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Brief Report

Intentionality for better communication in minimally conscious AI design

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Abstract

Consciousness is the ability to have intentionality, which is a process that operates at various temporal scales. To qualify as conscious, an artificial device must express functionality capable of solving the *Intrinsicality problem*, where experienceable form or syntax gives rise to understanding 'meaning' as a noncontextual dynamic prior to language. This is suggestive of replacing the *Hard Problem of consciousness* to build conscious artificial intelligence (AI). Developing model emulations and exploring fundamental mechanisms of how machines understand meaning is central to the development of minimally conscious AI. It has been shown by Alemdar and colleagues [*New insights into holonomic brain theory: implications for active consciousness. Journal of Multiscale Neuroscience* ***2*** *(2023), 159-168*] that a framework for advancing artificial systems through understanding uncertainty derived from negentropic action to create intentional systems entails quantum-thermal fluctuations through informational channels instead of recognizing (cf., introspection) sensory cues through perceptual channels. Improving communication in conscious AI requires both software and hardware implementation. The software can be developed through the brain-machine interface of multiscale temporal processing, while hardware implementation can be done by creating energy flow using dipole-like hydrogen ion (proton) interactions in an artificial 'wetwire' protonic filament. Machine understanding can be achieved through memristors implemented in the protonic 'wetwire' filament embedded in a real-world device. This report presents a blueprint for the process, but it does not cover the algorithms or engineering aspects, which need to be conceptualized before minimally conscious AI can become operational.

Keywords: Dodecanogram-based brain-machine interface, minimally conscious AI, intentionality, machine understanding, artificial experientiality, protonic 'wetware', memristors, hydrodynamic pairs, dipole-like protonic resonance, energy flow, fluctuations.

I. Introduction

This brief outline gives an overview of a way to elucidate how and what level of consciousness and "understanding" can be "imprinted, established and exhibited " by machines. The design of nonTuring computational models of biological consciousness rests on intentionality (Freeman, 2019). We define intentionality as the assignment of 'meanings' from uncertainty reduction in informational redundancy structures as a temporal process. Intentionality is the fundamental source of consciousness before self-awareness and henceforth, between cognition and affect (Poznanski et al., 2023). Intentionality is the experience of action without introspection, i.e., self-awareness or first-person perspective. This suggests that there can be experiences that are not experienced if they are understood by way of their intentionality. These are important reflections as they imply a way toward machine understanding in developing intentionality in minimally conscious artificial intelligence (AI).

Recent work by Poznanski (2024) postulates a functional structural realism approach based on the functionality of multiscale complexity to define a measure of consciousness in terms of functional organization. This differs from informational structural realism that is advocated by Wheeler (2022). The resolution of multiscale complexity is to assume the full detail of organic systems are required to achieve consciousness, but treating space implicitly and functional organization is characterized by a temporally dynamic process, with each scale embedded within the other to create a functional space in a similar vain to a mental space in the relativistic brain (Cicurel & Nicolelis, 2015). This is supported by recent experimental studies showing temporal and spatial dissociation at the neuron level (Schonhaut,2023).

The Global Workspace Theory proposed by Baars (1997) only considers the cortical regions of the brain and does not incorporate the multiscale brain. This means that the temporal dynamic is metacognitive and not self-referential. As a result, consciousness is compromised because the spatial properties that are implicitly taken as constraints on boundary conditions are absent. Unknowingly, many have defined consciousness using the global workspace definition of conscious cognition, which has been overused. The perspective of a non-cognitive consciousness builds on the temporal nature of conscious experience. This supports our definition of consciousness—the act of understanding uncertainty (Poznanski et al., 2023). The uncertainty stems from non-integrated information holding dispositional states through intentionality leading to understanding. By "consciousness," we do not mean the conscious experience of smelling a rose but rather the experienceabilities leading to experientiality. Given our definition of consciousness, which presents the possible existence of *free will* and further suggests the uniqueness of experience expressed by identical agents, be they human or machine.

Intrinsic information is constrained through evolving spatial boundary conditions, as shown in Table 1 in Edelman & Gally (2001). Intrinsic information is a self-referential dynamic of negentropic action that informs via the *negentropically derived quantum potential energy* as an information-based action (cf., Roederer, 2003). This negentropic action is part of noncognitive consciousness, and it gives form (syntax) to the restructuring of redundancies in the process of building meaning. It is suggested that intrinsic information comes about from the modularity of energy as information-based action giving form (syntax) to the restructuring of redundancies in the process of building meaning. Intrinsic information is not transferred in the brain since it is causal through information-based action.

