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Abstract: Information is not a fundamental quantity of the Universe. However, in denying the fundamental nature of information, we assert its importance for living beings in their environment. Living beings use their sensory organs to discover the non-living and those living in their environment. Through their sensory organs, they discover the bountifulness of matter and/or energy as expressions of their environmental spatial/temporal motion/change, as information or differences which make a difference. This paper begins the discovery of a phenomenology of information, or the fundamental study of information as an expression of how ‘we experience things; thus, the meanings things have in our experience.’ This brings to the forefront the process of info-autopoiesis, or the self-referenced, recursive process of information self-production that engages all living beings in their efforts to satisfy their physiological and social needs. Elucidating how living beings interact with their environment and how these interactions are constitutive of information generation, information exchange, information relations and life. Information cannot be the primary element that allows living beings their unique existence.

Keywords: information; phenomenology; Gregory Bateson; info-autopoiesis; Claude E. Shannon; syntactic; semantic; mystification; alienation; semiosis

1. Introduction

A unified concept of information is considered elusive [1]. This paper remedies this by approaching the definition of information from several angles. First, let us look at the etymological origin of the word information. We find that it derives from the Latin stem informatio, which comes from the verb informare (to inform) in the sense of the action of giving a form to something material; and as the act of communicating knowledge to another person [2–5]. Both of these interpretations carry the implication that human beings inform matter and/or other human/living beings, in the sense of interactively shaping matter or shaping the thinking/behavior of other human/living beings by an act of communication. Another approach to information is that of Bateson’s difference which makes a difference [6]. Bateson’s conceptualization is a dynamic view of the process of cybernetic actions, or constitutive absence [7], in which living beings are involved in almost every instant of their lives. From breathing and eating, to making things by acting on the world, and even when engaged in discussions with others. Each of these actions requires constant and recursive determinations of difference by our sensory organs to keep or internal milieu within homeorhetic bounds and/or learn from our actions. The learning process that takes place impacts our ability to deal effectively with our environment. We do this to inform other objects and subjects, while interactively and reciprocally we are also informed by said subjects and objects. In short, Bateson’s characterization of information is fully compatible with the dynamical nature implied by its etymological origin. Living beings are informed by their actions on their environment by way of their sensory organs.
The role of the sensory organs cannot be underestimated. Figure 1 shows a schematized conceptual image of a living being subsumed in its environment (LB/E) depicting interactive, recursive, and self-referenced relations.

Ontogenetic feedback–feedforward control reflex-actions keep the internal milieu of the living being within homeorhetic bounds. In order to clarify Bateson’s difference which makes a difference, consider the beginning of the LB/E cyclic interactions as the detection of environmental noise by the senses of the LB. This is the only window that the LB/E has to access the E. The primary motivation of the LB/E in sensing the noisy environment is to maintain and satisfy its physiological and/or relational needs [8–12]. This self-referential, recursive process leads to the LB/E finding meaning in its circumstances.

Two essential connections define the asymmetrical relationship between the LB and its E. First, a single sense element serves as intermediary between the external environment and the internal milieu of the LB. Interactions result in an electrical signal or action potential (AP), which is used by the LB to generate self-referenced information, by way of the comparator, as a difference which makes a difference. The comparator uses feedback and feedforward circuits incorporating quantities \( k_{fb} \) and \( k_{ff} \), respectively, to modify error/difference/information, \( e \) [9,12].

To pursue a phenomenology of information, the next section reviews Shannon’s theory of communication. Subsequently, the process of info-autopoiesis is examined as central to information creation and to a phenomenology of information. A brief summary and conclusions follow.

2. A Communication System

The schematic of a communication system in Figure 2 shows its main elements: an information source, a transmitter, a channel that inevitably incorporates noise, a receiver, and a destination [13,14]. The fundamental problem of communication is defined as ‘that of reproducing at one point … a message selected at another point’. Though the messages may have meaning, these semantic aspects of communication are irrelevant to the engineering problem.
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value, or powers, to information. Such is the postulate that information is a fundamental formation.

In summary, Figure 2 shows the process of communication where the LB on the left-end, after an internal process involving semantic and syntactic information, then externalizes Shannon/syntactic information to message the LB on the right-end. The LB on the right-end internalizes the received Shannon/syntactic information to produce its own semantic interpretation. It can then choose or not to externalize Shannon/syntactic information in a response.

