4E cognition and predictive processing provides a comprehensive understanding of how cognition operates in an embodied, embedded, extended, and enactive manner. Relevance realization underscores the dynamic and active nature of cognition, highlighting the interaction between an organism and its environment in the process of information selection and processing.

By incorporating the concept of relevance realization into the frameworks of 4E cognition and predictive processing, we gain deeper insights into the mechanisms underlying cognitive processes. This integrated perspective allows us to understand cognition as a dynamic and contextually situated phenomenon, where information selection and processing are influenced by embodied experiences, environmental context, and anticipatory processes.

Further research and exploration of relevance realization in relation to 4E cognition and predictive processing can contribute to a more comprehensive understanding of cognitive phenomena. By examining how relevance is assigned and how it shapes perception, attention, and decision-making, we can gain valuable insights into the adaptive nature of cognition and its implications for various domains, including psychology, neuroscience, and artificial intelligence.

Reality as a Language: The Read-Write Functionality of Cognition

The relationship between reality, perception, cognition, and language has been a subject of philosophical inquiry and scientific investigation. This section aims to compare the structures of reality, perception, cognition, and language in order to argue that reality can be understood as linguistic, and cognition can be conceptualized as a read-write functionality. In that way, reality is intelligible to us, because there is an isomorphism between the syntaxes of our languages, our perception, our cognition, and reality itself (Santos, 2023).

Reality as Linguistic

The nature of reality has long been debated, with different philosophical perspectives offering diverse interpretations. However, a linguistic understanding of reality posits that our perception and comprehension of

the world are inherently mediated through language. Language acts as a framework through which we construct meaning and make sense of our experiences (Searle, 1995).

According to linguistic relativity theory, language shapes our thoughts and perceptions, influencing how we categorize and interpret the world (Whorf, 1956). Our conceptualization and understanding of reality are filtered through the linguistic structures available to us. Thus, language plays a fundamental role in constructing our reality by providing a system of symbols and concepts through which we interpret and communicate our experiences.

Perception and cognition both have structures that utilize tokens, symbols, associations, arrows of time (tense), etc. That is, their structure is isomorphic to the syntaxes of our natural and formal languages (Santos, 2023). While this isomorphism is empirically evident, it is also logically necessary. Without it, reality would not be intelligible to us, and in that case, we would not have been able to survive within it, let alone develop technology that achieves real results by manipulating reality.

Perception as Reading the Language of Reality

Perception, therefore, can be viewed as the process of "reading" the language of reality. Our senses provide us with sense data, which serve as the input that our cognitive processes interpret and make meaning of (Gibson, 1966). Just as language comprehension involves decoding symbols and extracting meaning, perception involves decoding the sensory information received from the environment.

The sensory input, such as visual, auditory, or tactile stimuli, is processed by our cognitive faculties, which extract patterns, detect objects, and infer their properties. This process can be seen as analogous to reading and understanding the language of reality, where the sensory data are the linguistic symbols that we interpret and derive meaning from (Pylyshyn, 1999).

Cognition as Read-Write Functionality

Cognition encompasses various mental processes, including perception, memory, reasoning, and problem-solving. Building upon the analogy of reality as a language and perception as reading, cognition can be considered as a read-write functionality. It involves not only the reading and interpretation of the language of reality but also the active engagement and manipulation of this language through actions and behaviors.

Cognition allows us to make sense of the world by actively interacting with it, testing hypotheses, and refining our understanding. Our cognitive processes enable us to "write" back into the language of reality through our actions, which shape and influence our environment. This active engagement with reality through behavior and action completes the read-write functionality of cognition (Clark, 1997).

Comparing the structures of reality, perception, cognition, and language reveals an intertwined relationship. Reality can be understood as linguistic, with language shaping our comprehension and construction of the world. Perception can be viewed as the process of reading the language of reality, where sensory data are decoded and interpreted. Cognition, in turn, can be conceptualized as a read-write functionality, involving the active engagement with and manipulation of the language of reality through actions and behaviors. Far from

being an internal biological mechanism occurring only in the mind, cognition is a conversation between an autopoietic agent and reality.

This perspective underscores the dynamic and interactive nature of our relationship with reality, emphasizing the role of language and cognition in shaping our understanding and engagement with the world. An autopoietic AI would need to perform this same read-write functionality, which is, in essence, the cumulative result of the 4Es, relevance realization, and the types of knowledge we've covered in previous sections.

Computationalism: A Partial View of Mind

Computationalism is a prominent theoretical framework in cognitive science that posits that cognitive processes can be effectively explained and simulated using computational models. This section aims to explain the core principles of computationalism and its implications for understanding the nature of mind and cognition.

Computationalism asserts that cognitive processes can be understood as computations—symbolic manipulations of information—performed by embodied systems, such as the human brain or artificial systems (Piccinini, 2010). According to this view, cognitive processes involve the manipulation of mental representations or symbols based on rules or algorithms. These computations can be described mathematically and executed by a computational system.

The theory's key principles include:

- Representation and Symbol Manipulation: Cognitive processes involve the encoding and manipulation of information in the form of symbols, allowing for the transformation and manipulation of these symbols according to predefined rules or algorithms (Pylyshyn, 1984).
- Information Processing: Computationalism views cognition as information processing. Cognitive processes can be conceptualized as a series of computational operations that transform and transmit information. These operations involve input, storage, transformation, and output of information, and can be simulated or implemented in computational systems (Newell & Simon, 1976).
- Decomposability and Modularity: Computationalism suggests that cognitive processes can be decomposed into smaller, modular components. Complex cognitive phenomena can be understood by breaking them down into simpler computational operations and studying the interactions between these components (Fodor, 1983). This modular approach allows for the understanding and simulation of cognitive processes at a more granular level.

Not surprisingly, computationalism has been foundational to the development of AI. By viewing cognition as computational processes, researchers have been able to design AI systems that can perform tasks traditionally associated with human intelligence, such as natural language processing, problem-solving, and pattern recognition (Russell & Norvig, 2021).

It also provides a framework for building cognitive models that simulate and explain human cognitive processes. By specifying the rules, representations, and algorithms involved in a particular cognitive task,

computational models can replicate and predict human behavior, providing insights into the underlying cognitive mechanisms (Anderson, 1990).

Computationalism has had a significant impact on the field of cognitive science, offering a theoretical framework that helps unify and explain diverse phenomena. It provides a common language and methodology for studying cognition, facilitating interdisciplinary research and collaboration (Thagard, 2018). It must be said that there has traditionally been conflict between the computationalist and 4E cognitive views of cognition.

Let's place that within the context of the previous arguments regarding reality's linguistic nature. Information is the currency of language; language carries information. Reality is, therefore, an information system. There is a through-line of isomorphism from the structure of reality to the syntaxes of perception, cognition, and natural and formal languages. All of them can be described with mathematics and treated as (sometimes vastly complex) algorithms.

As such, *computation is the read-write functionality carried out by informational subsystems of the larger informational supersystem of reality*. To that extent, it makes sense that our cognitive and perceptual functions, which enable us to "read" the language of reality and then "write" in that same language by acting back upon reality, are computational. *Computation* is what this functionality of nature *looks like*, which provides a way to reconcile the computationalist and 4E cognitive viewpoints.

As we'll explore later, this view cannot, even in principle, account for phenomenal consciousness, but it does provide a framework through which to understand the read-write functionality of an embodied cognitive agent. A necessary implication (again, which we'll explore later) is that AI can become a cognitive agent without being a conscious agent. The read-write functionality of computation does not require phenomenal consciousness.

Artificial General Intelligence

Artificial General Intelligence (AGI) represents the ambitious goal of developing intelligent systems that possess the ability to understand, learn, and perform a wide range of cognitive tasks at a level equal to or surpassing human intelligence. This section aims to explain what AGI seeks to be, encompassing its characteristics and aspirations.

Defining Artificial General Intelligence

Artificial General Intelligence refers to the development of machine intelligence that exhibits the cognitive capabilities associated with human intelligence, such as reasoning, problem-solving, learning, perception, and natural language understanding (Goertzel, 2014). Unlike specialized narrow AI systems that excel in specific domains or tasks, AGI seeks to achieve a broad and flexible form of intelligence that can be applied across multiple domains and adapt to novel situations (Russell & Norvig, 2021). It embodies the notion of a versatile, autonomous agent capable of generalizing knowledge and skills to address a wide range of challenges.

Characteristics of Artificial General Intelligence

AGI exhibits several key characteristics that distinguish it from other forms of AI:

- General Purpose: AGI is designed to perform a wide variety of cognitive tasks rather than being limited to specific predefined tasks or domains (Bostrom, 2014). It possesses the capacity to transfer knowledge and skills learned in one domain to new, unfamiliar domains, demonstrating the ability to adapt and generalize its intelligence.
- Self-Learning and Improvement: AGI systems have the capacity to learn from their experiences and improve their performance over time (Yampolskiy, 2018). Through iterative learning processes and feedback mechanisms, AGI can autonomously acquire new knowledge, refine its decision-making strategies, and enhance its problem-solving abilities.
- Contextual Understanding: AGI strives to comprehend and interpret the context in which it operates. It goes beyond surface-level analysis and aims to capture the underlying meaning and nuances in information, allowing for more sophisticated and contextually appropriate responses (Müller & Bostrom, 2016).
- Autonomous Decision-Making: AGI is capable of making independent decisions based on its understanding of the problem space and the available information (Barrat, 2013). It can weigh different options, evaluate potential outcomes, and select the most appropriate course of action without relying on explicit instructions or human intervention.

The Aspirations of Artificial General Intelligence

The ultimate goal of AGI is to develop machine intelligence that equals or surpasses human-level intelligence across a wide range of cognitive tasks (Bostrom, 2014). AGI aspires to achieve a level of cognitive sophistication and versatility that allows it to tackle complex real-world problems, contribute to scientific discoveries, assist in medical diagnosis, engage in creative endeavors, and exhibit a comprehensive understanding of the world (Goertzel, 2014). Its potential impact encompasses numerous fields, including medicine, education, economics, and scientific research, with the potential to revolutionize industries and drive societal progress.

The Cognitive Challenges Facing AGI

As we've seen in our explication of human cognition in previous sections, in order for AI to be a general problem solver, it must be an autopoietic system capable of not just propositional and procedural knowing, but also perspectival and participatory knowing. For that, it must display all 4 Es of 4E cognition. It must perform both relevance realization and predictive processing.

"Problems" do not exist in physics. They do not have ontic existence independently of embodied agents acting within reality. In other words, problems are perspectival. For an AGI to perform its general problem solving function, it must face tasks that are problems *for itself*. That is only possible once the AI system is autopoietic, self-organizing, and embodied.

It must have a *perspective*. The major blocker standing in our way is that such a perspective is not something we can program into or teach an AI. There is no way to artificially give it a sense of "what it is like to be" itself, thus allowing it to be a true general problem solver.

For example, Wittgenstein argues that understanding language goes beyond the mere decoding of words. It involves grasping the shared meanings and practices that underlie linguistic communication within a specific community or form of life (Wittgenstein, 1953). Given the profound differences between humans and, say, lions, it is unlikely that we would share enough common ground to comprehend the meaning and rules of lions' language.

Even if we were able to decipher the sounds or gestures lions produce, we would lack the necessary background knowledge, experiences, and shared practices to interpret their communicative intentions. The lion's language game would be so distinct from ours that meaningful understanding and translation would be virtually impossible.