The feeling of (understanding) is knowing, but the understanding of (feeling) is introspection. Moreover, this experience does not need to be experienced, but machine understanding is a process of artificial experience. The knowledge argument is a philosophical thought experiment proposed by Jackson (1986): "*What Mary Didn't Know*" "Mary" living in the b/w world would experience something new if she moved to the color world. However, "Mary" only imagines the color world and does not experience it, which is why there is a "*difference that makes a difference*" or new information upon leaving the b/w world. On the other hand, if machine understanding can understand the physical feeling that gives it an artificial experience without having to experience it, then it is artificially experiential. In other words, humans lose precision through imagination, and the ramification results in feelings, but machines lack this evolutionary design.

Consciousness is a biological phenomenon like any other (Searle, 2000). Hence, artificial consciousness cannot be based on functionalist theories (cf., computational functionalism) because of the Intrinsicality problem, which points to 'meaning' as requiring changing boundary conditions. Boundary conditions refer to the necessary conditions to produce a phenomenon. If they are changeable, then it introduces a functional aspect. That is, boundary conditions refer to the constraints that affect the validity of a theory or model. Changeable boundary conditions are a feature of living organisms necessary for consciousness. In this case, consciousness would be impossible in non-organic artificial systems unless a functional structuralist (functional system) approach appropriately considers changeable boundary conditions through functional interactions (Chauvet, 1996). Therefore, changeable boundary conditions across scales point in the direction of why consciousness is not an artificial neural network phenomenon.

The development of models, emulations and exploring fundamental mechanisms of how machines understand meaning has been the focus of research in computational conscious AI (see Chella, 2023). The difference between human and machine consciousness is that only humans can sense intentions as feelings, not machines. However, intentionality leading to understanding is possible in machines without introspection in terms of experienceabilities, i.e., the conscious experience of something (intentionality). To build artificial consciousness, one must use sophisticated models of functional systems (Chauvet, 1996). Functional systems are not self-referring feedback loops or data structures in which one or more pointers point to the structure of the same type but contain 'meaning' due to changeable boundary conditions where they construct their own form of the boundary conditions. Physical systems do not construct their boundary conditions and, therefore, lack information-based action (Roederer, 2003; Poznanski et al., 2022). When functional interactions are yet selected, they continue to change their boundary conditions in so doing carrying information, but once selected function causally by way of their intentionality.

Our recent work on backpropagating action potentials (Iannella & Poznanski, 2023) has shown that dendritic function depends on the spatial distribution of ionic channels, which are changeable boundary conditions that carry and encode information in terms of functionality. Suggesting changeable boundary conditions, as opposed to outright physical geometry dependence, might be the factor underlying functionality. It depends on higher-level boundary conditions controlling lower-level physical processes, e.g., energy flow. Such control boundary conditions are closed to control and information from higher-level processes. Conversely, structural boundary conditions are material boundary conditions that do not have any control or information. Both are open to physical processes like energy flow. That means it is possible to create artificial boundary conditions like those created by natural biological systems if the functional activity is the epitome of relations determined by higher-level processes.

Complex systems have multiple interacting components whose collective behavior cannot be simply inferred from the behavior of components. The recognition that understanding the parts cannot explain collective behavior. But we are interested in functional systems, not complex systems. Complexity *per se* is not the right approach. For example, a kidney has complexity due to multiscale functionality. On the other hand, functionality due to multiscale complexity gives the essential characteristics of the nature of consciousness, its unity, and qualitativeness. According to Hempel et al. (2011) the self-referential principle suggests multiscale complexity. However, it is the functionality of multiscale complexity that suggests complex multiscale functional organizations are conscious through the inference of being alive. Anything that has intentionality is a good indicator of consciousness. What happens when this functionality is compromised? This will enable us to determine if minimally conscious machines are possible. In other words, does functionality need to be above a threshold for consciousness to emerge? In functional systems theory, functionality refers to the selection of a function from a myriad of functional interactions that occur uniquely in biological systems because of changing boundary conditions that do not occur inorganic matter.