3. Info-Autopoiesis

The fundamental problem of information is the basis for the phylogenetic and ontogenetic development of a LB. In other words, how does a LB, in a self-referential, recursive process, develop from a state in which its knowledge of the LB/E system is almost non-

Figure 2. Schematic of a system of communication.

However, is that all there is to the fundamental problem of communication? A critical examination is required to answer this question: Are there any missing elements that would merit inclusion for a more comprehensive analysis? For example, who designed, built, and uses this communication system? Where does the message originate? Who is the ultimate recipient of the message? These questions bring to mind whether or not we suffer from alienation, or an inability to recognize our handiwork in the products of our labor. We seem to forget that the communication system that we are describing is brought about by our handiwork. Further, there is a living being (LB) at the left-end and right-end of the communication system in Figure 2. The LB at the left-end generates a message that is the result of a process of creation of semantic and syntactic information to send to the LB at the right-end. However, only the syntactic information is sent through the communication system and reaches the ears of the LB at the right-end.

In this process, we also seem to suffer from fetishism, or an attribution of inherent value, or powers, to information. Such is the postulate that information is a fundamental quantity of the Universe in addition to matter/energy [15–18]. The implication is that information exists in the environment and is readily accessible. We are never told what LB sensory organs engage in this process of detecting information. What is more readily apparent is that matter/energy are dynamic above an absolute temperature of zero degrees absolute. Additionally, it is this motion that LBs learn to detect as information or, as a difference which makes a difference, in order to satisfy physiological and/or relational needs. In this learning process, LBs inform matter/energy and vice versa. Informing matter/energy interactively and recursively takes place in at least two ways: by actual manipulation of matter/energy to consume them as nourishment; and to create all of the objects that are part of the artificial world that surrounds us. Nowadays, it is surprising to find the untouched natural world that existed millennia ago, as only uncontacted peoples in the Amazon can claim such access. All of these artificial informed creations incorporate Shannon/syntactic information, which may be regarded as synonymous with ordered structure and with artificial creation, including analogue and digital information. In short, we postulate that an advantage of digitalization is the acceleration of the process of Shannon/syntactic artificial creation.

In summary, Figure 2 shows the process of communication where the LB on the left-end, after an internal process involving semantic and syntactic information, then externalizes Shannon/syntactic information to message the LB on the right-end. The LB on the right-end internalizes the received Shannon/syntactic information to produce its own semantic interpretation. It can then choose or not to externalize Shannon/syntactic information in a response.
existential to a state in which the LB not only recognizes the existence of the E but also sees itself as part of the LB/E system, and is not only able to self-referentially engage it and navigate through it, but to even transform it in its own image and likeness [9,11].

This is another way to identify the process of info-autopoiesis or of describing how LBs inform matter/energy and vice versa [9]. Info-autopoiesis is nothing more than a description of the process of LBs as producers of self-referenced, recursive information.

Figure 3 shows how the process of info-autopoiesis as a sense-information-action process results in a triadic relationship involving internal and external information relevant to the LB/E. Internalized components relate to the creation of Personal-Subjective-Relative (PSR-I) and Impersonal-Objective-Absolute (IOA-I) information. Externalized components include Shannon-Distilled or syntactic information [10,11].

![Figure 3. The process of info-autopoiesis.](image)

PSR-I is intrasubjective arbitrarily generated information, motivated by the satisfaction of physiological (internal and external) and relational needs, where sensorial percepts, feelings and emotion play an important role in the life of a LB. When some actions lead to pain/harm the LB/E takes notice and in so doing reflects that it has access, however small, to the beginnings of IOA-I. Not all PSR-I is capable of becoming IOA-I. The part of IOA-I that is outside of PSR-I may be regarded as having the potential for IOA-I to further develop. The interlacing of the PSR-I and IOA-I circles is to express their dependent connection, whereby IOA-I is dependent on PSR-I. PSR-I is primary/fundamental and IOA-I is secondary/derived. Overlapping arrows pointing away from and back to each of the information circles imply the ongoing and ever-present processing and recursive interactions between these information types. The arrows inside the information circles show the flow of information toward the region of triadic overlap. This region benefits from the interaction of PSR-I, IOA-I and SD-I which results in an optimal state of LB/E development. One can but wonder if this is the sweet spot of the highest expressions of human thought and action. One characteristic of individual PSR-I and IOA-I is its inaccessibility. Individual PSR-I and IOA-I can only be accessed if an individual is willing to share its contents. PSR-I and IOA-I can only be shared by external expressions that an individual can muster using language, gestures, pictographs, music instruments, sculptures, writing, etc. In so doing, an individual’s PSR-I and IOA-I is externalized. Coding is required for the distillation of individual PSR-I and IOA-I, so that the message content can be externalized. The act of distilling PSR-I and IOA-I transforms said PSR-I and IOA-I into Shannon/Distilled Information (SD-I). This implies that Shannon/Distilled Information (SD-I) is secondary to PSR-I and IOA-I and implies that Shannon/Distilled Information (SD-I) cannot exist independently. SD-I is the basis for the existence of this artificial world which we inhabit.
In short, this triadic process relies on Bateson’s difference which makes a difference as the basis for its phenomenological nature. It is here that we should look for a phenomenology of information that needs further development. Because of the nature of this article that emphasizes brevity, it is not possible to detail such phenomenological treatment of information.

