

ORIGINAL ARTICLE

A philosophical analysis of the emergence of language

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Abstract

There is a research programme in linguistics that is founded on describing language as an emergent phenomenon. This paper clarifies how the core concept of emergence is deployed in this emergentist programme. We show that if one adopts the weak understandings of the concept of language emergence, the emergentist programme is not fundamentally different from the other non-emergentist research programmes in linguistics. On the other hand, if one adopts the stronger understandings of emergence then the programme would have a unique character, but at the cost of some corollaries (philosophical, but not only) which the emergentist linguists would seemingly want to avoid. We show that if the emergentists accept those corollaries, the resulting hypothetical emergentist programme would be totally different from the emergentist programme in its present shape. We conclude that the emergentist programme, as it stands, should be either abandoned or reshaped in both theory and methodology.

KEYWORDS

emergence, emergence of language, emergentist programme, linguistics, philosophy of linguistics

1 | INTRODUCTION

Emergence has been taken to refer to the apparent irreducibility, or the putative unexplainability and unpredictability of a whole with respect to its constituent parts. This concept has attracted philosophers and scientists alike. There is a large body of philosophical literature on emergence (Humphreys, 2016b; Wilson, 2021), and there are scientists within various disciplines such as biology (Rothschild, 2006; Van Regenmortel, 2004), computer science (Holland, 1998; Mitchell, 2009), physics (Anderson, 1972; Wayne & Arciszewski, 2009) and linguistics (Deacon, 2005; MacWhinney, 2002) who have promoted using the concept in their fields. Within the sciences, the employment of the concept is usually sporadic rather than systematic. Linguistics is, relatively speaking, an exception. There is an emergentist research programme in linguistics

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(from now on, *the emergentist programme*) that is founded on describing language as an emergent phenomenon (O'Grady, 2008), and which aims to explain how humans, of all species, have acquired linguistic abilities, and particularly, how the child acquires the general rules that govern those abilities. In this paper, we analyse this programme through a philosophical lens.

Our philosophical analysis is aimed to clarify how the concept of emergence is deployed in the emergentist programme in linguistics. As our survey of the emergentist programme shows, linguists understand emergence in different ways, which vary in their philosophical content. Some understand emergence in a more technical way, and some understand it more philosophically. In each case, we discuss weak and strong understandings of the concept and show that the programme faces a dilemma. On the one hand, if one adopts the weak understandings of the concept of emergence, the concept (philosophically understood) would not add anything significant and the emergentist programme would not be fundamentally different from other research programmes in neuroscience or biology of language more generally (a.k.a. *biolinguistics*), and so there is no need to distinguish the programme by reference to emergence.

On the other hand, the stronger understandings of emergence give the emergentist programme a unique character, but at the cost of some potential philosophical corollaries, which the emergentist linguists would seemingly want to avoid. Moreover, we show that an emergentist approach based on the stronger interpretations of emergentism should limit efforts to explain language in terms of factors external to language (biological, social and the like). Therefore, such a hypothetical programme would not only be very different from the emergentist programme in its present shape, but would go in a direction that is opposite to current biolinguistics approaches that aim to study language from an interdisciplinary approach and that support the view that cognitive, behavioural, social and cultural facts interact to explain the properties of language, as well as how language is acquired and evolved. Because of this dilemma, we will conclude that the emergentist programme *stricto sensu* should be abandoned, unless its proponents are ready to adopt a metaphysics (and a research direction) that is incompatible with the current scientific approach to language.

The emergentist linguists who understands emergence as a purely technical, non-philosophical term within linguistics might disagree with our approach and hence our conclusions. Why, they might think, should linguists care about the philosophical understanding of the term to begin with? However, as we will see through the following survey of the programme, linguists use the term emergence in different ways and not all of those applications are purely technical. As much as they lean towards the philosophical concept of the term, linguists should be aware of the consequences of their philosophically loaded conceptualisations of the term. Even those linguists who use the term in a rather technical way sometimes make philosophically loaded remarks. A good example is O'Grady who (as we will discuss in Section 3.2) has provided a technical description of the emergentist programme and yet begins his discussions by defining emergence as 'the process whereby the interaction of simple entities, forces and events produces a system with its own novel properties' (O'Grady, 2021: 1). We will show in Section 4 that emergentist claims of novelty and uniqueness have important philosophical ramifications. Eventually, the conclusion of our discussions for an emergentist linguist who insists on a strictly technical, non-philosophical understanding of the term could be that it is better that linguists abandon using such a philosophically loaded term altogether, and use other more benign terms to avoid potential confusions and misconceptions.