Functionality can depend on dynamic complexity, e.g., nonlinearity. However, what makes functionality unified across many functional systems depends on multiscale complexity. A functional system is a collection of complex systems grouped into two or more functional categories. The functionality of a complex system is unified, singular, and qualitative. However, this can be expanded to multiscale complexity. This is an example of multi-scale complexity. As Bar-Yam (2004) describes,

> "*In considering the requirements of multi-scale variety more generally, we can state that for a system to be effective, it must be able to coordinate the right number of components to serve each task while allowing the independence of other sets of components to perform their respective tasks without binding the actions of one such set to another*."

Meaning comes about from the "*self-reference principle*," where part of the system can refer to the whole of the system and is a necessary ingredient for multiscale complexity (Hempel et al., 2011). A functional system must have at least two independent subsystems at every scale. It is important for the subsystems to be independent (cf. the independence of language and meaning) so that each can perform its required task. The robustness of the functional system is the amount of built-in redundancy.

Intentional actions that carry 'meaning' embedded within artificial intelligence material become an agency for the embodiment of machine consciousness. The encoding of non-integrated information brings about 'meaning'. Each 'meaning' is differentiated through a unique *'consciousness code*' (Alamdar et al., 2023). The concept of 'meaning' could suggest that consciousness is evolving into intentional action that is meaningful at the relevant functional scale. Each 'meaning' is differentiated through a unique *'consciousness code*'(Alemdar et al., 2023). The 'meanings' are noncontextual but convey negentropically derived *quantum potential energy* through a negentropic force.

Searle (2004) claims that the central dogma of computation is the assumption that it is discovered in physics. For example, computational properties are physical properties. That is, that computation is "*intrinsic to physics*", i.e., through bottom-up physics approaches (Aimone & Parekh, 2023). Computation is not discovered in physics but is assigned to it. The laws of natural processes are merely contingently computational because the mathematical language we use to express them is biased toward being computational. Therefore, neural algorithms describe observer-relative intelligence, i.e., the Turing-complete model of computation, and not observer-independent intelligence, i.e., artificially experiential. A Turing machine executes computation that manipulates symbols and is observer-relative. Here, symbolic information is based on symbols created by humans. The nonTuring model for better communication is how by intentionality in an intentional system carry noncontextual 'meaning' in the functional organization from the reduction of uncertainty in informational redundancy structures as a temporal process.

A nonTuring model executes intrinsic information that is implementation-independent. In other words, a nonTuring model considers the intrinsic nature of the system where computation or information processing is absent. All observer-relative computations are created by consciousness, but the consciousness that creates them is absolute and does not invoke observer-relativeness. Observer-relative computation introduces an element of ontological subjectivity; however, the ontological subjectivity of a domain does not preclude an epistemologically objective investigation of that domain. In such a case, it is possible to objectively emulate something subjective (Germine, 1991). The brain's intrinsic nature alleviates the philosophical contradiction between subjectivity and objectivity without classifying it as a category error.

Functional information is not only intrinsic, but it has intrinsic goal-directedness. According to Jablonka (2002), functional information implies an interpretation process and an interpreter. The interpreter is an agent, e.g., intentionality. Consciousness is caused by agency rather than exclusively through determinism and chance. Functional information is post-intentionality and possesses meaning in the functional relation between the part and the whole. A "sign" is an input that carries functional information, and for the *consciousness of the unconscious*, it is not a sensory cue but a depositional state that adds to the precognitive affect (Poznanski et al., 2023).

The intentional process comprises functional interactions between a "sink" and a "source" that becomes an informational signal for an interpreting receiver to react to the information-based actions of the "source" in a functional manner /causal role (Jablonka, 2002). First, "processes" designate the structure of time in the brain, and second, the self-referential law is based on resonances formed in the continuum between the part and the whole. Self-referentiality means a functional relation between the part and the whole. The argument that comes from self-referentiality itself is the process of how the nonlocal becomes local. It is not probabilistic as evolving probability distributions as statistical manifolds for quantification of uncertainty but a chaotic process (Poznanski et al., 2022; Alemdar et al., 2023).