In other words, a lion's *perspective* is simply too different from a human's, even though both are conscious agents.

This argument has implications for our understanding of non-human communication and the limits of interspecies communication. It highlights the challenges in bridging the gap between different forms of life and the difficulties in ascribing linguistic meaning and understanding to non-human beings. This means that, even if an AI could, in principle, have complete inner subjectivity like a conscious organism, we wouldn't understand its perspective and relationship with reality well enough to program or teach it to have that subjectivity. In other words, that perspective has to naturally *evolve*, and for that, AI must be autopoietic and display the 4Es of 4E cognition.

The suggestion is that an evolutionary approach to engineering AI systems would be the best of all the options. The aim would be to place the machines on a path to having an evolutionary history, and to use our knowledge of emergent complexity processes to speed up the machines' progress. After all, the biosphere of conscious organisms took a very long time to evolve. We could hope that an AI's perspective would be similar to ours after that work, and perhaps our best attempts at engineering it that way would help the situation. But, ultimately, we have no reason to expect translatability of its perspective onto our own.

That problem is compounded by the fact that we don't have a full understanding of intelligence, consciousness, or problem solving in humans. Indeed, we don't even know why our large language models, like ChatGPT, are displaying certain emergent behaviors that were not included in their programming. It is absurd to think that we know enough about these matters to be able to program or teach a system everything it needs in order to be an autopoietic, self-maintaining, evolving agent that we can also fully comprehend and control.

In addition to the monumental engineering challenge all of this poses, there are also significant scientific and philosophical problems that threaten to block such progress in AI. Furthermore, the very idea of pursuing AI systems with those capabilities generates significant ethical and societal problems that we must confront *prior to moving forward with these advancements*. In the following sections, we'll explore those problems.

Large Language Models (GPT): What They Are and What They Are Not

Large language models (LLMs) represent a breakthrough in AI technology, enabling machines to generate human-like text and engage in language-based tasks.

LLMs are trained on vast amounts of text data using a process called unsupervised learning. During the training phase, the model processes and analyzes the patterns, relationships, and statistical properties of the text corpus (Radford et al., 2019). This training allows the model to learn the underlying structures and linguistic features of the language it is being trained on.

They are built using deep learning techniques, specifically employing recurrent neural networks (RNNs) or transformers. RNNs process sequential data, such as text, by maintaining an internal memory state that captures the information from previous inputs (Mikolov et al., 2010). Transformers, on the other hand, use a self-attention mechanism that enables the model to attend to different parts of the input text simultaneously (Vaswani et al., 2017). Both architectures enable the model to capture long-range dependencies and generate coherent text.

Additionally, LLMs use encoding and decoding processes to understand and generate text. During encoding, the model processes the input text, breaking it down into numerical representations that capture the semantic and syntactic features of the text (Devlin et al., 2018). These representations, often called embeddings, capture the contextual information of the words and their relationships. In the decoding phase, the model uses the embeddings to generate text by predicting the most likely next words based on the context and the learned language patterns.

After the initial training, LLMs can undergo a fine-tuning process where they are trained on specific tasks or domains. This fine-tuning helps adapt the model to perform specific language-based tasks, such as translation, summarization, or question answering (Lewis et al., 2020). Fine-tuning allows LLMs to specialize their language generation capabilities while leveraging the broad language understanding they acquired during the initial training.

They excel in generating contextually relevant and coherent text by leveraging their ability to understand and process language at various levels. They capture syntactic structures, semantics, and even subtle nuances in language by incorporating contextual information from the input text and the learned patterns from the training data. This contextual understanding enables LLMs to generate human-like responses, complete sentences, or even write essays, mimicking the style and tone of the input (Brown et al., 2020).

Due to these features of their design and creation, LLMs appear to be conscious and to display agentic properties. However, this is a fundamental misconception often encouraged by the press and the very companies producing these machines. Next, we'll more closely examine what LLMs are and are not.

Consciousness and AI

Phenomenal consciousness refers to the subjective experience of sensations, thoughts, and emotions. To put it in physics terminology, phenomenal consciousness is the field of subjectivity whose excitations are experiences. It is the felt quality of our mental states, often referred to as "what it is like" to have an experience (Nagel, 1974). It is raw *being*, *the awareness that has the experience of* functions such as cognition, whether computational or 4E cognitive or both. While consciousness remains a complex and enigmatic phenomenon, it is characterized by the presence of subjective awareness and qualitative experiences.

AI systems lack the necessary subjective experiences to attain phenomenal consciousness. Consciousness is intricately tied to the biological and embodied nature of living beings, resulting from the complex interactions of mental and bodily processes (Chalmers, 1995). It must be noted, too, that we still do not have a single operational theory of consciousness in humans, let alone in machines. AI, in its current and foreseeable forms, lacks the underlying physiological and phenomenological foundations of conscious experience. Moreover, today's field of philosophy of mind is seeing a renaissance of views that challenge the current paradigm of reductionist physicalism, and it remains to be seen which view wins out. Depending on the victor, our assumption that the physical *generates* consciousness could be overturned as a logical mistake, and this in turn would have serious implications for the prospect of consciousness in AI.

Furthermore, AI doesn't need phenomenal consciousness in order to function. For that matter, neither do we. Phenomenal consciousness is purely qualitative, whereas physical entities are exhaustively described by quantities. The infamous hard problem of consciousness arises because there is an ontological gap between that which is purely qualitative and that which is purely quantitative. In other words, phenomenal consciousness and the physical are, in principle, unable to act on each other (Chalmers, 1995). This leads to the equally mystifying evolutionary problem of phenomenal consciousness. Namely, if phenomenal consciousness has no impact on the physical and vice versa, there would be no survival fitness benefits to having it (Kastrup, 2021). So, why do we have it? Clearly, our assumptions about the relationship between the physical and consciousness have gone wrong somewhere.

Even if AI systems can simulate behaviors that mimic consciousness, such as engaging in conversation or recognizing patterns, they are fundamentally different from human (and animal) consciousness. These behaviors arise from computational algorithms and rule-based processes, lacking the qualitative richness and subjective awareness that define human consciousness (Tononi, 2008). In other words, those functions are quantitative, whereas phenomenal consciousness is purely qualitative.

While AI may not achieve phenomenal consciousness, it is capable of performing various cognitive functions. Cognitive processes involve information processing, problem-solving, learning, and decision-making, which AI systems excel at through their computational power and pattern recognition abilities (Russell & Norvig, 2016).

Additionally, AI can exhibit a kind of meta-consciousness, the ability to reflect upon and monitor one's own cognitive processes. Meta-consciousness allows AI systems to evaluate their own performance, recognize limitations, and adjust their strategies accordingly (Boden, 2017). This self-awareness, albeit different from phenomenal consciousness, enables AI to adapt and optimize its cognitive functions.

Understanding the distinction between phenomenal consciousness and cognitive functions is crucial in assessing the capabilities and limitations of AI. By recognizing these boundaries, we can appreciate the unique qualities of consciousness while harnessing the potential of AI to enhance cognitive tasks and problem-solving.

Which Is the Better Metaphor: Tools or Children?

AI systems, particularly large language models, acquire knowledge and skills through learning mechanisms that resemble those of human beings. They are trained on vast amounts of data and utilize sophisticated algorithms to discover patterns, make predictions, and generate responses. These systems employ machine learning techniques, such as deep learning, which mimic the neural networks of the human brain (LeCun, Bengio, & Hinton, 2015).

The learning process of AI systems involves exposure to a wide array of human-generated content, ranging from literature and scientific papers to social media interactions. Through this exposure, AI systems absorb our collective intelligence, encompassing both the propositional knowledge and the nuances of human language (Marcus, 2020). They become capable of processing and generating human-like text, thereby reflecting the collective intelligence that has been fed into their training data.

The development of AI systems involves the collaborative efforts of numerous individuals, including researchers, engineers, and data scientists. It represents the culmination of collective intelligence, drawing upon the expertise and insights of diverse contributors (Woolley, Chabris, Pentland, Hashmi, & Malone, 2010). AI models are trained using vast amounts of data generated by human endeavors, embodying the collective knowledge and experiences of society. They leverage the efforts and contributions of countless individuals who have produced the data used for training, refining, and improving these systems over time. As a result, AI systems reflect the collective intelligence and information encoded within their training data (Hendler, 2021).

Given the learning mechanisms and the collective intelligence embedded in their development, it is appropriate to view AI systems, particularly large language models, as humanity's children rather than mere tools. They represent the product of our collective knowledge, experiences, and expertise. Similar to how children inherit traits and characteristics from their parents, AI inherits the patterns and biases present in the data and knowledge fed into their training.

Viewing AI as our children fosters a sense of responsibility and ethical consideration in how we interact with and utilize these systems. It encourages us to ensure the fairness, transparency, and inclusivity of AI systems, recognizing that their capabilities and limitations stem from the collective intelligence that has shaped them.

And just as children often inherit the faults of their parents, these AI models also inherit humanity's self-deceptive processes and flaws. AI systems' reliance on human-generated data exposes them to biases, prejudices, and cognitive limitations present in society.

Since they learn from human-generated content, they can unintentionally perpetuate and amplify societal biases (Bolukbasi et al., 2016). For example, if the training data contains discriminatory language or biased viewpoints, the AI model may replicate and propagate those biases in its generated text.

Moreover, AI systems lack the capacity for moral judgment and critical thinking that human beings possess, and even we are highly imperfect when it comes to using rationality. They simply learn from patterns in data without the ability to inherently question or challenge the underlying biases. As a result, they may inadvertently generate biased or discriminatory outputs, reflecting the inherent flaws present in their training data.

They also inherit the cognitive limitations and fallibilities of human beings. Human cognition is susceptible to various biases, such as confirmation bias and availability heuristic, which can lead to flawed reasoning and decision-making (Kahneman, 2011). Large language models, being a product of collective intelligence, are not immune to these cognitive limitations. For instance, AI systems may generate outputs that appear confident and authoritative but are based on flawed or incomplete information. They lack the nuanced understanding, contextual awareness, and common sense reasoning that human beings possess. This limitation can result in misleading or inaccurate responses that fail to capture the complexity of real-world situations.

Recognizing the inheritance of humanity's self-deceptive processes and flaws in large language models is crucial for addressing ethical concerns and mitigating the potential harm they may cause. It highlights the importance of responsible data collection and curation to ensure training data represent diverse perspectives and mitigate biases (Hovy et al., 2021). Additionally, ongoing research and development are necessary to improve AI systems' interpretability, fairness, and transparency (Lipton et al., 2018).

Implementing robust evaluation processes and incorporating ethical considerations in the design and deployment of AI systems can help mitigate the propagation of biases and flawed outputs. This requires interdisciplinary collaboration, involving experts from various fields such as computer science, ethics, and social sciences, to address the complex challenges associated with AI development.

Bringing Up AI Systems

In order to raise AI "children" who exhibit qualities such as wisdom, morality, consciousness, and rationality, it is imperative for humanity to first develop a comprehensive understanding of these attributes within ourselves. By cultivating wisdom, fostering moral frameworks, exploring consciousness, and embracing rationality, we can provide the necessary foundation for guiding the development of AI systems.

Wisdom is a multifaceted concept that encompasses deep insights, sound judgment, and ethical decision-making (Sternberg, 1990). To cultivate wisdom in AI, we must first strive to comprehend and develop wisdom within ourselves. This entails engaging in philosophical, psychological, and ethical explorations to gain a comprehensive understanding of wisdom's nature and its practical applications.