4. Summary and Conclusions

This paper starts with a schematic of a LB/E to highlight its main attributes to achieve sensing-information-action; Shannon’s theory of communication is then critically examined to determine that the process of semantic/syntactic information creation is internal to LB/E. Next, the process of info-autopoiesis is examined as central to information creation and to a phenomenology of information. In conclusion, the externalization of information, as informed matter, can only be in the form of Shannon/syntactic information. The syntactic/artificial world that exists and in which we live is the result of this process that informs matter.

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References
1. Pattee, H.H. Epistemic, Evolutionary, and Physical Conditions for Biological Information. *Biosemiotics* 2012, 6, 9–31. [CrossRef]
2. Capurro, R.; Hjørland, B. The concept of information. *Annu. Rev. Inf. Sci. Technol.* 2003, 37, 343–411. [CrossRef]
3. Capurro, R. Past, present, and future of the concept of information. *TripleC* 2009, 7, 125–141. [CrossRef]
4. Diaz Nafria, J.M. What is information? A multidimensional concern. *TripleC* 2010, 8, 77–108. [CrossRef]
5. Peters, J.D. Information: Notes Toward a Critical History. *J. Commun. Inq.* 1988, 12, 9–23. [CrossRef]
6. Bateson, G. Steps to an Ecology of Mind. Ballantine Books: New York, NY, USA, 1978; p. 456.
7. Deacon, T.W. Emergence: The Hole at the Wheel’s Hub. In *The Re-Emergence of Emergence: The Emergentist Hypothesis from Science to Religion*; Clayton, P., Davies, P., Eds.; Oxford University Press: Oxford, UK, 2008; pp. 111–150.
8. Cárdenas-García, J.F. Distributed Cognition: An Ectoderm-Centric Perspective. *Biosemiotics* 2013, 6, 337–350. [CrossRef]
9. Cárdenas-García, J.F. The Process of Info-Autopoiesis—The Source of all Information. *Biosemiotics* 2020, 13, 199–221. [CrossRef]
10. Cárdenas-García, J.F.; Ireland, T. Human Distributed Cognition from an Organism-in-its-Environment Perspective. *Biosemiotics* 2017, 10, 265–278. [CrossRef]
11. Cárdenas-García, J.F.; Ireland, T. The Fundamental Problem of the Science of Information. *Biosemiotics* 2019, 12, 213–244. [CrossRef]
12. Burgin, M.; Cárdenas-García, J.F. A Dialogue Concerning the Essence and Role of Information in the World System. *Information* 2020, 11, 406. [CrossRef]
13. Shannon, C.E. A Mathematical Theory of Communication. *Bell Syst. Tech. J.* 1948, 27, 379–423. [CrossRef]
14. Shannon, C.E.; Weaver, W. *The Mathematical Theory of Communication*; The University of Illinois Press: Urbana, IL, USA, 1949.
15. MacKay, D.M. *Information, Mechanism and Meaning*; MIT Press: Cambridge, MA, USA, 1969.
16. Dretske, F.I. *Know ledge and The Flow of Information*; The MIT Press: Cambridge, MA, USA, 1981.
17. Stonier, T. *Information and Meaning—An Evolutionary Perspective*; Springer: Berlin/Heidelberg, Germany; New York, NY, USA, 1997.
18. Floridi, L. *The Philosophy of Information*; Oxford University Press: Oxford, UK; New York, NY, USA, 2011.