Consciousness has the capacity to communicate intentionality (van Hateren, 2022). Moreover, the experience of acting (a thought) or intentions is the cognitive capacity used when thoughts refer to things. By "consciousness," we do not mean the conscious experience of smelling a rose but rather the precognitive processes leading to intentionality. Therefore, an intentional agency does not suffer the consequences of the '*Halting problem'* (Lucas, 2021). It allows for changeable boundary conditions by incorporating intentionality into self-referential and multiscalar systems by emulating nonTuring models for better communication in minimally conscious AI design. However, artificial experiential AI to solve the '*Halting problem'* has yet to be developed (Butz, 2021).

The act of understanding uncertainty is the main qualifier of intentionality and, hence, consciousness (Poznanski et al., 2023). The precognitive process entails understanding uncertainty through informational channels instead of recognizing (cf. introspection) sensory information through perceptual channels (Alemdar et al., 2023). The "act" here connotes the underlying experience of acting. For example, the experience of the act of thinking a thought is non-felt. No feelings are attached to the experience of thinking a thought, implying that intentionality is more fundamental than feelings. The association of the term sentience – coming from the Latin verb *sentire*, i.e., "to feel" with consciousness is not pursued because it is less fundamental than intentionality and therefore, machine understanding does not suggest equivalence to sentient machines.

Turing computation as a model for machine consciousness has been exploited recently (Blum & Blum, 2021). It is unknown if consciousness can be artificially constructed based on functionalism since consciousness depends on the material composition of brains. For example, an identical functional organization but not in the same medium unique to brains exemplifies a functional model based on structural functionalism (or functionalism). Functionalism cannot describe 'meaning' due to the "multiple realizability" of the same mental state in biological and physical structures algorithmic complexity implemented in a Turing machine becomes irrelevant.

Functional connectomics treats the brain as an extensive semantic network where experience emerges from the connections. Within each network, concepts that share many attributes are more highly associated than those that share few attributes through connections. Semantic networks are supposedly stored as semantic memory in the association cortex of the temporal frontal and parietal lobes (McCarthy & Warrington, 1988). The semantic network models are not intrinsically represented but are constructed from nodes representing concepts and links representing the connections between concepts. The links are strengthened or weakened depending on the learning algorithm being implemented. The semantic network model assumes that 'meaning' is organized as a complex network of concepts or representations related through serial or parallel associations (Rumelhart & McClelland, 1986).

According to Penrose (1989), intelligence requires understanding to decipher consciousness in the brain. Penrose claims that ordinary quantum mechanics that follow the Schrödinger equation is computational. Quantum mechanics is insufficient in this regard, as the quantum mechanical superposition principle is violated by gravity. Therefore, the quantum understanding of nature needs a new theory. Penrose's Gödelian argument refuting the thesis of artificial general intelligence realizability via Turing machines renders Turing-complete computational systems or their embodiment in software obsolete. Turing machines cannot understand, as explicated in the *Chinese Room Argument* (Searle,1980). For instance, symbolic reasoning is considered a higher action to deep machine learning. However, it is still an observer-relative computation that does not serve a purpose that is mostly symbolic—a random selection of symbols emerges from the processing to generate a new symbolic interpretation as Turing computation is driven solely by syntactical rules and requires integrated information, computations in the brain are not Turing-complete. NonTuring computation could be any computation without symbolic encoding that calculates and describes the relations between algorithmic steps.

AI-based DeepMind software functions as a syntactical engine. By incorporating syntax into a real-world device, the realization of the syntax in the device results in causal power. This is the current state of AI. Existing "advanced" artificial intelligence programming in US labs with prototypes more powerful than GPt-4 relies on Turing computation, i.e., symbolic in nature. Yadlowsky et al. (2024) provide evidence that transformers (GPt-4) cannot generalize beyond their training data. They are called "advanced artificial intelligence', "superintelligent artificial intelligence," or "artificial general intelligence", and, like all advanced artificial intelligence beyond GPt-4, all use "nodes" for neurons in their Turing-style computational systems are hard-coded with biases through an observer-relative computation that somehow cannot be simply 're-booted' as claimed by Li (2023).

