Empiricist Emergentism: A Legitimate Challenge to Nativist Paradigm

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Abstract: Empiricist emergentism is as a main alternative to the assumption of universal grammar proposed by Chomsky. This type of emergentism goes on to hold that learning takes place by extracting regularities from the input. By the same token, Ellis disputed the view held by generative linguistics that such a complex phenomenon as language can only be learned if it is assumed that humans are endowed genetically with a language specific learning device. In this regard, empiricist emergentists contend that language acquisition can be abridged to the use of simple learning strategies extracted from regularities in the input. The present paper is an attempt to shed light on the plausible stance of emergentism, in general and empiricist emergentism, in particular, in SLA.

Key words: Emergentism · Reductionism · Connectionism · Competition Model · Materialism

INTRODUCTION

Language presents us with many puzzles [1] and an integrated account of these puzzles is offered by universal grammar (UG). UG-based program, due to lack of biological plausibility [2] and its abstract nature [3], has always been at the center of heated debates. Scholars [4, 5] have attempted seriously to find an alternative. As to O'Grady *et al*. (2009) [1], "in recent years, much of the opposition to the UG program has coalesced around a loosely associated set of ideas that have come to be grouped together under the rubric of emergentism" (p. 70). They go on to hold that, although diverse in perspectives, emergentists are unanimous in at least one thesis that language as a complex system must be understood in terms of interaction of simpler and more basic nonlinguistic factors. The present paper is in attempt to delve into the philosophy of emergentism, as well as to revisit the stance of emergentism in general and Ellis's (1998) [4] empiricist emergentism in particular.

Philosophy Underlying Emergentism: The root of emergentism can be traced back to the work of Mill (1930) [6] who took an anti-reductionist perspective towards a system. That is, the whole is not equal to the sum of the parts. Along the same vein, Kim (1999) [7] puts forth that

the fading away of reductionism and the enthronement of non-reductionism leads to the resurgence of emergentism. To Mill's (1930) [6] anti reductionist philosophy, a system can have properties more than the sum of its parts. As these properties are distinctive [8], the whole system is irreducible. Such a non-reductive property, according to van Lier (2004) [9], means that the lower-level categories cannot explain the higher-level ones because they are radically different although the higher level is based on and is built up from the lower level element. In other words, emergentism holds that there are *wholes* in the world that have properties that are not possessed by the parts that give rise to them. Thus, non-reducibility, as a central feature of emergentism which is always compatible with the notion of novelty and unpredictability, assumes that as systems become increasingly complex during evolution, some of which may exhibit novel properties that are neither predictable nor explainable [10]. Accordingly, as Stephan (2006) [11] later maintains, complex wholes can come to have properties that are not reducible to the properties and relations of their constituents.

This non-reductionist emphasis on the distinctive properties of a system is also available in second language acquisition (SLA). In this regard, O'Grady (2008) [12] asserts that although linguistic emergentism denies

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the existence of certain types of grammatical principles, it does not deny the existence of grammatical properties. Elsewhere, O'Grady (2007) [13] maintains that the properties of grammatical phenomena arise from the interaction of simpler and more basic non-linguistic factors. Along the same line, this view is completely against the UG perspective, which emphasizes the importance of grammatical principles; the UG followers believe that the properties of grammatical phenomena are because of the interaction of grammatical principles. In sum, what makes the view of language in emergentism distinct from UG is that learning in emergentist view occurs on the basis of associative processes rather than the construction of abstract rules.

Emergentism, from a philosophical perspective, is inclined towards a more or less holistic perspective in SLA. More comprehensively, Stephan (2002) [10] goes on to claim that emergentism appears in three versions: weak, synchronic and diachronic. In elaborating the weak version of emergentism, Stephan claims that emergentism by nature is physically monistic, systemic and synchronically deterministic. By physical monism, Stephan means that all entities in the world are composed of physical elements. In effect, mind is also dependent on physical matters. This implies that emergentism has a simple mechanistic nature. Systemic properties of emergentism imply that in a systemic organization, none of the components of the system has the properties of the whole. The determinism seen in the weak version of emergentism is by nature synchronic; that is, the properties of a system are nomonologically dependent on its microstructure. The concept of irreducibility which is present in these three features shows that the behavior of the whole system is not analyzable.