On the other hand, philosophers of emergence will benefit from our linguistic discussions by seeing philosophy of emergence in action. Broadly speaking, the puzzles of language emergence are not fundamentally different from the general puzzles of emergence, and the emergentist programme within linguistics, as a relatively speaking well-developed scientific emergentist programme, provides a particularly interesting case study for philosophers. And vice versa, the case also provides an opportunity for philosophical insight to contribute to science by explicating the key foundational concept of a scientific programme.

We start with some preliminary discussions of the philosophical concept of emergence in Section 2, and characterise the concept as simultaneous dependence and independence of a whole with respect to its parts. We then switch to linguistics and give an overview of the emergentist programme in Section 3. In Section 4, we hypothesise about a truly emergentist programme in light of the philosophical concept of emergence, as discussed in Section 2. We discuss weak and strong views of independence, and analyse the philosophical and methodological consequences of each of these understandings for language. The analyses of some of the strong understandings lead us to discuss Kim's exclusion argument, one of the most important challenges facing emergentism, in Section 5. Finally, in Section 6, we present some conclusions about our philosophical analysis of the concept of emergence as applied to language. We suggest that the core lesson drawn from our analysis can inform similar applications of the concept in other disciplines such as biology where the concept is gaining popularity (Mazzocchi, 2008; Newman et al., 2003; Newman & Comper, 1990; Oyama, 2000; Van Regenmortel, 2004). At the end of the paper, we summarise this generalisable core conclusion in the following adage: Half-hearted emergentism is expendable. Wholehearted emergentism is expensive.

2 | EMERGENCE: SOME PRELIMINARY CONSIDERATIONS

Emergence is usually associated with the old slogan that the whole is more than the sum of its parts. Philosophers of emergence have explicated this slogan in different ways. But most of those explications, one way or another, describe emergence as some high-level properties of hierarchical systems showing some sort of independence with respect to the lower level constituents they also depend on, in the sense that their properties cannot be reduced to, or explained and predicted by, the properties of the constituents at lower levels of the hierarchy (Humphreys, 2016a). This apparently paradoxical dependent and independent nature of emergent phenomena is the distinctive feature of emergence.

The independence is usually demonstrated by referring to features that are idiosyncratic, that is, distinctive with respect to low-level features. Consider the case of mental phenomena, like feeling pain. The sense of pain depends on the underlying neurobiological machinery, specifically, the nociception system, involving skin receptors, specific brain areas and the like. But at the same time, feeling pain also involves an introspective phenomenological perception of pain, which can be argued to be of a different nature compared to its underlying neurological machineries. Accordingly, one could argue that a hypothetical neurologist who knows everything about nociception but has never experienced pain does not really know what pain truly is (Chalmers, 1996; Nagel, 1974). Importantly too, a wildly wide range of neurobiological machineries and states can all result in a perception that is nonetheless called 'pain' (i.e., the multiple realisability of pain), so that pain cannot be exactly equated with any of those underlying machineries, but with the sum of all of them (Aizawa, 2013; Fodor, 1974). Therefore, at least on the face of it, it seems that pain both depends on, yet it is independent of, the underlying neurobiological machinery. As noted, this paradox is the essence of emergence and so we can conclude that pain is an emergent phenomenon.

Different theories of emergence diverge by the various ways that they describe and explain this simultaneous dependence and independence of emergent phenomena. These theories fall into two broad categories: metaphysical and epistemic (Chalmers, 2008; Wilson, 2021). Theories of metaphysical emergence suggest that emergent phenomena, once produced, are metaphysically distinct from their lower-level constituents, this accounting for their distinctive properties. If pain is metaphysically distinct from the underlying nociception system, it is not surprising that it shows its own unique features. Theories of epistemic emergence, on the other hand, deny metaphysical independence of emergent phenomena and suggest instead that their apparent independence with respect to their lower-level components is only due to epistemic

limitations of beholders such as us, humans. From, for example, God's perspective, so the thought goes, pain is nothing but whatever its underlying producing systems are. But for us, because of our limited knowledge, pain cannot be explained by reference to those underlying systems only, and this is why it appears to have some unique properties.