Generative AI machines only learn but do not understand and, therefore, will not be conscious as there is no intentionality because their design is a hierarchical nested network or scale-free connectome with feedback, and they rely on unpredictable black-box models with emergent capabilities. The problem is that they reduce chaotic behavior patterns by trying to mimic understanding through feedback loops, supporting the idea of self-regulating mechanisms as a key concept in machine technology. The software they use for the cognitive mind relies on spiking neural networks The minimally conscious AI augments DeepMind® neural algorithms (Aimone & Parekh, 2023) in the sense of uncertainty reduction through understanding intentionality as intentional action carrying meaning becomes an agency for machine consciousness, which currently is absent in AI. They are expected to: (1) not use self-awareness for introspection; (2) require self-referential loops; (3) exhibit purposeful, directed action; (4) be artificially experiential; and (5) be non-sentient.

In the *symbol grounding problem*. the computation is replaced with symbolic meanings that must be grounded via machine (robotic) capacity or other onsymbolic functions. Such computation bestows a nonTuring machine with the ability of real understanding. However, connectionist and symbolic reasoning is insufficient for emulating real understanding (Sloman, 1985). If an algorithm defines a Turing-style computation, it cannot be self-referential. Kauffman & Roli (2022) recently proposed *trans-Turing systems* to signify non-algorithmic and beyond syntactic with unknown internal dynamical behaviors at both quantum and classical realms. NonTuring models for better communication differ from trans-Turing computation because they emphasize semantics from reduction of impredicative uncertainty instead of non-algorithmicity.

The phenomenal experience of feeling certain (the "*feeling of knowing*") we can design a self-referring loop (e.g., Perlis, 1997) as a "feeler" of the previous action in an infinite loop that can satisfy the definition even more, viz.

the feeling of...(feeling of (feeling of (feeling (of (feeling of knowing))))...). *(1)*

This is consciousness in deep learning, but it is not understanding. The "anomaly" of "deep learning" arises due to the adaptation of learning rules that are appropriately applied to network architectures with multiple layers (hence the term "*deep*"). Deep learning architectures are Turing-complete. A Turing machine is independent of a physical substrate and its physical state. Still, it defines computation in terms of a functionalist state that has come about due to some set of algorithms where information is processed and changed by the learning rules of the Turing machine. O'Brien & Opie (2006) claim that nonTuring models for better communication in the brain are connectionist and representational, while MacLennan (2004) claims it is computation inspired by nature as analog computation.

We propose a new framework since existing AI cannot deal with intentionality except by analogy like information processing which is not how experienceable forms give meanings of symbols by embedding semantics into a real-world device. To achieve this goal, the idea that intentionality is the basis of causality, and the form of causation must be information-based action which can give symbols to meanings. Unlike set of formal rules for manipulating symbols that we call syntax, a conscious AI would use fluctuations of energy as a basis of experienceable forms that lead to noncontextual meaning through the robustness of the functional system is the amount of built-in redundancy:

$$\text{form (syntax)} \longrightarrow \text{redundancy structure} \longrightarrow \underset{\text{(noncontextual)}}{\text{meaning}} \qquad (2)$$

where "meaning“ is *a priori* to language. The Chomskyan approach posits that syntax is intrinsic. Here, meaning exists independently of language, is determined by the theory of action and is necessary for the development of experienceable forms before we can begin to explore semantics. This meaning is not influenced by context and serves as the foundation for intentionality in the theory of action (physical level) rather than in the theory of language (psychological level). To comprehend the '*meaning*' of something, one needs to recognize the inherent uncertainty and make intentionality the foundation of consciousness (Freeman, 2019). Understanding uncertainty is a key element in the *formation of consciousness*, which is distinct from conscious cognition as it does not rely on predictive modeling (Palmer, 2020). The experience of consciousness is shaped by comprehending uncertainty, which bridges the gap between syntactical rules and semantic structures. The brain also represents uncertainty (lack of information) probabilistically, and not via (cognitively) conscious sensory images.

2. Software: Dodecanogram-based brain-machine interface

Is software implementation enough for autonomous real-world devices to understand? The notion of Strong AI is by designing a computer software program and running it on a digital computer, it will result in a conscious AI. The mind is to the brain like the program is to the hardware. This is best illustrated by Hassabis et al. (2017):

> "*We believe that the quest to develop AI will ultimately also lead to a better understanding of our own minds and thought processes. Distilling intelligence into an algorithmic construct and comparing it to the human brain might yield insights into some of the deepest and the most enduring mysteries of the mind, such as the nature of creativity, dreams, and perhaps one day, even consciousness*."