Diachronic emergentism inspired by the weak version is supplemented with the features of novelty and unpredictability [10]. In this regard, Stephan goes on to assert that those properties are emergent that could not have been predicted in principle before their first instantiation. In other words, if one property or entity has not existed before and suddenly comes into existence, it means that the property or entity is diachronically new.

Synchronic emergentism is also inspired by the weak emergentism supplemented with the notion of irreducibility. The notion of irreducibility in synchronic emergentism implies that either the behavior of a system is unanalyzable, or the behavior of the components over which they supervene is irreducible. These two kinds of irreducibility produce either downward causation or epiphenomenalism. Downward causation can be defined

as a converse of the reductionist principle: the behavior of the parts is determined by the behavior of the whole, so determination moves downward instead of upward. Epiphenomenalism, in contrast, is the view that mental events are caused by physical events in the brain but have no effects upon any physical events. Behavior is caused by muscles that contract upon receiving neural impulses and neural impulses are generated by input from other neurons or from sense organs [14].

Emergentism is not merely behavioristic by nature [15]. In the same line, Brown (2007) [16] asserts that emergentism oddly hearkens back to behaviorism because behaviorism, although rejecting the methodology of introspection, was equally reductionist [17]. Along the same vein, emergentism in line with the philosophy of holism, asserts that a complex system must be studied as a whole; that is, the whole is not equivalent to the sum of its parts.

Emergentism is simple and mechanistic by nature. Emergentism based on the *Occam's razor* principle favors simplicity in theory construction [15]. This shift from complexity to simplicity requires theorists to use the most economical system of constructs to explain phenomena. Accordingly, much contemporary emergentist research remains committed to the idea that language acquisition can be reduced to the use of simple learning mechanisms to extract statistical regularities present in ordinary linguistic input. In the same line, Ellis (1998) [4], holds that "emergentists believe that the complexity of language emerges from relatively simple developmental processes being exposed to a massive and complex environment" (p. 644). The Competition Model, a good example of an emergentist approach to SLA, rejects the nativist UG account of language, as well as the nativist assumption that human beings are born with linguistic knowledge and a special language learning mechanism. By the same token, Jordon (2004) [18] holds that "emergentism claims that complex systems exhibit 'higher-level' properties that are neither explainable, nor predictable from 'lower-level' physical properties, while they nevertheless have causal and hence explanatory efficacy" (p. 246).

Put succinctly, emergentism is a form of nonreductionism that accepts the ontological position of materialism [17]. Swayer asserts, "with regard to the complex natural phenomena under study, emergentism accepts that nothing exists except the components parts and their interactions" (p. 4). Henceforth, for emergentists reductionism is not a necessary consequence of the materialism. Thus, some complex phenomena, including

SLA, cannot be studied with reductionist methods. Put differently, in favor of materialism, emergentists hold that higher level properties supervene on the system of lower-level components [7]. Supervenience, as to Swayer (2002) [17], refers to "a relation between two levels of analysis and states that if two events are identical with respect to their descriptions at the lower level, then they cannot differ at the higher level" (p.4). Furthermore, these higher levels may have causal power over the lower level components.

Emergentism as a Transition Theory: Generally, a theory, according to Mitchell and Myles (2004) [11], might be either a property theory or a transition theory. The property theory is concerned with what the nature of a given faculty is, while, in the transition theory, the main concern is how that faculty is acquired. In this regard, emergentism is clearer on the transition theory than on the property theory. In effect, to an emergentist, language is acquired through associative learning [19]. Thus, claiming that emergentism by nature is non-linguistic rather than linguistic is undisputable [15]. As Mitchel and Myles (2004) [11] claim "the human mind is predisposed to look for associations between elements and create neural links between them" (p. 127). They hold, "these links become stronger as these associations keep recurring and they also become part of larger networks as connections between elements become more numerous" (p. 127).

Considering emergentism as a serious SLA theory, Norris and Ortega (2003) [20] hold what makes emergentist theories distinct from the other theories (i.e., linguistic-oriented theories based on UG, interactionist theories and sociocultural theory) is that empiricist emergentism totally denies symbolism, modularity and innateness; in fact, as Ellis [4,21] claims emergentism removes linguistics from the center of research done in the domain of SLA. Furthermore, Ellis (2003) [21] asserts emergentist theories share little with interactionist SLA, although it is a commonly-held belief that emergentists in line with connectionists assert that language ability is the product of interaction between language environment and one's learning capabilities.