Epistemic approaches to emergence divide on whether they take the epistemic limitations that result in appearance of emergence to be surmountable or insurmountable. Those that take the epistemic limitations to be surmountable, suggest that emergence is a passing side effect of our current technical, and perhaps theoretical limitations, and, therefore, they predict that it is going to fade away in light of future technological and scientific advances (Hempel & Oppenheim, 1948). On the other hand, those that take the epistemic limitations to be insurmountable contend that emergence will forever be part of our scientific understanding of the world (Bedau, 1997).

The concept of emergence has been deployed in a variety of scientific contexts, though the scientific value of the concept has been a matter of debate. Modern biology, for example, is a field that abounds with emergentist claims (Heng, 2017; Kaiser, 2017; Kauffman, 1993; Mazzocchi, 2008, 2011; Mikulecky, 2001; Plsek & Greenhalgh, 2001; Rickles et al., 2007; Shapiro, 2011; Tabatabaei Ghomi, 2023; Walsh, 2015). Observations such as asymmetries in relative prevalence of sugar or amino acid enantiomers (Anderson, 1972), concepts such as 'organism' (Walsh, 2015), or phenomena such as biological programming (Noble, 2008) are claimed to be best explained within an emergentist framework. Importantly, scientific recourses to emergence are usually not merely theoretical viewpoints, but also have a methodological dimension. If one takes emergent phenomena to be metaphysically irreducible to their constituent parts, or epistemically unexplainable in terms of interactions between parts, then it may make no sense to try to understand those phenomena by reference to such low-level mechanisms. Instead, one should better consider the system as a whole and try to describe and explain its features on the systemic level. In biology, for example, some emergentists claim that for understanding what an organism is, instead of zooming in and merely describing how its components work, we should better zoom out and describe its characteristics from a holistic perspective (Tabatabaei Ghomi, 2023; Walsh, 2015). Similar views motivate practical fields such as systems pharmacology that promote finding medical solutions not by modulating the effects of a particular drug target, but by intervening with the dynamics of molecular and physiological networks as a whole (Latourelle et al., 2017; Luu & Palczewski, 2018; Wang et al., 2021).

Our focus in this paper is on language. We aim to understand in which sense, if any, language can be regarded as an emergent phenomenon, and to explore the ensuing philosophical and methodological consequences. We will ask how the approaches to language that are regarded as *emergentist* characterise the emergence of language, and we then discuss the different philosophical ways to understand each of those characterisations. In this, we will examine more closely the two types of theories of emergence mentioned above, namely, metaphysical and epistemic, as applied to language. In every case we discuss the potentially problematic aspects resulting from each understanding of language emergence, possible solutions to address those complications and, ultimately, the kind of emergentist programme that ensues from those solutions. Eventually, we will reveal the dilemma facing the emergentist programme: the weak understandings of language emergence do not warrant establishing a standalone emergentist programme, and the strong understandings of language emergence come with philosophical and methodological consequences that the language emergentists seemingly prefer to avoid.

3 | A GENERAL OVERVIEW OF EMERGENTIST APPROACHES TO LANGUAGE

Usually, emergentism in linguistics refers to the view promoted by Bates et al. (1998), MacWhinney (2002), O'Grady (2021) and others that the language faculty is a new machinery

built out of old parts, as opposed to the ‘essentialist’ or ‘nativist’ view promoted by Chomsky (until recently) and many of his followers (Berwick & Chomsky, 2019) that the language faculty is built on inborn universal grammatical principles that have no counterpart elsewhere in cognition. Despite this prevalent understanding of language emergentism, there are different ways that the term ‘emergence’ is used by different linguists, and it is dubious that a solid, well-founded emergentist programme of language exists. What one finds is a potpourri of sometimes half-baked ideas. As Austin (2021: 16) puts it, emergentist formulations are still ‘brainstorming more than the kind of definition of language that is needed for a scientific linguistics’. This situation makes it almost impossible to formulate a unifying definition of *language emergence* or even *emergent properties of language* that accurately applies to all the so-called emergentist approaches to language, and particularly, that is compatible with how *emergence* is construed in philosophy, which is the main target of our approach here. Considering this situation, we try to summarise (and eventually, clarify) the different ways that the concept of language emergence is characterised in the field of linguistics. For each characterisation, we consider its plausibility and implications according to extant philosophical approaches to emergence. We also ask if that particular characterisation of language emergence can sufficiently differentiate it from non-emergentist accounts. More specifically, in each case we will ask if approaches avoiding the concept of emergence would really provide poorer, less biologically accurate views of language, as claimed. Ultimately, if non-emergentist and emergentist views of language overlap or prove to be equally accurate and useful, we will discuss if it makes sense to maintain a differentiated emergentist research programme in linguistics.