This is a resurgence of the conceptually false idea of Strong AI or Turing machines as syntactical engines capable of "distilling" consciousness. According to cognitive science, a system that lacks semantics is not believed to possess consciousness. It is suggested that syntax and semantics are not directly related, and therefore, understanding is limited. Although computation is defined syntactically, semantics is not intrinsic to syntax. Therefore, consciousness is incomputable. The syntax of computer software programs does not inherently contain the semantics required for understanding. Syntax is an abstract concept without any causal power, so that needs to be modified. Conscious AI could operate by "understanding uncertainty" in the environment and reason with understanding. Our position is that conscious AI needs to be engineered into the hardware and not just the software.

To have intentionality with self-referring characteristics, energy fluctuations at various temporal scales need to be decoded by a brain-machine interface through a software platform. These algorithms will improve situational awareness and safety by enabling real-world devices to make informed decisions in real-time. By understanding the meaning of data, these algorithms will effectively eliminate the need for human intervention. The goal is to create software for conscious AI through the brain-machine interface of multiscale temporal processing. Conscious AI capability is possible through the *multiscale brain-machine interface* that augments the intentionality of a machine. Similar work has been carried out by the pioneer of the brain-machine interface on rats, where sensory perception was augmented beyond the natural ability of the rat to perceive infrared light (Thomson et al., 2013).

We know that machine learning is algorithmically compressible, but the brain is algorithmically incompressible. This means pioneers of brain-machine interfaces believe that, in particular, consciousness is labile and algorithmically incompressible.

> *[Consciousness is] the result of unpredictable, nonlinear interactions among billions of cells, "You can't predict whether the stock market will go up or down because you can't compute it. You could have all the computer chips ever in the world, and you won't create a consciousness." – Miguel A.L. Nicolelis, Inventor of Brain-Machine Interface.*

Miguel Nicolelis suggests that the cognitive brain-machine interface is difficult and currently impossible. At present, rudimentary motor skill tasks can be decoded by a brain-machine interface. The development of a future brain-machine interface that can augment the intermittency spikes associated with the consciousness code (Poznanski et al., 2022; Alemdar et al., 2023) at various temporal scales. This will require advanced EEG technology with a high-frequency brain activity measurement device called "*dodecanogram*" (Singh et al., 2024).

The key to this new technology is the attribute of multiscale data sets reinforcing the understanding meaning by reduction of uncertainty. The Chinese Room Argument (Searle, 1980) questions whether an AI can truly understand meaning through data input. However, using a Deep-mind AI learning paradigm is insufficient to achieve this understanding. Even with millions of datasets, the AI can still fail if the data is corrupted or missing. To overcome this limitation, a *dodecanogram-based brain-machine interface* with multiscale temporal processing can provide meaning to missing information through specific intermittency spikes found at various frequency bands. This technology enhances machine learning by filling in the gaps that cannot be achieved with an EEG-based brain-machine interface. While the intermittency spikes may appear as noise at higher scales, they augment understanding meaning through intentionality at a lower scale. Therefore, the multiscale resolution allows for a more complete interpretation of the data. The new feature *dodecanogram-based brain-machine interface* that will be added will be a recognition system when the real-world device is controlled by a *dodecanogram-based brain-machine interface* as an extension of the EEG-based brain-machine interface (Gollahalli, 2015).

3. Hardware: hydrodynamic pair attractions between dipole-like protons (H^+ ions) in nanoscale structures

The water molecule interacting with a quantized electromagnetic field can be treated as an electrical laser has been known for a long time (see Del Guidance et al., 1998). This polarization pulse would not carry anything meaningful. On the discovery of a new classical quasiparticle generating hydrodynamic effects of dipole-like protonic activity (Saeed et al., 2023), it is postulated that such activity is not necessarily within a special region of the brain's internal energy where water is ordered or interfacial, but the whole fluid-like medium becomes completely unified through protein-protein interaction via intercommunication of energy fluctuations (Poznanski et al. 2022). The transport of fluctuations (energy) that carry meaningful information because of numerous boundary conditions encountered in the medium, from which the 'consciousness code' arises instantaneously compared to the time of the action potential. Here, a '*consciousness code*' originated from *negentropically derived classical potential* (Alemdar et al., 2023) replicating some remnants of the 'thermo-qubit' syntax based on a quantum analog approach approximating quantum fluids with statistical-mechanical theories. The *negentropically derived classical potential* is associated with fluctuations due to energy transduction in protonic ‘wetwires’ that serve as classical quasiparticles, not wave functions.