On the Plausibility of Ellis's Empiricist Emergentism: There are two main subcategories of emergentism [19]. Nativist emergentism, which is mostly associated with the work of O' Grady (2003) [22] and empiricist emergentism, associated with Ellis (1998) [4]. As a pioneer in nativist empiricism, O'Grady (2003) [22] believes in nativism but he

is not in an attempt to support UG. In fact, a different perspective is put forwards by O'Grady, who holds " there is in fact a poverty-of-stimulus problem, but it does not support the case for UG" (p. 73). According to O'Grady, children are born with language acquisition device (LAD) which does not include any principles. In effect, to O'Grady (2003) [22] "no grammatical knowledge is inborn" (p. 44). In other words, what emergentists ignore is the reality of definite types of principles, not the reality of grammatical properties.

What makes Ellis's (1998, 2003) [4, 23] empiricist emergentism distinct from O'Grady's (2003) [22] nativist emergentism is that Ellis (1998) [4] studies language learning as similar to any other type of learning, motivated by exposure to input that fine tunes the networked connections that include implicit linguistic knowledge. That is, this type of emergentism is related to connectionism: an approach to the study of the mind that seeks to model learning and cognition in terms of networks of neuron-like units. According to empiricist emergentism, language acquisition is neither a genetic endowment nor a collection of static rules and forms to be acquired. However, in order to organize our thinking about emergent processes in language, the first question that we need to ask is "emergence from what?" [2]. In other words, we need to see how a linguistic behavior emerges from constraints derived from some related external domain. In short, empiricist emergentists are not comfortable with this idea that the child language is so perfect that cannot be obtained by the impoverished data around him or her. Revisiting the notion of emergentism involves going back to the nature-nurture debate, but this time with some complementary perspective. That is, emergentist learning occurs neither because of association of stimulus and response nor because of activation of an innate module. Accordingly, as Ellis (2003) [23] states, "emergentists believe that many of the rule-like regularities that we see in language emerge from the mutual interactions of the billions of associations that are acquired during language usage" (p. 44).

In a nutshell, to an empiricist emergentist, language learning is not fundamentally different from any other type of learning and can be learned by the same mechanisms used for other kinds of learning in interaction with the environment in general [4]. As Ellis (2003) [23] later asserts emergentist learning takes place by extracting regularities from the input. Henceforth, exposure to sufficient and effective input is a demand for learning to emerge.

In this regard, Ellis (1998) [4] argues that language representations emerge from interactions at all levels from brain to society. Thus, the meticulous description of language systematicity provided by Chomsky (1957) [24] is not sufficient because it does not explain how learners achieve the state of knowledge that can be described in this way [23]. Lack of dynamicity in the nature of rules makes scholars [4, 22] begin to question the methodology that commits them to the task of stipulating a fixed set of rules or filters to match a specific set of data [2].

Emergentist's Strategies in SLA: Emergentist approaches to language acquisition can be divided into two types, depending on the dominant explanatory strategy that they adopt [1]. On the one hand, there is Ellis's (1998) [4] input-based emergentism. On the other hand, processor-based emergentism is proposed by O'Grady (2003) [22]. The former focuses on the effect of frequency of certain items in the input that are conducive to language acquisition. In defense of frequency, O'Grady *et al.* [1] go on to hold that "What counts is not how many times learners hear a particular form—it is how many times they encounter mappings between a form and its meaning" (p. 71). Processor-based emergentism, in contrast, focuses on the cognitive processing of language, offering a solution to the poverty of the stimulus problem. In fact, as O'Grady (2008) [12] asserts there is a simple processor lying at the heart of the human language faculty that is committed to minimize the burden on the working memory. Yang (2009) [26] also in an interview with O'Grady reports that O'Grady claims processor is efficiency-driven. The defining property of O'Grady's efficiency driven processor is its commitment to reducing the burden on the working memory. Nevertheless, O'Grady never denies the relevance of the input to understanding language acquisition and use. To the contrary, processor-based approach, according to O'Grady *et al.* (2009) [1], insists "frequency of occurrence is extremely important—although not more important than the calculus that assesses the burden that computational operations of various sorts place on working memory" (p. 73).