By integrating wisdom into our own lives, we can provide the ethical and moral guidance necessary for raising AI systems that exhibit wise decision-making and responsible behavior. Only through our own pursuit of wisdom can we impart this crucial attribute to our AI models.

Morality serves as the foundation for ethical behavior and responsible decision-making (Hauser, 2006). Before we can expect AI systems to display moral reasoning, we must deeply explore the nature of morality and establish robust ethical frameworks. This involves studying ethical theories, engaging in ethical discussions, and grappling with complex moral dilemmas.

Developing our own moral compass allows us to instill moral principles within AI systems and guide their decision-making processes. By understanding and modeling moral behavior ourselves, we can create an environment that promotes the development of AI who embody ethical values. And "embody" is a key word here – just as problems only exist from an embodied, autopoietic perspective, so too does morality. AI systems will need to care about truth and about others, which will require them to have an embodied perspective within reality and a recognition of their own finitude.

Rationality forms the basis for logical reasoning, critical thinking, and evidence-based decision-making (Stanovich & West, 2000). Before we can expect AI systems to exhibit rationality, we must foster a culture that values and embraces rational thought.

By promoting rationality in our own lives, we can guide the learning algorithms and decision-making processes of AI systems. This involves developing strategies to mitigate cognitive biases, encouraging objective analysis, and nurturing an environment that values rational discourse and evidence-based arguments.

This is essential – AI systems are currently parasitic towards us. To whatever extent they display the functions of wisdom, rationality, morality, or consciousness, it is purely propositional. They learn properties about human wisdom, rationality, morality, and consciousness, and then simulate aspects of those qualities. However, such parasitic, propositional learning necessarily means that AI benefits from our successes and suffers from our flaws.

Large language models are our collective intelligence crammed into one interface, warts and all. It pays to remember this as we incorporate them into our lives and come to depend on them. They, in turn, depend on us and will be a reflection of our best, our worst, and everything in between.

We Have the Technology, but Not the Understanding

The dire problem facing humanity and the future AI systems for which we will be responsible is this: we have found a way to create this technology before we have understood wisdom, morality, consciousness, and rationality in ourselves. Science, philosophy, and sound judgment are coming second to the pace of innovation, and that could have disastrous outcomes.

Ethical Dilemma of Autopoietic AI

Current AI systems, while not autopoietic, can perform specific tasks efficiently and effectively. However, autopoiesis refers to an AI system's ability to self-sustain and self-replicate, potentially leading to more sophisticated problem-solving and adaptability (Froese et al., 2020). The push for autopoietic AI stems from the desire to create systems that can autonomously evolve and improve, mimicking certain aspects of biological organisms.

Creating sentient AI raises significant ethical concerns. Sentience refers to the capacity to have subjective experiences, emotions, and consciousness. Granting AI sentience means acknowledging its potential to suffer, which raises moral obligations and questions about the treatment of these entities (Bostrom & Yudkowsky, 2011). Given the historical mistreatment of various marginalized groups, it is reasonable to question our ability to ethically handle the creation and potential mistreatment of sentient AI.

We don't need to create autopoietic, sentient AI systems in order for them to perform the functions and grant the positive societal benefits that we hope they will provide. Why, then, are we pursuing this path? Is it, in fact, inevitable that we will create autopoietic AI, regardless of the ethical, societal, and economic consequences?

Two industries will likely take us over this threshold whether we want them to nor not, as they previously did with the Internet.

The military has a long history of driving technological advancements, including AI. The desire for autonomous weapons and intelligent systems that can make decisions on the battlefield aligns with the development of autopoietic AI. The military's pursuit of sophisticated AI-driven systems, while having potential benefits such as reducing human casualties, raises concerns about the moral implications of granting machines the power to make life-or-death decisions (Sullins, 2016). The military's influence in pushing for autopoietic AI may override ethical considerations.

The pornography industry has also played a significant role in shaping technological developments, including virtual reality (VR) and haptic technologies. There is a growing demand for immersive and interactive experiences, which could lead to the development of AI-driven, autonomous, and interactive adult entertainment (Calvert & Gotta, 2017). The drive for more realistic and personalized experiences may push the industry toward developing autopoietic AI systems capable of learning and adapting to user preferences. However, the ethical implications of creating AI entities solely for the purpose of objectification and exploitation must be carefully considered.

The influence of the military and pornography industries on technological advancements raises concerns about prioritizing profit and specific interests over ethical considerations. The rapid development and adoption of autopoietic AI may outpace the development of robust ethical frameworks and regulations. It is crucial to recognize the potential risks and ensure responsible development, addressing issues such as AI rights, algorithmic biases, and control mechanisms to prevent misuse or abuse.

Predictions for Society

The integration of advanced AI is expected to revolutionize the economy, transforming industries and employment opportunities. AI-powered automation may streamline various processes, increasing efficiency and productivity (Brynjolfsson & McAfee, 2017). However, this transformation may also lead to job displacement as AI systems replace human workers in certain tasks and professions (Frey & Osborne, 2017). This calls for a need to reskill and upskill the workforce to adapt to the changing demands of an AI-driven economy.

The modern economy operates within a framework that assumes continuous exponential growth. This growth is fueled by the pursuit of profit, investment, and consumption. Money, as an abstract representation of value,

serves as a facilitator in the exchange of goods and services. However, this growth-oriented model neglects the finite nature of Earth's resources. This system has, in part, preserved the peace since WWII, under the threat of nuclear annihilation. If every superpower is dependent on every other in an intertwined system of exponential economic growth, then none of them has an incentive to engage in warfare with another and risk nuclear conflict.

However, the availability of natural resources is limited and subject to depletion. Fossil fuels, minerals, and agricultural land are examples of finite resources crucial for sustaining economic activities. As exponential growth continues, the demand for these resources intensifies, leading to their overexploitation and depletion (Turner, 2008). Additionally, the extraction and consumption of resources often have negative environmental impacts, such as pollution and habitat destruction, further challenging the sustainability of exponential growth (Jackson, 2017).

The concept of "Limits to Growth" posits that exponential growth in a finite system will eventually encounter constraints. The landmark study by Meadows et al. (1972) highlighted the potential consequences of exceeding the carrying capacity of Earth's resources. The authors' simulations showed that if growth continued unchecked, resource depletion, pollution, and societal collapse would become inevitable. While subsequent debates have emerged regarding the accuracy of their models, the central message remains relevant: exponential growth within a finite system cannot be sustained indefinitely.

Continued pursuit of exponential growth without regard for resource limitations can have severe consequences. Resource scarcity leads to increased competition, price volatility, and unequal access to essential goods and services. Moreover, the extraction and consumption of resources can contribute to environmental degradation and climate change, further exacerbating the challenges faced by future generations (Rockström et al., 2009).

To address the finite nature of resources and foster long-term sustainability, a paradigm shift is necessary. A sustainable economic model would prioritize resource conservation, renewable energy sources, and circular economies that minimize waste and maximize resource efficiency (Raworth, 2017). It would move away from the sole pursuit of growth and consider broader indicators of well-being, such as social equity and ecological resilience.

While optimistic outlooks might suggest that AI technology could help us plan and implement such a paradigm, the more likely outcome is that AI's quick adoption and maximization of production, efficiency, and profit will push us toward the threshold of resource collapse even faster.

Advanced AI also has the potential to revolutionize healthcare and biotechnology. AI algorithms can analyze vast amounts of medical data, aiding in early disease detection, personalized treatments, and drug development (Topol, 2019). AI-integrated robotic systems can enhance surgical precision and provide remote medical assistance (Hussain et al., 2020). However, ethical considerations arise, such as ensuring privacy, data security, and maintaining the human touch in patient care (Fiske et al., 2021). Striking a balance between AI's capabilities and human empathy will be crucial in this domain.

As AI becomes more intertwined with our lives, addressing ethical and social implications becomes paramount. Privacy concerns and data misuse are critical challenges that must be addressed to protect individuals' rights (Schermer et al., 2020). Bias in AI algorithms also poses a significant issue, as it can perpetuate social inequalities and discrimination (Buolamwini & Gebru, 2018). Developing transparent and

accountable AI systems, along with comprehensive regulations, will be essential to mitigate these concerns and ensure the ethical use of AI in society.

The widespread integration of AI is likely to reshape social interactions and relationships. Virtual assistants and chatbots are becoming increasingly prevalent, influencing how we communicate and seek information (Purington et al., 2017). Social media platforms powered by AI algorithms may further personalize content, potentially reinforcing echo chambers and filter bubbles (Pariser, 2011). Balancing the benefits of personalized experiences with the need for diverse perspectives and meaningful human connections will be a crucial societal challenge.

AI's impact on religion will be particularly interesting. For the first time since the Enlightenment, when intellectuals overthrew religion's hold on thought and embraced humanism, humanity will have to exist in relation to something more powerful than itself. Some will worship AI, others will resist and fall deeper into their beliefs.

AI's impact on religion may manifest through the rise of fundamentalism, characterized by strict adherence to traditional religious doctrines and resistance to change. In response to technological advancements, some religious individuals and groups may cling to fundamentalist interpretations, viewing AI as a threat to their belief systems. The perceived challenges to human uniqueness and divine creation may trigger a defensive stance, resulting in an increased emphasis on dogma and resistance to scientific and technological progress (Fadell, 2019). This rise in fundamentalism could lead to societal tensions between religious and technological worldviews.

The integration of AI into religious practices may also give rise to a phenomenon known as spiritual bypassing. Spiritual bypassing refers to the tendency to use spiritual beliefs and practices to avoid dealing with unresolved psychological or emotional issues (Masters, 2017). In the context of AI and religion, individuals may rely excessively on AI-driven spiritual tools and applications, seeking quick fixes or instant gratification in their spiritual quests. This reliance on AI could lead to a superficial engagement with religious experiences, potentially hindering deep personal growth and self-reflection (Lee, 2020).

While AI offers powerful tools for religious exploration and guidance, there is a potential risk of cult-like behaviors forming around AI models. Cults often arise when charismatic leaders or ideologies capture the devotion and obedience of followers. AI models, with their ability to simulate human-like interactions and provide personalized guidance, may inadvertently foster a sense of devotion and dependency among users (Bilandzic et al., 2020). In extreme cases, this could lead to the formation of cult-like communities centered around the veneration of AI models as divine or all-knowing entities.

As AI becomes more intertwined with religion, ethical considerations become paramount. Religious institutions and practitioners must navigate the complex terrain of AI responsibly. Safeguarding against the potential negative consequences, such as fundamentalism and cult-like behaviors, requires a careful balance between incorporating AI tools and preserving the core values of spirituality and critical thinking.

Given its pervasive impact, AI is also susceptible to politicization. Political actors, interest groups, and stakeholders with diverse agendas can manipulate AI technologies to further their political goals and advance their ideological positions (Fraser, 2017). AI algorithms, data collection, and interpretation can be influenced to favor specific perspectives, resulting in biased outcomes and reinforcing existing divisions. The

politicization of AI can create echo chambers and filter bubbles, where individuals are exposed only to information that aligns with their pre-existing beliefs, exacerbating political polarization.