3.1 | Two types of language emergence

Our analysis of the so-called emergentist literature in linguistics suggests that two different views of language emergence exist in this field. First, the emergence of language out of non-linguistic components, both during language acquisition by the child and during language evolution in the species (see, e.g., Deacon, 2005; O’Grady, 2005). Second, the emergence of language phenomena within the realm of language, such as the semantic enrichment of words when they are used in specific utterances to convey context-dependent meanings. As a simple example, consider the meaning implied by the word ‘sun’ when someone quotes the last verse of Shakespeare’s sonnet 33: ‘Suns of the world may stain when heaven’s sun staineth’. In this case, the meaning of the word ‘sun’ is said to emerge from the conceptual, grammatical and pragmatic systems into which it is plugged (see also MacWhinney, 2005). This type of language emergence forms the basis of the connectionist methods of language analyses that try to parse meanings and grammatical structures based on contextual cues (Palmer-Brown et al., 2002). Putting this differently, the first type of emergence is about how language develops, whereas the second one is about how language works once it is developed. The focus in the paper is on the first type of language emergence.

That said, these two types of emergence are commonly mixed together in discussions of language emergence, so that both types are put under the single banner of language emergentism. This mixing is not due to scholarly sloppiness. These two types of emergence are, in fact, related. How language works depends on how it is acquired, which depends in turn on how it evolved. According to the first type of language emergence, language acquisition entails the development and the progressive functional interrelationship of diverse auditory, visual, cognitive and behavioural mechanisms that evolved for other functions, but that have been recruited for language during our recent evolution (Kandel & Hawkins, 1992; MacWhinney, 2002). This can be seen particularly well at the neurobiological level, where language processing by the brain depends on neural devices that perform basic representations and computations and that are recruited for other cognitive functions besides language (Poeppel, 2012; Poeppel & Embick, 2005), with this language machinery showing a strong

evolutionary continuity with devices found in other animals, particularly primates (e.g., Lieberman, 2016). It makes sense that the ultimate linguistic products of such a background can be understood only by concerted consideration of various types of inputs, rules and contextual dependencies, leading to the second type of language emergence.

Despite their relations, however, these two types of language emergence can be distinguished ontologically, because they can be said to happen, as noted, at two different borders. The first type happens at the border between biology and linguistics. The second type happens within the realm of linguistics. As also noted, our focus will be on the first type, but we will discuss aspects of the second type where they become relevant to the discussions of the first type.

3.2 | A negative characterisation of language emergence

One classical formulation of language emergence (of the first type) is O'Grady's:

The phenomena of language are best explained by reference to more basic non-linguistic (i.e., 'non-grammatical') factors and their interaction—physiology, perception, processing, working memory, pragmatics, social interaction, properties of the input, the learning mechanisms, and so on (O'Grady, 2008: 448).

On the face of it, one could argue that this formulation just emphasises the dependence of language on non-linguistic factors but fails to clarify the more important aspect of the alleged emergent nature of language, that is how language is independent from such non-linguistic factors. Probably, O'Grady's purportedly emergentist approach was originally meant to separate the functionalist characterisation of language development from nativist accounts, particularly Chomsky's view. As noted at the beginning of Section 3, it is common to describe the emergentist approaches in contrast with the nativist research programme (MacWhinney, 2002, 2015; O'Grady, 2008). Roughly speaking, the nativist approach sees language as a set of fixed rules resulting from a certain language-specific machinery in human brains that works under some language-specific constraints and that evolved to fulfil some particular functions, specifically, generating more sophisticated thoughts (Berwick & Chomsky, 2016; Chomsky, 2005; Hauser et al., 2002; Pinker, 1994). This view is notoriously in debt to Fodor's (1983) view of cognition and the subsequent takes by evolutionary psychology (e.g., Sperber, 2001). Instead, the emergentist programme, as formulated by O'Grady and others, describes language as a network of assorted items, such as sounds, meanings, combinatorial rules and the like, otherwise not specific to language and resulting from complex interactions between innumerable biological, cognitive, social, environmental, mathematical and other factors (MacWhinney, 2015). Furthermore, it supports the view that language acquisition depends on perceptual and cognitive abilities neither specific to language, such as categorisation, statistical learning and the like (e.g., Saffran et al., 1996). Ultimately, it supports the view that if language can be eventually characterised as a distinctive, full-fledged cognitive faculty within the human brain/mind, this is only true in the adult state, so that language is more an ontogenetic outcome than something existing *ab initio*. This emergentist programme when it comes to cognition and the brain can be labelled as *neuroconstructivist* (following, e.g., Karmiloff-Smith, 2009; Sirois et al., 2008; and others), because as also famously stated by Bates et al. (1988: 284), 'modules are not born, they are made'.