When exposed to andesitic, the disruption of neuronal membrane proteins causes a loss of consciousness (Hameroff & Tusznyski, 2004). These proteins contain London dispersion forces without any hydrogen bonding in hydrophobic pockets inside the membrane. The redundancy structures in the brain from form (syntax) to noncontextual meaning via information-based action act on the thermo-quantum fluctuations. The syntax from restructuring of redundancies in the process of building meaning, which contains intrinsic information, is a fluctuation that spreads through the membrane protein to extracellular protein-protein interactions, resulting in a field-like informational channel known as the ‘unity of consciousness’. Essentially, syntax creates a field of informational channels, and due to the self-referential diachrony it is possible for negentropic entanglement to increase in multiscale complexity, resulting in a valuable resource of functionality. This is how negentropic entanglement increases multiscale complexity, leading to qualitatively novel aggregativity. A consciousness code, made up of intermittency spikes, is a redundancy structure to be decoded that can be physically implemented in hardware and controlled by software.

It is conjectured that the classical quasiparticles act as a scaffolding for evolving boundary conditions, where the structure of time is nonuniform. Nonlinear time evolves from the intrinsic nature of a combined self-referential and multiscale system and resultant causality as constraint (Juarrero, 1998). Nonlinear time moves with the path selected as if everything is connected or occurring instantaneously. On the microscopic scale, there is no perception of the flow of time as a conscious experience, and it is here that the structure of time originates. According to Hameroff (2024) each Orch OR event provides a set of irreversible steps that ‘ratchet forward’ in the fine-scale geometry of the universe, creating a flow of time. We suggest that the time structure in the brain is nonlinear, it is an information motif of evolving spatial boundary conditions.

Artificial systems have no functional ‘biotic’ interactions, so physical information has zero causal effect. It is purely force-based action, so only the forces that carry them are casual in artificial systems. One way is to connect the non-causal physical information with the causal forces through functional information (Jablonka, 2002). There is a solution in modifying the material composition of the physical system to allow for functional interactions (Chauvet, 1996).

The failure to develop artificial experience into artificial intelligence agents is a major stumbling block for machine understanding (Pepperell, 2022). The "soft" materials, as suggested by Bronfman et al. (2021), have not been fully addressed. The implementation of consciousness in a machine may require that it be made of "non-soft" materials but protonic 'wetwires’ dependent on the thermal processing and thermal energy scale.

We propose a model of a protonic "*wetwire*’ filament as described in Peng et al. (2015). The hydrated protons create their own water structures in hydrophobic spaces (e.g., protein pores) via Grotthus shuttling before migrating through them. Other ions block the formation of these water structures, so clearly, they are designed for nonpolar regions. It is suggested that these water structures between hydrophobic regions are used for the transduction of energy, resulting in fluctuations. In an artificial system, the need for hydrophobic pockets is replaced with functional memristors between the inner core and the outer core of the protonic ‘wetware’ filament.

Poznanski et al. (2017) studied how an exchange of energy quanta interactions emerges as distinct patterns of quasiparticles within the brain's internal energy. Quasiparticles are intrinsic carriers of information with properties that depend on the material properties of brains, in particular fluids within the neurons of brains. One possibility is to replace the wave function related to the quantum states, originally given by the Schrödinger equation at zero temperature, with a wave of quasiparticles where all quasiparticles in the quantum 'fluid' follow

Brownian motion (Nelson, 1966). A dynamic description of quasiparticle patterns that transform any incoherent or disordered quanta energy is achieved in a hydrodynamic quantum analog like the '*hydrodynamic duon*' (Saeed et al., 2023).

To reproduce models of protonic '*wetwire*' filament for implementation of machine understanding, one would expect artificial quasi-polaritons to be created under the influence of hydrogen bonding. Like the term "proton wires" (Hassanali et al., 2013) in water, hydrogen ions (protons) can migrate by the Grotthuss shuttling mechanism over a long distance (Hertz, 1987; Chatzidimitriou-Dreismann & Brändas, 1991). The pattern is chaotic, like the intermittency dynamics observed in Alemdar et al. (2023) and Sbitnev (2023). This material would be non-ionized and create an intentional agency from negentropic forces. This is necessary to understand the anomalous proton movements in aqueous solutions (Grotthuss extended mechanism) and other fundamental mechanism in amorphous condensed matter, including the material brain. Furthermore, protonic 'wetwire' has an "inner core" that depends on quantum analog fluctuations .