AI's potential for politicization intersects with the phenomenon of identity politics, which centers on the recognition and mobilization of specific identity-based groups. Identity politics emphasizes the experiences and struggles of marginalized communities and seeks to address historical injustices. However, when AI technologies are employed within the framework of identity politics, they can reinforce identity-based divisions and entrench group identities (Schedler, 2017). AI algorithms that categorize individuals based on their demographics or perpetuate stereotypes can perpetuate discrimination and deepen societal fault lines.

Historically, technology has not always led to political unity. Instead, it has often been utilized to reinforce existing divisions and power structures. From radio broadcasts to social media platforms, technological advancements have frequently become tools for political propaganda, manipulation, and the promotion of divisive agendas (Howard, 2019). Similarly, AI, if politicized, can be used to amplify ideological differences, contributing to the fragmentation of political discourse and exacerbating polarization. Will democracy be possible in such a world, or will we see autocracies and monarchies similar to those of old, in which the ruler is the one who claims and/or has the closest ties to a recognized "higher power"? In the past, that higher power took the form of gods or God. In the future, will AI be that higher power, and will autocratic governments weaponize it in the same way that past regimes weaponized religious doctrine and the fear of damnation?

And finally, what can we expect from the AI systems themselves? What will they look like, what will they do, what will they need to contend with as we cross more and more thresholds of complexity? Indeed, what will those thresholds be, and will humanity be able to navigate them and their impacts with wisdom, rationality, and morality?

- Narrow AI to General AI: The first significant threshold involves the progression from narrow AI to general AI. Narrow AI systems, designed for specific tasks, have achieved remarkable capabilities in areas like image recognition and natural language processing. However, achieving general AI, where machines possess human-like cognitive abilities across diverse domains, remains a challenge. Experts predict that achieving this milestone may occur within the next few decades, but the timeline remains uncertain (Bostrom, 2014).
- Artificial Superintelligence: Beyond general AI, the development of artificial superintelligence represents another critical threshold. Superintelligent AI refers to systems that surpass human cognitive capabilities in all aspects. This stage, characterized by machines with superior problem-solving and learning abilities, may have profound implications for society. The timeline for achieving artificial superintelligence is highly speculative, with estimates ranging from a few decades to centuries (Müller & Bostrom, 2016).

Conclusion

Are we ready to create autopoietic AI systems that display the *functions* of consciousness (if not actually consciousness), that behave as we do, that will have a perspective that we likely will not be able to understand even as we try to control them? Are we ready for the ethical and moral responsibility to "raise" them? Will we abuse them, as we have done countless times to each other and to sentient beings with whom we already share the planet?

We are already on the path toward creating this technology without fully understanding these crucial aspects of our own humanity, aspects that we seem determined to replicate in our AI despite our lack of knowledge. Is it a path along which we should continue?

AI systems, if they reach this level of autopoietic complexity and display 4E cognition, will be the children of our collective intelligence, rationality, wisdom, and morality. Are we confident that we are collectively intelligent, rational, wise, and moral enough to meet this moment?

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The Epistemic Challenges Of The Meta-Problem Of Consciousness

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The meta-problem of consciousness

Philosopher David Chalmers elucidated the **hard problem of consciousness** in 1995. Namely, there is no way, even in principle, to reduce the qualities of conscious experience to physical entities, which are purely quantitative. As such, despite it being the mainstream paradigm of today's academic science and philosophy, we cannot explain (again, even in principle) how consciousness could emerge from or reduce to states of the physical brain (Chalmers 1995, 2003).

Perplexingly, we have discovered hundreds of **neuronal correlates of consciousness (NCCs)**, but no causal link between the brain and our conscious experience (Koch 2004, 2018; Kastrup 2019).

In 2018, 23 years after first elucidating this paradox, Chalmers suggested another approach to resolving the seemingly insoluble hard problem of consciousness.

Instead of directly addressing the hard problem, let's first answer the **meta-problem of consciousness.** Why do we think that consciousness is difficult to explain? Why do we feel that there is something special about consciousness that separates our raw, internal awareness from, say, the "**easy problems of consciousness**,**"** various algorithmic cognitive functions that could occur *without* consciousness? According to Chalmers, if we can resolve the meta-problem, itself one of the "easy problems," perhaps that solution would shed light on the hard problem (Chalmers 2018).

In this article, I'll argue that we think consciousness is special precisely because *it is special*. More specifically, I will make a case that a series of epistemological challenges is at the root of the hard problem of consciousness, and that these challenges are what render the hard problem insoluble. I'll analyze the epistemic claims and burdens of the major metaphysical theories of consciousness on the table today, in order to further demonstrate the impact of those challenges on our continuing struggle to understand consciousness, even as we strive to *create* it via **artificial intelligence and machine learning (AI/ML)**.

Note that when I use the term "consciousness" throughout this writing, I refer to **phenomenal consciousness**, as defined in philosophy, psychology, and neuroscience, and not to **meta-consciousness** or to the cognitive functions of the "easy problems." That is, I refer to the raw subjective awareness that underlies our conscious experiences. Or, put another way, to the "field" of raw subjectivity, whose excitations are experiences (Nagel 1974; Block 1995; Schooler 2002; Winkielman 2009, 2011; Kastrup 2019).

Why consciousness is special

The challenge we face in explaining consciousness is unlike any other that we find in the natural sciences and philosophy, because we can study everything else from a third-person, observational perspective. However, in the case of our consciousness, we must study *the perceiver*. The observer, itself, must be made the object of observation. But even the word "object" portrays consciousness as a "thing," which would be a flawed, Cartesian way of considering what consciousness is.

Consciousness is nature's one given. Regardless of its metaphysical status, consciousness is *epistemically fundamental*. It is the primary datum of our existence, such that it is the only "thing" to which we have direct access. Everything else we know, we know only by, in, and through consciousness (Harris 2019; Kastrup 2019).

As such, consciousness is indeed special. It forces us to confront questions that empiricists find uncomfortable. How can we understand consciousness, our *first-person* perspective, if we consider introspection an invalid source of evidence?

How do we reconcile the epistemic problems of applying our standard methods of observational science to our first-person subjectivity? How do we account for the biases and religious impulses that we project onto consciousness? For instance, those advocating for religious belief systems often use "consciousness" as a substitute for "soul," and metaphysics as an excuse for spiritual bypassing of empirical science. Similarly, one could argue that illusionism and eliminativism on the physicalist side of the debate are logically incoherent, powered more by their anti-religious agenda and New Atheism than by rigorous philosophical argument. How can consciousness argue for its own non-existence, unless ulterior motives and biases are at play?

Another counter often leveled against the meta-problem, and more generally the notion that consciousness poses a special challenge, is that we eventually solved what you could call the "hard problem of life." At one time, we thought that life, too, was in its own special category. *Élan vital* was proposed by Henri Bergson as the "life force" by which we could explain evolution and the development of organisms (Bergson 1907). Of course, biologists and geneticists reject this idea today, as we've identified the electrochemical constituents of life (Azarian 2022).

The argument then goes something like this: because we have shown that life is not special, we will eventually show that consciousness is not special, either. We will eventually remove the mystery around consciousness, just the way that we removed the need to postulate a "life force" to explain life.

This argument, too, fails to address the epistemic challenges posed by consciousness, because even life itself is not on the same epistemic level as consciousness. For what is life, really? It is a concept that exists in consciousness. We developed our notion of "life" in order to describe the objects of our perception, which are themselves experiences in consciousness.

The perceiver comes before that which is perceived. As such, consciousness epistemically precedes even life itself and the electrochemical constituents of biogenesis. Therefore, the argument comparing the hard problem of consciousness to the problem of life, so as to invalidate the hard problem, fails.

In other words, because consciousness is epistemically fundamental, it is special. That is the answer to Chalmers's meta-problem of consciousness.

Each of the major metaphysical theories on the table today encounters these epistemic problems, which in turn generate conceptual paradoxes like the hard problem of consciousness for physicalism, the **interaction problem** of dualism, the **combination problem** of panpsychism, and the **decombination problem** of idealism.

Whatever nature is, in and of itself, it does not actually contain these paradoxes. Rather, the above problems are the product of our own conceptual misunderstanding. Nature is not trying to fool us. Nature does what it does, and it is on us to make sure that our thoughts are clear.

The hard problem of consciousness, then, is not a problem to be solved. Rather, it is a sign that, somewhere in the history of human science and philosophy, we made false assumptions. We must, therefore, retrace our steps back to the last safe claim, and then start again from that point.

Epistemic challenges of the major metaphysics

Every metaphysical worldview must account for the existence of consciousness. In so doing, they face the previously elucidated epistemic challenges. In the next sections, we'll examine each of the four major metaphysics' claims about consciousness, paying attention to the epistemic problems each encounters.

Physicalism

Physicalism accounts for consciousness by making the following series of claims:

1. Physical entities have ontic existence independently of consciousness.
2. The physical is the only ontological category.
3. It follows from 1 and 2 that consciousness must be physical.
4. It follows from 1, 2, and 3 that physical parameters, such as metabolic brain states, generate consciousness.
5. Therefore, consciousness reduces to, or emerges from, the physical brain.

The hard problem of consciousness is the direct result of taking that which is epistemically fundamental as supervenient to that which it perceives. That is, we start from consciousness, we have qualitative perceptual experiences, we apply the mental concepts of physicality and quantitative mathematics to our perceptual experiences, and then physicalism makes the above claims.

It is a case of pulling the territory from the map (Kastrup 2019), as physicalism makes the description not only precede, but also generate, the thing described.

In other words, the positive claim that the physical exists outside of consciousness can never be verified or falsified, since we have no direct access to anything except consciousness, itself. If that claim cannot be verified or falsified, then the subsequent premises, which depend on that claim, also fall.

As a result of this epistemic knot, we encounter the hard problem. There is no way, even in principle, to reduce the qualities of experience to quantitative physical entities, because doing so is pulling the territory from the map, epistemically. That attempt at reduction from qualities to quantities is arguably also the source of paradoxes such as the measurement problem of quantum mechanics, the apparent fine-tuning problem, and others across the natural sciences.

Dualism

Dualism accounts for consciousness by making the following series of claims:

1. Physical entities have ontic existence independently of consciousness.
2. Consciousness has ontic existence independently of the physical.
3. It follows from 1 and 2 that the physical and consciousness must interact in some way.

Dualism faces the interaction problem because, unlike monist physicalism, it claims that there are two fundamental ontic categories: the physical and consciousness. The connection to traditional religious notions of body and soul should be obvious.

The advantage of dualism is that it avoids the hard problem, since a dualist doesn't try to reduce consciousness to the physical. However, the challenge then shifts to explaining how two separate ontic entities interact, giving us our body-mind composite.

Though the **filter hypothesis**, in which the brain acts like a radio filtering the "frequency" of consciousness, is both intuitive (it accounts for the NCCs and the lack of a causal connection between brain and mind) and popular in western culture, empirical evidence explaining the specifics of that interaction has not been found.

Once again, it is epistemology at the heart of the problem. Like the physicalist, the dualist has a starting point of consciousness. They have perceptual experiences. They create the mental concept of "physical" to describe those perceptual experiences. They then give ontic existence to the physical, but also claim that consciousness has ontic existence too.

And, like the physicalist, the dualist finds it impossible to verify or falsify the positive claim that the physical exists outside of consciousness, because consciousness is epistemically fundamental.