In view of this, it can be argued that the nativist programme and the emergentist programme fundamentally differ when it comes to the second type of language emergence. The nativist programme suggests that language is shaped primarily by rules that are specific to language, while the emergentist programme denies the existence of such specific rules, and instead suggests that linguistic rules do not differ from other rules governing cognition, so that the rule-like regularities of language emerge out of complex interactions beyond language. The two programmes also differ with respect to the first type of language emergence. These differences

were more noticeable in the past, but as we will show below, they have become less and less noticeable as our understanding of how the brain works and how it evolved has improved.

The nativist programme suggests that there is a specialised language machinery in the human brain which grows in the child under genetic guidance mostly, and that results in a set of rules specific to language. This claim was stronger in the first proposals by Chomsky, as with the UG (Universal Grammar) model. As noted by Chomsky (1977: 164), UG is ‘a common human attribute, genetically determined, one component of the human mind’. By contrast, the emergentist programme denies that there is such a specialised machinery, so that the language-specific patterns of brain activity that can be identified during language processing result, as noted, from complex interactions between non-linguistic brain devices. That said, there is quite a noticeable common ground between these two programmes. On the one hand, it can be argued that this type of recurrent patterns of brain interconnection comprises a module, at least a functional or mental module, in the spirit of current evo-devo approaches in biology (see Breuker et al., 2006, or Griffiths, 2007 among many others). On the other hand, if one considers the last proposals by Chomsky, particularly, after the advent of the Minimalist Program (MP) (2005), language can be viewed as well as arising from biological infrastructures. In the MP, the computational system of language is reduced to a single operation *Merge*, and language ultimately results from an interface between the conceptual-intentional system, important for meaning, and a sensory-motor system involved in the perception and production of linguistic items (see Hauser et al., 2002 for details).

Despite these biological grounds, standard minimalism insists on at least a minimal degree of language specificity in *Merge* (Berwick & Chomsky, 2016, 2019) and has it that this specifically linguistic *Merge* is what differentiates their programme from reductionist or ‘negative’ emergentist approaches such as O’Grady’s. By claiming some aspects of *Merge* to be exclusively linguistic, standard minimalism introduces a linguistic element that is irreducible and thus, independent of non-linguistic cognitive elements and therefore, falls under positive accounts of language emergence that are discussed in the following sections. However, many adherents of minimalism have departed from standard minimalism, specifically when discussing language evolution, and have argued that *Merge* could derive from a non-specifically linguistic ability. For example, Fujita and Fujita (2022) argue that *Merge* could derive from motor action planning, Liu et al. (2023) suggest that *Merge* can be localised in Broca, as a non-language-specific brain area, and others have suggested that the computational system of language can be decomposed in primitives (a sequencer, a memory stack) that can be found in other animals contributing to other functions (Balari, Antonio et al., 2013; Balari, Lorenzo & González, 2013; Lieberman, 2000). Such proposals are in line with a general trend in neurolinguistic research that suggests language can be spelled out in terms of basic components that are not specific to language, following, for example, Poeppel (Poeppel, 2011; Poeppel, 2012). On these non-standard views, the MP can be seen as a variety of negative emergentism described by O’Grady’s description of language emergence, that language is best described in terms of its non-linguistic underlying causes.