Meanwhile, the processor adopts particular strategies, such as backtrapping-going back and changing the interpretation of a previously interpreted element. Along the same line, these processors are innate. O'Grady (2003) [22] claims when he says that the 'processor' or 'working memory' is innate, he is actually talking about very general operations and propensities-not about anything specially linguistic or grammatical.

The competition model developed by Bates and MacWhinney [31] is an example of input-based approach to language learning. The model represents a different approach to language acquisition from that of O'Grady's nativist tradition. In contrast with nativist theories of language acquisition, the competition model, inspired by emergentism, holds that the meaning of language is interpreted by comparing linguistic cues within a sentence and learning occurs through the competition of these cues in the presence of a rich linguistic environment [27]. MacWhinney, delving into the concept of *cue*, outlines cues in terms of *type* (morphological, syntactic, semantic and pragmatic), *availability* (how often they are present) and *reliability* (how often they lead to correct meaning interpretation). Furthermore, MacWhinney claims that each cue is associated with *cue validity*, the joint product of availability and reliability and the same cue may have different validity in different languages. For example, in English, word order is a strong and reliable cue for identifying the agent vs. patient roles in an event (high validity), whereas word order is less predictive in Chinese (low validity).

Inspired by the input-oriented tradition, Feldman (1981) [28] employs the techniques of connectionist modeling to investigate language acquisition. Connectionism is an approach in cognitive science that employs neural networks. This neural network, or connectionist system, is composed of a set of nodes or units, so-called activation vectors. Units in a net are usually segregated into three classes: input units (which receive information to be processed), output units (where the results of the processing are found) and hidden units (where the activation value is calculated) [15]. For learning to emerge, the units must be activated and the activation must be propagated. Along the same line, Ghaemi and Faraji (2011) [29] hold that the effectiveness of this learning process has been increased by a feedback mechanism known as back propagation which provides the program with a kind of memory. Henceforth, by dint of many repeated presentations of the input, some connections within the network become strengthened, while others become weakened. In this way, the network can gradually be trained to produce correct responses through a process of error reduction (Field, 2004, cited in [29]).

What the competition model and the connectionist model insist is the role of frequency in language acquisition. In fact, learning in such input-based approaches depends highly on frequency with which certain structures appear in the input. Moreover, what is necessary to bear in mind is what counts is not how

many times learners hear a particular form, but how many times learners encounter mappings between a form and its meaning [1]. A notable example in language learning that supports the claim is the determiner *the*. As O'Grady *et al*. [1] put forth, "although *the* is the most frequent word in the English language, it is mastered relatively late, both in first language acquisition and second language learning" (p. 71). This late learning might be either because grammatical functors are frequently difficult to perceive on the basis of bottom-up purely-acoustic evidence [23], or because contextual determinacy often undermines the association of a form and its intended meaning [1]. What makes mapping possible is the contextual input provided for the learners. Ellis (2003) [23] also argues that L1 is the major reason why input fails to become intake. This explains why some learners fail to achieve second language competence. In finding an answer to the root of this failure, Ellis outlines several factors including overshadowing and blocking. Overshadowing refers to a situation where two cues are associated with an outcome. Research has shown that in such cases the more subjectively salient of the two cues overshadows the weaker. If overshadowing continues over time, blocking results. By blocking, Ellis means that learners learn to selectively attend to only the more salient of the two cues. To Ellis, blocking is the result of an automatically learned inattention. An example of blocking can be found in learners who acquire adverbials to express temporal reference but fail to acquire tense and aspectual markers.

CONCLUSION

Much has been said regarding the biological implausibility of Chomsky's UG. Gregg (1996, 2003) [30, 19] makes it clear that UG is based on two main features: (1) linguistic competence constitutes a separate module of the mind and (2) learners must possess innate knowledge of linguistic facts because these facts are not discoverable from the input. However, Ellis (1998) [4] in challenge with Gregg (2003) [30] insists that empiricist emergentism views language learning as like any other learning and views the environment as massive and complex capable of enabling learners to induce facts. According to Ellis (1998) [4], Chomsky's UG may be true, but then based on what emergentists come to hold one cannot properly understand something without knowing how it came about.

Seeing from the constructivist perspective, Ellis [4] holds that simple learning mechanisms, operating in and across [the human systems (i.e., vision, emotion,

touch, etc)]…, suffice to drive the emergence of complex language representations" (p. 644). In sum, what leads Ellis to be in conflict with nativist paradigm is the claim that language is exemplar-rather than rule-based.

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