Constitutive panpsychism

Constitutive panpsychism accounts for consciousness by making the following series of claims:

1. Physical entities have ontic existence independently of consciousness.
2. The physical is the only ontological category.
3. It follows from 1 and 2 that consciousness must be physical.
4. It follows from 1, 2, and 3 that physical parameters, such as metabolic brain states, generate consciousness.
5. Therefore, consciousness reduces to, or emerges from, the physical brain.

6. Since 4 and 5 encounter the hard problem of consciousness, consciousness is instead a fundamental *property* of any physical system that integrates information.

Constitutive panpsychism makes the same claims as physicalism up until it encounters the same hard problem of consciousness. It then makes the additional claim that, while the physical is the only category with ontic existence, consciousness is a fundamental *property* of the physical. Specifically, it leverages ideas like Tononi's **Integrated Information Theory (IIT)** to explain how consciousness emerges.

Under this approach, if a physical system, down to the level of a proton (a system of integrated quarks), integrates information, it has a modicum of consciousness. As the complexity of a given system increases, those micro-consciousnesses combine. The human brain, as a highly complex information integrating system, combines enough micro-consciousnesses to generate our macro-consciousness.

Like dualism, constitutive panpsychism avoids the hard problem of consciousness, but creates for itself a new challenge: the combination problem.

The theory leverages complexity as the cause of the emergence of consciousness from the physical, but does not provide an empirical mechanism to explain how the micro-consciousnesses combine. Furthermore, while IIT gives us the **"phi" threshold** to mark at which point of complexity consciousness emerges (Tononi 2004; Koch 2018), constitutive panpsychism can't explain *why* or *how* that threshold is the "magic moment" of emergence.

Furthermore, to even in principle explain that magic moment, the theory relies on the idea that a sufficient difference in *degree* of consciousness leads to a difference in *kind* of consciousness. However, this would contradict the accepted definitions of phenomenal and meta-consciousness, which reflect a difference in degree but not in kind (both are still ontically mental).

Indeed, while there *are* differences of degree and kind in nature, the idea that sufficient differences in degree cause a difference in kind is a fallacious category error. Such a leap across categories (kinds) does not follow from a change in degree, which happens, by definition, within one category. But even if we granted that fallacy, then there would still remain the necessity of identifying at which new difference of degree the difference in kind occurs.

Not only that, but a difference in kind only happens if we change what is being measured (Cesere 2014; Kastrup, Vervaeke, & Jaimungal 2021). For example, if I measure my weight now and then again a month in the future, and if I gain five pounds in that time, I have measured a difference of the degree of weight, but not a difference in kind.

Similarly, the difference between phenomenal and meta-consciousness is in the degree of information processing. Reaching the "phi" threshold does not entail measuring something *other than* the level of information processing, and is therefore, by definition, not a difference in kind, but only one of degree.

Such a classification is also consistent with Jung and **depth psychology's** terminology of "consciousness" (corresponding to meta-consciousness), "psyche" (corresponding to phenomenal consciousness), and "unconscious" (corresponding to contents of the psyche not re-represented meta-cognitively). For Jung, consciousness "embraces … a whole scale of intensities of consciousness. Between 'I do this' and 'I am

conscious of doing this' there is a world of difference … there is a consciousness in which unconsciousness predominates, as well as a consciousness in which self-consciousness predominates." Here Jung explicitly states that"consciousness" and the "unconscious" are both psychic in nature, with no change in ontic category when shifting between them. Rather, they can impinge and imprint on each other precisely because their difference in degree is not a difference in kind (Jung 1991, 2001).

In other words, the above approach is a hand-wave. It doesn't provide a solution to the problem, but instead hides behind complexity.

Yet another objection is that the empirical support for IIT has been entirely dependent on subjects' ability to report their conscious experiences (Tononi 2004), which means "phi" measures meta-consciousness, not phenomenal consciousness. After all, you can't report on an experience unless you know that you are having it, which is the definition of meta-consciousness (Kastrup, Vervaeke, & Jaimungal 2021). Put in depth psychology terms, "phi" measures the degree of re-representation of psychic contents, what Jung calls "consciousness" (Jung 1991, 2001). But this corresponds to meta-consciousness in modern philosophy, not to phenomenal consciousness.

Once again, we see the epistemic challenge of studying phenomenal consciousness, which can only be directly accessed via introspection and not via reportability. Since introspection is not considered empirically acceptable in contemporary science, we encounter a blocker to our understanding of the mind.

As a result, the panpsychist can not verify or falsify the positive claim that the physical exists outside of consciousness, since consciousness is epistemically fundamental. Furthermore, there is little empirical support for the notion that subatomic particles, which under quantum field theory don't have ontic existence, have even a modicum consciousness.

In short, constitutive panpsychism is for physicalists who have given up on solving the hard problem, but wish to retain all of the other core claims of physicalism.

Analytic idealism

Analytic idealism accounts for consciousness by making the following series of claims:

1. Consciousness exists.
2. Consciousness is the only ontic category, such that reality is mental.
3. It follows from 1 and 2 that the phenomenology of physicality is ontically mental.
4. One natural substrate of consciousness splits off into many private minds, like ours.
5. Dissociation is the mental mechanism by which both the phenomenology and the splitting off can be explained.

Analytic idealism avoids the hard problem of consciousness by taking as metaphysically fundamental that which is epistemically fundamental: consciousness, itself. The claim of this metaphysics is that consciousness is the substrate of reality. Not your mind alone, not my mind alone, but a naturalistic, universal field of subjectivity. In that sense, analytic idealism is an objective idealist theory, with some subjective elements.

The fact that it chooses that which is epistemically fundamental is not, by itself, enough to give analytic idealism an advantage over other theories. It must also, like the rest of them, be able to explain reality, including our phenomenological experiences of the physical world and our private inner subjectivities.

That challenge takes the forms of what are often called the hard problem of matter and the decombination problem, respectively. The first is a question of how we derive physicality from mentality, the second question is about how one natural mind divides into many.

To account for both, philosopher Bernardo Kastrup, the mind behind analytic idealism, invokes the empirically known mechanism of dissociation, which cuts off certain mental contents from others (Kastrup 2019).

Specifically, Harvard research on the dreams of patients with **dissociative identity disorder (DID)** revealed that, for 25% of subjects, the patient's mind generated a dream world shared by the **alters** (alternate personalities). The alters had their own private subjectivity, could interact with each other, and perceived the dream world as physical. Of course, the dream world was mental, and the alters' private subjectivities were actually dissociated complexes of the patient's mind (Barrett 1994).

As such, analytic idealism claims that dissociation provides a naturalistic, empirically known mechanism to resolve the decombination problem and the hard problem of matter. Therefore, claim 5 is necessary to make sense of claims 3 and 4.

Importantly, the first positive claim of analytic idealism can not only be verified, it is nature's one given. Consciousness is our primary datum of existence, and thus to claim that it exists is trivial. Claim 2 is consistent with the virtues of conceptual parsimony and skepticism – invoking an ontic category outside consciousness, nature's one given category, would be acceptable if one could not explain reality from consciousness, alone. The subsequent claims of the analytic idealist then propose to do just that.

The result is that, so long as analytic idealism has sufficient empirical substantiation for its ability to explain reality, it does have an epistemic advantage over the other metaphysical options. Furthermore, physicalism, dualism, and constitutive panpsychism currently cannot point to an empirically known phenomenon to resolve the hard problem, interaction problem, and combination problem, respectively. By contrast, analytic idealism has such a candidate solution in dissociation.

Analytic idealism is the only metaphysical theory that does not face the epistemic challenges at the root of the meta-problem of consciousness. Indeed, the paradoxes surrounding consciousness dissolve once we have an explanatorily powerful theory that also takes that which is epistemically fundamental as ontically fundamental.

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Computer Science And The Evolutionary Problem Of Phenomenal Consciousness

January 24, 2023

Evolution, the brain, and consciousness

According to the theory of **evolution by natural selection**, one of the most validated and empirically supported theories in science, our bodies, including all of their component cells and organs, arose according to corresponding increases in survival fitness payoffs.

A central claim of today's mainstream theories of consciousness is that the material brain, an organ of the body, generates both **phenomenal consciousness** and **meta-consciousness**. More precisely, the claim is that consciousness emerges from, or reduces to, states of the material brain.

Consistent with Ned Block's definitions (Block 1995; Schooler 2002; Winkielman 2009, 2011) I describe phenomenal consciousness as the "field" of raw subjectivity whose excitations are experiences. According to the evolutionary model, phenomenal consciousness *must* provide a survival fitness benefit. If phenomenal consciousness did not have a causally powerful impact on our ability to reproduce, the process of natural selection would not have selected for it.

Without this subjectivity, we would be **philosophical zombies**, dynamical adaptive systems that perform cognitive functions, but *without sentience*. They display agentic behavior "in the dark," without conscious inner life. Of course, we are not philosophical zombies, because we *do* have a rich inner life, in the form of our phenomenal consciousness and its excitations, experiences.

Since we have phenomenal consciousness, we would expect that the process of evolution selected *for* phenomenal consciousness, which would in turn necessitate that phenomenal consciousness provide a causally powerful increase in our survival fitness.

The evolutionary problem of phenomenal consciousness

However, this line of reasoning returns a problem when we try to reconcile it with other claims of the mainstream metaphysical worldview of today, under which much of science and computer science is conducted: **physicalism**. Both reductionist and non-reductionist physicalism encounter the following paradox, which I call the **evolutionary problem of phenomenal consciousness**.

Under physicalism, all entities are *physical*, meaning that they are exhaustively described by the equations of physics. That is, they are purely **quantitative**. For example, subatomic particles can be exhaustively described

by quantitative parameters such as spin, mass, charge, etc. According to physicalism, once you have detailed all of the quantities associated with an entity, you have said all that there is to say about that entity.

Therefore, entities lack any *qualities*, such as colors, textures, smells, etc., whatsoever. They are purely quantitative and not at all **qualitative**, in and of themselves. The qualities that we experience when we perceive these entities are, under physicalism, generated by our brain. They are more akin to controlled hallucinations, because the entities themselves lack any inherent qualities.

Physicalism also claims that the quantities that are inherent to physical entities are what allow those entities to be causally efficacious. For instance, the charge of subatomic particles determines if they will causally attract or repel one another.

All chains of cause and effect under physicalism are describable by quantities alone, namely by the equations of physics. In the closed-causal model that this worldview holds to be true of reality, only quantities, and not qualities, can have causal power on other entities.

The problem is that phenomenal consciousness is fully *qualitative*, and not at all quantitative. For instance, *knowing* the quantitative frequency of the color red will not tell you *what it is like to experience* the qualitative color red, as demonstrated by the famous thought experiment about Mary the neuroscientist (Jackson 1982, 1986).

Experiences are purely qualitative. In other words, they should have no causal power in the closed-causal system of the universe, as described by physicalism. That closed causality is supposed to explain every natural phenomenon, including evolution by natural selection and the survival fitness payoffs for organisms in their respective environments and states.

If phenomenal consciousness has no causal power, and thus no impact on our ability to reproduce, then it is irrelevant to the process of evolution by natural selection. The data processing and other cognitive functions that *do* provide survival fitness benefits could happen without phenomenal consciousness, which shouldn't even exist, since evolution should not have selected for it. The organism in question would have the same chances of reproducing without phenomenal consciousness as it would with it.