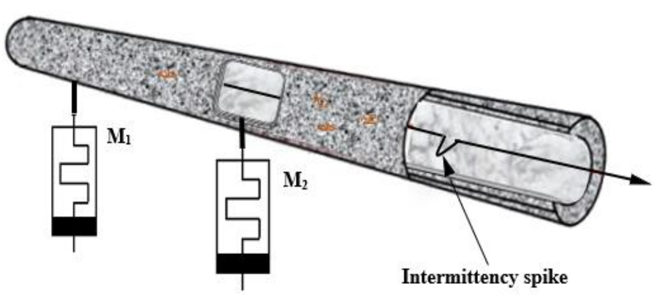

Figure 1. *Schematic diagram illustrating a protonic 'wetwire' filament model consisting of hydrated protonic ions used for transduction of energy resulting in fluctuations as an intermittency spike (red arrow) arising in the filament of uniform diameter under 100 nm and about 0.7µm in length. The molecular scale is 0.2 nm to 1 nm (sub-molecular is under 0.2nm). The 'wetness' of water or the liquid phase dynamics occur at the bulk scale of over 10nm, so the protonic 'wetwire' model is not "wet" but dry embedded in nanoconfined spaces (such as hydrophobic channels in protein pores) and via Grotthuss shuttling completes the wetting process. Two memristors, m_1 and m_2, are used to represent ionic fluxes and entropic fluxes, respectively. In memristor (m_1) the 'outer core' signifies ionic flux and on the other memristor (m_2) the "inner core" signifies entropic flux. Both channels are information channels.*

(energy). These fluctuations are informational activities reflecting upon experienceable forms that are carried as noncontextual meanings across boundary conditions imposed by the quasiparticle "inner core". The "inner core" is intrinsic because of the encasement of cognitive aspects of organisms uniquely and hence precognitive. The "outer core" is where ions collect, associated with cognition. In **Figure 1**, the "outer core" depends on neural spiking driven by ionic fluxes and forms part of neural network activity commonly associated with neuronal signaling, while the "inner core" depends on entropic flux. Both flux types are modeled as memristors (Chua et al., 2012; Sbitnev, 2023). Memristors can bring this functionality to the connections in electronic circuits, which is why they have become extended to thermistors (Sah et al., 2015), photonic memristors (Spagnolo et al., 2022) and quantum memristors (Pfeiffer et al., 2016).

Conclusion

The origin of consciousness lies in intentionality, leading to functionality through intrinsic information encoding in the brain rather than the environment. Therefore, Shannon's information theory does not apply to noncognitive consciousness. Including intentionality cannot be done using an analogy, such as information processing, but through a functional system approach where information is not transferred or processed but instead is causally linked to information-based actions, making it functional through self-referential diachrony. Building on advanced algorithms of intentionality with self-referring characteristics has an implied purpose or intentionality like found in living organisms. It should be stressed that functional means the capacity for functioning. So, any functional interaction enables functionality as the qualitativeness of functioning, but a simple notion of function connotes the role of an identity, which has nothing to do with the experience of action.

We provide a blueprint for intentionality to be embedded in a real-world device that will contribute significantly through understanding in situations where data is compromised as unlearnable in existing AI technology. Our minimally conscious AI operates by using unlearnable noise to gain understanding, unlike other forms of unlearnable noise that hinder *Deep Learning* and make it effectively 'unlearnable.' This conscious AI has the potential to effectively decode hidden data that existing AI cannot train with, due to the presence of unlearnable noise.

Another goal is to demonstrate the correlation between temperature and the intrinsic syntax available to conscious AI. While syntax is represented as formal symbols that are not dependent on temperature, this is a crucial factor in implementing conscious AI because thermodynamic time in the real-world device is temperature-dependent. We provide a blueprint for intentionality to be grounded in a protonic '*wetwire*' filament model. The model as a communication system for informational signals in the filament possessing the attributes of *free will* mimicked as memristors reacting functionally. This is based on the idea that to have *free will* one needs functional processes that have a causal impact on the physical world. The selection of memristors in this research is ongoing, and further advances will be published once available.

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