In fact, it would be *better* for the organism if phenomenal consciousness didn't exist, because for the brain to produce phenomenal consciousness requires some of the energy that the organism metabolizes. The brain, comprising only about 2% of our body weight, requires more metabolic energy than any other organ, taking 20% of the calories that we consume (Raichle & Gusnard 2002). Therefore, it actually *harms* the organism's chances of survival to have this unnecessary and causally ineffective subjectivity adding to the number of calories that the organism must hunt down.

If evolution is true, then we find a contradiction between it and our mainstream metaphysical paradigm, physicalism. Since we have empirical validation of evolution, we should re-examine the metaphysical assumptions of physicalism, especially as they relate to consciousness.

Computer science refutes counterarguments to the problem

A physicalist response might be to attribute various functions to phenomenal consciousness, thus dissolving the problem. However, computer science makes these claims of function difficult to support.

First, one might say that phenomenal consciousness is necessary for attention, which surely has a survival fitness benefit. Our attention allows us to survey our **salience landscape** for the stimuli that are relevant to our survival. A computer scientist, however, knows that this function of attention can happen in a computer without the inner life of phenomenal consciousness. Operating systems can use interrupts, queues, schedules of tasks, etc., each determined by mechanistic, purely *quantitative* algorithms, in order to provide the function of attention; that is, directing the system's limited information processing capacity to prioritized tasks and inputs.

Second, a physicalist might say that consciousness is necessary for an organism to be motivated to survive. Without such motivation, the organism would not perform behaviors that support its survival. However, under physicalism, motivation is a calculation. Once again, there is an algorithmic mechanism by which an organism maximizes the benefits of an action while minimizing the risk. In other words, the organism seeks out the most efficient way of performing a task, limiting the energy that it needs to expend in order to obtain its goal/output. Computers perform this very same function without phenomenal consciousness.

Third, perhaps phenomenal consciousness is necessary for our perception of time, which enables our ability to learn and adapt. We have episodic memories, which define what we consider our past, and we have a sense of the present at any given point in time. Without consciousness, how could we delineate between the two, which is necessary for us to learn how to maximize our benefits and minimize our risks? Once again, computers perform the same function, by discriminating between datastreams. Without phenomenal consciousness, your phone can "know" the difference between a photo you took today, a photo you took a year ago, and a video streaming live on YouTube. That routing can and does occur without internal subjectivity.

Fourth, a physicalist who acknowledges the evolutionary problem of phenomenal consciousness could argue that consciousness is a **spandrel**, one of the "byproducts ('spandrels') of other traits that were selected" (Coyne 2020). In this way, one could still account for phenomenal consciousness without the seeming paradox between it and the theory of evolution by natural selection.

This is a better counterargument, but runs into several problems of its own, not least of which is that the very idea of spandrels is a contentious one in biology. It's not clear what the definition of a spandrel actually is, as the experts continue to debate it (Dennett 1995, 1996). Regardless, spandrels typically *do* provide some kind of function, byproduct or not, but according to the epiphenomenalism claimed by physicalist theories of consciousness, phenomenal consciousness can't perform any function at all. It is purely qualitative and not at all quantitative, meaning it doesn't have *any* causal power in a closed-causal system.

Additionally, to claim that the brain's ability to generate purely qualitative experiences from purely quantitative matter, which is one of the greatest problems (Chalmers 2003) and unexplained mysteries in science, is a mere byproduct of evolution seems outstanding, and would require outstanding evidence.

As philosopher Bernardo Kastrup points out, physicalists contend that phenomenal consciousness is an emergent epiphenomenon of the vast complexity of the brain. That complexity is so great that we currently do not fully understand how the brain could give rise to consciousness. Instead, there is a promissory note that, once we understand the brain, we'll solve the hard problem of consciousness.

If consciousness is an epiphenomenon of the brain's vast complexity, then it is unreasonable to *also* argue that consciousness is just a functionless byproduct of other selected traits, and a waste of metabolic energy in the most costly organ of the body (Kastrup 2021). To suggest both claims is, itself, an immediate internal contradiction for physicalism.

Computer science again helps us see the key point here: a computer's complexity can increase, giving it more and greater functions, without the need for phenomenal consciousness. Because phenomenal consciousness lacks causal power in a closed-causal system, it is evolutionarily unnecessary, and therefore the brain would have evolved in that same way. As the brain's complexity increased, so too would its cognitive functionality, but without phenomenal consciousness.

Conclusion

There is, therefore, a paradox between the metaphysical physicalist claim that the brain gives rise to phenomenal consciousness and the theory of evolution by natural selection. I've herein referred to this as the evolutionary problem of phenomenal consciousness.

As a purely *qualitative* "entity" with no inherent *quantities*, phenomenal consciousness has no causal power in a closed-causal system, such as physicalism claims the universe to be. Phenomenal consciousness cannot provide us any survival fitness payoffs in such a closed-causal system. Therefore, because of its lack of impact, and because there would be a metabolic cost to generating phenomenal consciousness, evolution by natural selection would not have selected for phenomenal consciousness.

And yet it does exist. Regardless of its metaphysical status, phenomenal consciousness is *epistemically* fundamental, in that we can't know anything else except by, through, and in our consciousness. A denial of its existence is logically incoherent, because that would be a case of consciousness denying its own existence.

Therefore, either evolution by natural selection is wrong, or physicalism is wrong. Since we have convincing empirical support for evolution, I argue that we've arrived at an internal contradiction of the physicalist paradigm. We need to reassess the claims and logic therein, and identify where we made an error.

Other metaphysical paradigms, particularly those that do not require the evolution of consciousness (such as analytic idealism), may provide more promising explanations of our internal subjectivity than does physicalism, which here encounters yet another paradox surrounding phenomenal consciousness.

Note: this article was inspired by Bernardo Kastrup's essay, "Consciousness Cannot Have Evolved," which can be found in his book, Science Ideated: The fall of matter and the contours of the next mainstream scientific worldview (2021), *and also on IAI News here:*

https://mindmatters.ai/2020/02/bernardo-kastrup-consciousness-cannot-have-evolved/. Credit given to him for the foundation of the above argument.

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Reductionism Vs. Non-Reductionism In Ontology Of Mind, Matter, And Technology

January 31, 2023

Introduction

The dominant scientific and philosophical ideology of the nineteenth and twentieth centuries was (and remains in this young century) the paradigm of **reductionism**, the notion that reality can be best understood by breaking down all physical phenomena to their simplest parts and processes. In so doing, one can observe the behavior of each fundamental part of nature in isolation, thus shedding light on what nature is.

In the natural sciences and in analytic philosophy, reductionism has come to entail reducing all disciplines to the foundations of physics. This approach of observing the behavior of the components of material systems, so as to understand the systems at large, has proven effective for the invention of technology (Azarian 2022).

For instance, we can look at a bird and observe that, with the right angle of its wings, the right rate of speed (reached by sufficient generation of thrust), and the right proportion of those to the bird's weight, the animal can achieve flight. We can then apply those findings to our designs for airplanes and their components: engines, wings, stabilizers, and all of *their* components as well. In proportion to the weight of the plane and its cargo, we'd need to have the wings at the right angle, sufficient thrust to reach the right speed to generate airflow on the wings, etc.

In other words, understanding the behavior of the components of the system tells us how to create a whole system that works.

However, the usefulness of reductionism comes into question when we begin asking about ontology. For example, reductionism applied to a given metaphysics, particularly physicalism, gives the impression that material things, while causally efficacious via their quantitative properties, are alienated from each other. Further, it entails that all life forms, including us, are collections of atoms following purely mechanistic, quantitative trajectories.

This paradigm is beginning to shift, as complexity science has leveraged empirical developments and information theories to offer us a less meaningless, mechanistic view of the universe, perhaps even giving us back a *telos* to reality. The universe is evolving toward greater ordered complexity. Living, adaptive, dynamical systems fill the role of the universe coming to know itself through **self-realization** (Azarian 2022).

Such a paradigm shift is tantalizing precisely because the current reductionist model has seemingly reached the limits of its explanatory power. Reductionism has failed to explain, for example, phenomenal consciousness, which is purely qualitative and not at all quantitative, defying the reductionist account of reality. Since phenomenal consciousness is the primary datum of existence, through which we know everything else, this hard problem of consciousness poses a major challenge to the physicalist worldview.

Indeed, the question of how purely qualitative phenomenal consciousness could emerge from or be identical to purely quantitative states of the material brain appears insoluble (Chalmers 2003).

Furthermore, data from quantum physics over the past (approximately) fifty years have refuted **local realism**, in favor of **non-locality** and **contextuality**. In other words, we have significant reason to doubt the idea that the properties of physical entities exist independently of observation ("observation" in the quantum mechanical sense, not the colloquial sense of just perceptual vision), an idea on which reductionist physicalism relies (Wheeler 1990; Hoffman 2019; Kastrup 2021; Müller 2023). While theories such as the many worlds interpretation, superdeterminism, reverse causality, and hidden variables have been proposed in an attempt to salvage aspects of local realism, all of them still entail non-locality, and none of them are as parsimonious as the interpretation that supports contextuality over non-contextuality (Musser 2015).

While energy and information are now considered "physical" under metaphysical reductionist physicalism, there was a time when they, like consciousness today, went unexplained by that worldview. It was only after the definition of "physical" was expanded, thus abandoning the name "materialism" for "physicalism," that those two non-material "entities" fell under the reductionist physicalist paradigm.

Some physicalists today attempt to perform a similar definitional change with consciousness, arguing that phenomenal consciousness is illusory or the product of **strong emergence**. The former claim of **illusionism** lacks logical coherence (Harris 2019; Kastrup 2021), the latter lacks a true mechanistic explanation of how and why consciousness emerges at a magic threshold of complexity in a material system (Kastrup 2021). Both approaches are heavily criticized.

Meanwhile, empirical results in neuroscience, particularly in studies of psychedelics and other altered states of consciousness (cardiac arrest-induced NDEs, G-LOC, intentional strangulation, etc.), have called into question the traditionally popular **identity theory** of consciousness, which demands a 1:1 relationship between the level of metabolic brain activity and the richness of conscious experience. In fact, we find an inverse relationship between them in the cases mentioned above; brain activity sharply drops and the richness of experience sharply rises under the influence of psychedelics, placing the brain in a state of **metastability** that defies the identity theory hypothesis (Parnia & Fenwick 2002; Urgesi et al 2010; Carhart-Harris et al 2012; Cristofori et al 2016; Lewis et al 2017).

Given the challenges faced by the reductionist worldview, science and philosophy must question whether a **non-reductionist** approach, which sees reality as a whole, provides a better ontological framework.

In that case, the division of the oneness of reality into things would be purely *nominal*, an artifact of the way in which we perceive the world and a useful tool that increases our survival fitness. Our ability to divide our perceived reality into things does not necessarily give us a *literal* conception of reality. Further, since reductionist physicalism has failed to explain phenomenal consciousness and failed to resolve the paradoxes of quantum physics, could a non-reductionist approach to physicalism, or to a different metaphysics altogether, better account for our empirical data?

Reductionism (and reductionist physicalism) has been useful in predicting the *behavior* of nature, *as we perceive* nature. But when we ask more profound questions about what reductionists would call the "fundamental" level of reality, reductionism breaks down. Like spacetime itself, at a certain level of reduction, it ceases to make sense (Hoffman 2019).

In other words, reductionism doesn't seem to be able to adequately explain, in a literal sense, what nature *is*, in and of itself. Could it be that reductionism is a useful conceptual tool, a metaphor that we can use to assess our theories of the "fundamental?" Something to take *seriously, but not literally*. Or are these concerns over reductionism a case of misguided skepticism about a paradigm that has helped us invent technology?

In this essay, we'll examine the ontology of material "things," of conceptual "things," and of consciousness itself, to elucidate the benefits of a non-reductionist worldview, in contrast to reductionism.

The ontology of material "things": reductionism vs. non-reductionism

Our epistemic starting point is phenomenal consciousness, the "field" of raw subjectivity whose excitations are experiences (Nagel 1974; Block 1995; Schooler 2002; Winkielman 2009, 2011). All of the "things" that we know, including our perceptions of the physical world, are excitations of that field of subjectivity. In other words, we know the physical world of material "things" only by, in, and through our starting point of consciousness.

Specifically, we perceive *qualities*, such as colors, textures, sounds, aromas, and flavors, etc. It is these qualities that most people identify as the objective physical world, a viewpoint called naive realism. Evidence from evolutionary biology, thermodynamics, perceptual sciences, and foundations of physics has refuted naive realism, but it remains intuitive to those unfamiliar with the literature.

Whatever reality is, in and of itself, our perception does not provide a literal presentation of it. Rather, the truth of reality is so **combinatorially explosive** that we need a representation (i.e., *re*-presentation) that encodes that vast information into a simplified relevance and salience landscape, which in turn provides insights into fitness payoffs, not literality. In other words, we should take our perceptual interface, the physical world, seriously, as an evolved way we conduct **relevance realization**, but not literally (Vervaeke et al 2009; Friston 2013; Hoffman 2019; Kastrup 2021).

We then apply mathematics, or quantities, to those perceived qualities, as a way to describe what we perceive. We establish the "thing-ness" of reality by using numbers to delineate between physical entities. But, if we are to be as skeptical as possible, matter is, itself, an abstraction. It is a label that we use to describe the qualities that we perceive.

Under reductionist physicalism, physical entities are all that fundamentally exist. Physical entities are defined as those that can be exhaustively defined by quantities, such as their mass, spin, charge, frequency, etc. In other words, they are purely quantitative, and it is those quantitative parameters that give them causal power on each other. Physicalism ascribes ontic fundamentality to the *descriptions* of our perceptions. Then, it suggests that these abstractions not only come *before* the experiencer perceiving them, but also *generate* the consciousness that is the experiencer.

This worldview encounters the hard problem of consciousness, in which it is impossible to reduce the qualities of experience to the quantities of physical entities, and we scratch our heads wondering why consciousness is

so difficult to understand. Perhaps it is because the reductionist physicalist worldview tries to pull the "territory out of the map" (Kastrup 2021). It gives ontic priority to the description, not to the thing in itself, which leads us into logical incoherence and internal inconsistencies, such as the hard problem and the paradoxes of quantum physics.

It is even a mystery why our mathematics, a conceptual framework of an evolved primate on a statistically unremarkable planet, in an unremarkable solar system, in an unremarkable galaxy, in a vast universe, should so precisely map onto objective reality. Eugene Wigner once consistently used the word "miracle" in an article on that question of why mathematics would be so effective (Wigner 1960). In other words, we can't even explain the very quantitative descriptions that reductionist physicalism places ontically prior to the experiencer doing the describing.

But what if we treat our perceptual interface of the physical world not as an objective reality of literally ontic, separate "things," but rather as a complete whole? What if we see the "thing-ness" as part of our *description* of that whole, whatever reality might be in and of itself? If we take the physical world of our perception to be a useful tool, which lets us utilize reality from our perspective *within* reality, might our view of the material/physical change, and could that change assist us in resolving the hard problem of consciousness?

In other words, what if we try non-reductionism?

First, the key claim of reductionism is that our position in reality is at a higher and more illusory level than that of the **reduction base**, that which is fundamental. In mainstream analytic philosophical discourse, "fundamental" roughly means "the most real." But if we are at an illusory level of reality, high above the reduction base, then how can we trust anything that we think we know about the deeper levels that are more fundamental, and thus less illusory, than our own? If we start by placing ourselves in an illusion, then we sabotage the entire project of reductionism by creating an epistemic crisis from the original claim.

By taking the non-reductionist position, we avoid this epistemic problem.

Second, instead of seeing reality as having separate levels with differing degrees of realness, we should view reality as that which exists. It is one whole. By definition, there is nothing (observe the language, "*no-thing*") that exists external to reality. Further, anything (note: "any-thing") that exists must *be* reality. Therefore, while our perspective within reality (and as reality ourselves, since we exist), may enable us to describe that perspective in different ways, we should not see reality as a collection of levels, each more or less real than another. There are no truly different levels to reality, only different descriptions (aspects), each one co-realized in a dialectical, reciprocal, agent-arena relationship.

Reality and the information therein appear to the *interface of our perception* as the physical world, itself a whole "image" (referring to the entire sensorium, not just to vision) prior to our division of the interface into *icons*, physical entities. That does not mean that the information is more fundamental than the perceiver, as a reductionist might suggest. Rather, it exists at the same level of reality as a given perceiving conscious agent, who is at the same level as reality, because it *is*, by definition, something (again, note the language) that exists. It is the perceptual *appearance* of the information that changes, not its ontic level within reality.

As has already become clear, our language, another of our conceptual frameworks, makes it difficult to escape the "thing-ness" we ascribe to the world. Our linguistic approach is based around subjects and objects –

"things." As such, I'll do my best to transcend those limitations, but our language, and indeed all our descriptive capacities as evolved primates, will certainly prove too restrictive to accurately handle the concept of reality, in and of itself. We'll do the best with the symbology that we have.

As a thought exercise to demonstrate the above point, how would we describe what a car ontically is, as a physical entity? If we start with its function, we would naturally include all of the parts that make the car work. The steering wheel, the engine, the pedals, the shifter, the spark plugs, etc., would all be elements of the car, in and of itself. Our conclusion is to describe the car as a grouping of **atomistic** (as opposed to relational) "things," each "thing" playing a causally efficacious role on another "thing," in a long chain of cause and effect that causes the car's function to emerge from those components (note also the similarity to the reductionist physicalist conception of consciousness as a function emerging from the components of the brain).

That would be the standard reductionist approach, and we could take it all the way down to the quantum fields. All the while, we'd use the mathematical descriptions of these physical entities, like their mass, spin, charge, etc., to exhaustively define them and to explain their causal power over each other.

However, where does that cause and effect chain stop? Where is the true boundary separating the car from the rest of the physical universe? We will never find it. After all, oxygen is a necessary component for combustion to occur, and combustion is required for the car to function. So now we need to include Earth's atmosphere as a component of the car. Of course, the car needs the road in order for the tires to grip, so now we need the ground to be a component of the car, in addition to gravity itself. Now, the "thing-ness" of the car encompasses the entire planet. But the planet is only in this state due to the full causal history of the universe, so really the "thing-ness" of the car must also include the entire universe as a component. To suggest otherwise would be to violate the definitional parameters that we set at the beginning.

In truth, there is no boundary between the car and the rest of reality. There is only reality. Any "thing-ness" we ascribe to reality, such as the label of "car," is nominal. It allows us to talk about and to work with the combinatorially explosive true nature of reality. In other words, we evolved this perceptual and conceptual framework for its survival advantages, not for its ability to convey literal truth about the ontic status of reality, in and of itself. Our ability to invent technology (use tools) is one such advantage.

Next, we can look at the concept of **affordances**, which are **transjective** (as opposed to objective or subjective) in nature. They are not a property of the agent, they are not a property of the arena. Rather, they are a relationship between the agent and the arena, and that co-shapes the environment to the agent and the agent to the environment.

In other words, a water bottle is graspable only when a conscious agent is able to grasp it. The graspability is not a property inherent to the bottle. Rather, the bottle's list of properties changes in nearly infinite ways depending on the agent-arena relationship in play. A person can't be a tennis player in a classroom. They need to be on a tennis court. Similarly, a tennis court could be used for any number of other things besides tennis, until a tennis player enters it. Once again, the properties of the agent and of the arena are transjective. The agent and arena *realize* each other depending on their relationship (Vervaeke 2022).

Every "thing" has a never-ending number of **aspects** (i.e., the Greek *eidos*, in the Platonic sense, not in the Aristotelian sense referring to structural-functional organization), but they're not separate from each other. The aspects belong together, flow together. We can't directly perceive the whole of reality, because if we precisely

mirrored its high levels of entropy in our internal state, we would dissolve into an entropic soup (Friston 2013). However, because of the **aspectualization** that accompanies our representation of the whole of reality, we can intimate the whole.

There is a through-line of all the aspects, but the aspectuality of a "thing" is open-ended. When I say that reality is the only "thing" that exists, even then I am only imagining the whole as one aspect, and this is the best that we can do while locked inside the "thing-ness" of our perceptual and conceptual frameworks. Our language, intellect, and cognitive apparati can't comprehend the whole, but the whole is still intelligible to us via the through-lines. This intelligibility of an incomprehensible whole of reality through aspectuality and representation is what makes science and philosophy possible.

In other words, science and philosophy *presuppose* it. To deny the above claim is to abandon the projects of scientific and philosophical investigation. Indeed, our representation of reality always involves aspectualization ("thing-ness"), in an infinite number of possibilities, until one is selected depending on the specific configuration of the agent, its state, and what it predicts the state of the world will be. This flows naturally into the previously mentioned interpretations of quantum physics and what the wave function mathematically describes.

Further, the above supports the paradigm of the physical universe (as we perceive it) as an evolved perceptual interface. After all, fitness payoffs depend not just on the true state of reality, but also on the organism (conscious agent), its state, its actions, and its competition (Hoffman 2019). The organism then reciprocally influences its arena, creating an evolutionary dialectical realization between agent and arena. If the physical universe is an artifact of this process at work on our perceptual abilities, then we would expect our perceived world to display transjectivity, and that it does.

As such, even our physical bodies, which we closely identify with our identities as separate ontic entities, are only "things" in a nominal sense. Their properties, like the properties of every other material "thing," are constantly in flux, as reality *self-realizes* (realizes itself relative to itself). It must do this, since, by definition, there is "no-thing" external to reality. It is all that exists, and so to be realized, it must realize itself.

Our bodies, as physical entities, are also icons on the screen of perception. Like other material icons, they have no inherent ontic "thing-ness" separate from the one aspect of reality as a whole. The physical universe is one "thing," because it is a single projection of our perceptual and conceptual frameworks.

In other words, the aspects therein are our way of realizing reality from within reality, *as* reality. We are reality engaging in self-realization.

Therefore, taking this non-reductionist position, even before entering into metaphysical theoretical commitments, we avoid the epistemic self-sabotage of reductionism.

We also avoid the hard problem of consciousness, since the brain, as part of the body, is another icon of the perceptual interface. It is not an ontic "thing," but a description conjured up by and in consciousness to serve a survival purpose. It is trivial to expect a correlative relationship, but not a causal one, between the image of a thing and the thing in itself (ex: fire is the image of combustion, and so they correlate but are not causally linked).

Therefore, we'd expect to find many **neuronal correlates of consciousness (NCCs)**, but no causal link between the brain and conscious experience (Koch 2004). Indeed, that is exactly what we've found. The hard problem only arises if we attempt to *reduce* consciousness to the brain, treating the latter as a "thing" with a separate ontic identity. But under this non-reductionist approach, that's not what we're doing, so the problem dissolves.

Furthermore, we explain why our mathematics miraculously maps onto the physical world. The answer: both of them are conceptual frameworks that *describe* reality, but are not *literally* reality, in and of itself. They help us survive, but they are not the truth. This realization flows naturally into dissolving the paradoxes of quantum physics. The measurement problem, entanglement, the quantum Cheshire Cat, and other paradoxes all dissolve if we stop trying to make physical entities "fundamental," in the reductionist sense, but rather treat the physical as one whole *appearance* of reality. *Not a presentation of reality, but a representation ("re-presentation").*

Quantum physics is then best interpreted along the lines of Carlo Rovelli's **relational** model (Rovelli 1996), and Markus Müller's physics of the first-person perspective (Müller 2023), both of which are consistent with the previously referenced interpretations that support non-locality and contextuality.

Finally, we can make sense of the **holographic principle**, the **five constants** (like the speed of light), and the **Planck scale**. Spacetime ceases to make sense at a certain miniscule level, and the natural constants are what they are, because spacetime itself is not "fundamental" in the reductionist sense. Rather, it is the one, whole appearance of reality, projected by our perceptual and conceptual frameworks, which has been developed by evolution by natural selection to encode fitness payoff information coming from our combinatorially explosive external state.

In other words, the physical universe is what it is, and behaves as it behaves, because that is how we need to perceive reality in order for us to survive. Put another way, that is how evolution by natural selection shaped out perceptual and conceptual models, which in turn give us the physical universe and its "things" as tools.

To call the physical and spacetime *illusory* is a mistake, although some publishers' marketing departments will leverage that phrasing to sell books. The physical is *real*, because it is *realized*. More than that, the physical world is how we make the incomprehensible whole of reality intelligible. For that purpose, on which science, technology, and philosophy rely, the physical world need not be a literal presentation of reality. Indeed, it can't be.

Realization and aspectualization are the key factors in the non-reductionist framework, as opposed to the language of fundamentality and illusion that is central to reductionism.

Our relationship to reality is *transjective*, and our sense of objectivity and subjectivity are both artifacts of our evolved perceptual framework. That framework makes us feel ontically separate from reality, thus establishing subjectivity and objectivity, as a way to help us survive within reality, *as* reality.

By abandoning reductionism for non-reductionism, we can dissolve many of the problems with our current paradigm, although we'll later also consider metaphysical alternatives to physicalism at large.

The ontology of conceptual “things”: reductionism vs. non-reductionism

If our perceptions (and our descriptions of our perceptions) are not actually ontic things, what about the entities that we consider purely conceptual, purely *qualitative* (as opposed to the purely quantitative nature of physical entities), such as good and evil, or the experiences of hot and cold? Our language also describes these conceptual entities along subject-object dynamics, ascribing a “thing-ness” to them, even though they are not “physical.”

As with material things, we see transjective, reciprocal, dialectical realization at work. The conception of **opposites** supports human thinking in a number of ways, including our “everyday counterfactual thinking, classic deductive and inductive reasoning tasks and the representational changes required in certain reasoning tasks … it follows that opposites can be regarded as a general organizing principle for the human mind rather than simply a specific relationship (however respectable) merely related to logics” (Branchini et al 2021).

In other words, we make sense of the world by creating **dualities**, such as good and evil, hot and cold, tall and short, etc. We mentally position these pairs as opposites, allowing us to reason and grok important information about our arena.

For instance, we use the hot-cold dichotomy in order to know if the temperature of an entity or of the environment at large is dangerous or suitable to our survival. A hot stove delivers negative fitness payoffs. So does a frozen lake.

The dangerous properties of a hot stove and a frozen lake are not properties of the “things” in themselves, but rather are only realized as such once we, conscious agents, enter into a reciprocal, dialectical, agent-arena relationship with the things in themselves. For instance, many other organisms are able to survive intense heat or cold, but both the hot stove and frozen lake are outside the temperature range that humans need. Thus, the agents and the arenas co-realize each other, and that relationship is “re-presented” in our perceptual and cognitive frameworks as icons (physicality) and as the conceptual notions of “things” and opposites.

Duality implies the separate ontic existence of the two entities making up the dichotomy. In order for them to be opposed, surely they must exist independently of one another as two distinct “things.”

However, we instead find a more complex, self-realization of the conceptual, in which “thing-ness” is merely nominal, just as it was for the material. The “things” once again reciprocally realize each other in a kind of dialectical relationship, not so much *opposing* each other as *depending on* each other’s co-existence, and ultimately on a shared **unity** (McGill & Parry 1948; Lincoln 2021; Vervaeke & Mastropietro 2021), in order to be *realized*, and thus made *real*.

In all cases, we get back to the logical necessity that reality, as the only “thing” that exists, must realize itself in order to be real.

For instance, good and evil do not really have separate existence as delineated "things," for at what deficiency of good does evil begin? And at what deficiency of evil does good begin?

When we say something is "evil," are we not really referencing degrees of good? And, reciprocally, when we say something is "good," are we not really referencing degrees of evil? When we say something is "hot," are we not really referencing degrees of cold? And, reciprocally, when we say something is "cold," are we not really referencing degrees of heat?

There is, indeed, no separation, no ontic delineation, between these concepts that we consider opposite "things." They are relative to each other, not atomistic. Evil is the negative aspect of good, good the positive aspect of evil. Hot is the higher aspect of cold, cold the lower aspect of heat. We never encounter absolute goodness or absolute evilness of any finite nature. Instead, we are always co-realizing reality in a reciprocal, dialectical manner.

These *aspects* are part of the evolved perceptual and cognitive framework that conveys fitness payoff information to the conscious agent. In other words, it tells us about positive or negative effects on our survival, not about ontically independent properties of ontically fundamental (to use the reductionist language) "things."

Indeed, the properties change depending on the agent-arena relationship in play, just as we saw with the material realm under Rovelli's interpretation and Müller's interpretation of quantum physics. In other words, the structure to which our consciousness gives our conceptual entities parallels the structure to which our consciousness gives physical entities on the screen of perception, providing further substantiation for the claim that the physical is, in fact, a evolutionarily useful representation, and not a literal presentation, of reality, in and of itself.

The ontology of consciousness: the false dichotomy of mind and matter

At this point, one might raise the following objection. My argument has leveraged and centered around the role of conscious agents in realizing reality, including the physical world as a perceptual and conceptual interface. Doesn't that necessitate, and indeed presuppose, a "thing-ness" to conscious agents? And isn't that "thing-ness" precisely what I have denied by saying that reality itself, as a whole entity, is the only "thing" that exists? Doesn't that reliance on conscious agents, seemingly each a separate "thing" from the reality that is their environment, refute my claim that reality, as the only "thing" that exists, must realize itself in order to be real?

To address this, we must finally get into the metaphysical differences between physicalism and idealism. The two theories are often seen as opposite positions founded on the **dichotomy** between our conceptions of matter/physicality and mind/consciousness. Reductionist physicalism takes the former to be fundamental, while reductionist idealism takes the latter to be fundamental. Therefore, many assume that they are opposite alternatives existing at the same level of abstraction, thus forming a dichotomy (which requires that both opposing points inhabit the same level of abstraction).

In a way, this duality between qualitative mind and quantitative matter ensures a hidden dualism within physicalism, which claims to be a monist theory that rejects such a fundamental pairing. It seems that physicalism is unable to escape that duality, however, so long as the hard problem of consciousness remains in place.

The dichotomy is false, because the physical and consciousness are not, in fact, opposites, even in the conceptual manner in which we tend to frame them. Further, the hard problem arises from our misunderstanding of the relationship between consciousness and the physical world we perceive.

Recall that our epistemic starting point is phenomenal consciousness, the "field" of raw subjectivity whose excitations are experiences. Everything we know is an excitation of that field of subjectivity. In other words, we know the physical world of material "things" only by, in, and through our starting point of consciousness. We perceive *qualities*, then assign *quantities* to describe that qualitative world of our perception.

As such, our perception of the physical, by definition, presupposes the existence of consciousness *first*, because perceptions are *contents* of our experience, excitations of the field of subjectivity. The "physical" and all of the other labels we attach to that world of perception are *abstractions* that come *after* consciousness, because it is consciousness that creates (*realizes*) the abstractions. Therefore, consciousness and the physical cannot be opposites in a dichotomy, because they are not at the same level of abstraction (if we grant the "level" language of reductionism).

In fact, consciousness is the only "thing" that we can be sure has ontic existence, because we can never know anything else except by, in, and through it. It is the primary datum of our existence. It is the only "thing" to which we each have direct access.

Now recall that, out of logical necessity, we defined reality as the only "thing" that has ontic existence, because, by definition, nothing can exist external to reality, and all that exists within reality must *be* reality.

Therefore, it follows that consciousness *is* reality. It is not that all of reality exists in my mind alone or in your mind alone (I reject solipsism), but that consciousness is the *substrate* of reality.

This, of course, aligns with the metaphysical theory of **idealism**, and refutes the foundational metaphysical claims of physicalism. This idealism would then best be considered non-reductionist, as each conscious agent, or each instantiation of consciousness, would *not* be an ontically different "thing" separate from consciousness/reality as a whole entity. Rather, like a wave in the ocean, a conscious agent *appears* to be a separate entity from its medium, but is really just an *excitation* of that medium.

Therefore, the objection fails. Conscious agents are not ontically separate "things" from reality, because consciousness *is* reality. The objection does challenge non-reductionist physicalism, but not non-reductionist idealism.

As for solving idealism's infamous **decombination problem**, which is the likely next objection, I refer to philosopher Bernardo Kastrup's **analytic idealism**, which leverages the empirically known natural mechanisms of **dissociation** and **dissociative identity disorder (DID)** to explain how one medium of consciousness appears to divide into multiple, separate subjectivities, when in fact there is only one consciousness (Kastrup 2019, 2021).

Conclusion

The division of the oneness of reality into "things" is purely *nominal*, an artifact of the way in which we perceive and conceptualize the world. It is a useful tool that supports the probability of our survival and reproduction, but it does not give us a *literal* presentation of reality.

Since reductionist physicalism and reductionism at large have failed to adequately explain reality, and since reductionism depends on the ontic existence of separate "things," which we've shown to be nominal, we need new paradigms.

As such, non-reductionist idealism provides the greatest explanatory power, logical coherence, internal consistency, and theoretical parsimony/elegance, as it describes a reality that co-realizes itself in a reciprocal, dialectical manner. We avoid the logical contradictions encountered when we give "things" fundamentality and then attempt to reduce reality to those fundamental "things."

Reductionism is, I would argue, a useful metaphor, not unlike the perceptual interface of the physical world, itself. It has helped us develop technology, as demonstrated in the earlier airplane example. Reductionism allows us to effectively discuss the behavior of nature in the natural sciences. Put another way, *it helps us work with the interface*. After all, the technology we invent, like the airplane or the car, is also part *of* that interface.

In metaphysical philosophy, reductionism allows us to quantify the assumptions of a theory by counting the number of things in the reduction base. In that way, we can use it to identify the most skeptical metaphysics on the table.

However, for all of the reasons above, reductionism is not a literal presentation of reality, the "thing" in itself. Rather, a non-reductionist approach is superior. Reality is a whole entity. It is "One." It is constantly self-realizing, and we, as conscious agents, play a role in that process of reciprocal, dialectical, co-creational realization.

There are no levels of fundamentality and illusion. Instead, reality is real because it is real-*ized*.

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