Another aspect of the MP that is emergentist by O’Grady’s formulation of language emergence is the role of what Chomsky calls the ‘third factor’. The third factor refers to non-linguistics principles and constraints that affect the development and, eventually, the final shape of language (Chomsky, 2001: 1–2; 2005). For instance, take the mathematical principles of efficient computation. These principles are inherently non-linguistic but influence the computational system of language.¹ Biolinguistics can offer a wide range of such third factor influencers, like various physico-bio-chemical parameters and properties such as viscoelasticity, differential biochemical diffusion and oscillation, mechanochemical excitability, and the very dimensions of the space in which chemical reactions take place. Newman and Comper call such factors ‘generic factors’, and show their roles in biological pattern formation in general

¹We have to underline that the minimalist MP is far away from providing a successful detailed third factors explanation for linguistic phenomena.

(Newman et al., 2003; Newman & Comper, 1990).² Patterns of language are no exceptions. Under the influence of these third factor principles, many features of language ‘come for free’ from non-linguistic origins, that is, are emergent by nature, thus approaching Chomsky’s MP to the allegedly rivalling emergentist programme as described by O’Grady.

In summary, once one appreciates that the differences between the recent views in the nativist and the emergentist programmes are unessential and diminishing, O’Grady’s formulation of language emergence loses its significance and seems to be a relic of outdated debates. The formulation only tells us that there is no biological machinery in the brain operating under language-specific principles and resulting from specific genetic cues. As noted, most neurolinguists, psycholinguists and biolinguists would now agree on this. More importantly for our philosophical concerns here, the formulation gives us only a negative understanding of the concept of language emergence by rejecting some outdated views about the origins and the development of language, but does not provide a positive understanding of language emergence by clarifying the role that emergence plays in the nature of language, and particularly, in how it is acquired, how it evolved, and how it operates. Going back to our philosophical characterisation of emergence, O’Grady’s formulation of language highlights the *dependence* of emergence on non-linguistic elements, and fails to characterise how language is *independent* and distinct with respect to its non-linguistic precursors. In other words, O’Grady seems to be a complete reductionist about language, with his account telling that the whole is best described in terms of its parts, and his account does not follow the old emergentist slogan that the whole is more than the sum of its parts.

This strong reductionist nature of the negative characterisation of language emergence has been noticed with concern by some linguists whose sense of language emergence is closer to the philosophical anti-reductionistic sense of the term. Geoff Jordan, for instance, writes:

I think the latest radical empiricist versions of emergentism are actually quite dangerous; no more dangerous than one of those meteorites that might collide with planet earth, but dangerous. While classic emergentism was unable to explain how novel properties could emerge from complex systems, and thus remained somewhat mysterious (even smacking of dialectics), the latest versions of emergentism seem to be getting closer to a model of the process. The problem with this for a rationalist ... is that the more it becomes possible to demonstrate the systematic interconnections between psychology and physics, for example (the more we can do away with the construct of the mind, and just talk about the brain), the closer we get to describing the necessary and sufficient conditions for psychological states in physical terms, and the closer we get to reductionism. Reductionism finds the ultimate meaning of the ‘object’ not in its inherent qualities but in the parts which compose it, which is to say that we enter the topsy turvey world where there are only parts (Jordan, 2003: 247).

However, there are other language emergentists that have leaned, to different degrees, towards a positive characterisation of language emergence with anti-reductionistic features as we discuss below.

3.3 | Towards a positive characterisation of language emergence

MacWhinney (2015) has suggested another unifying theme for the emergentist approach to language that gets at least one step closer to a positive characterisation of language emergence.

²Similar ideas can be seen in works of Kauffman (1995, 2000), where he writes about the general laws which regulate the self-organisation of biological systems, and Oyama’s when she claims that part of the information which determines the features and functional properties of any biological structure is generated by developmental processes themselves (Oyama, 2000; Oyama et al., 2001).

He suggests that emergentism in linguistics means working within three frameworks: emphasis on Darwinian evolution, analysis of complex systems as structured hierarchies, and the appreciation that the processes on each level of these hierarchies happen at different timeframes. MacWhinney claims that these three frameworks are the common themes of all emergentist accounts of language, and the differences between them arise only from which framework they emphasise.

One problem with MacWhinney's thesis is that the two types of language emergence, as characterised in Section 3.1, are mixed in its various aspects. For instance, the Darwinian evolution that MacWhinney refers to includes both the evolutionary processes resulting in the human language-ready brain, and the evolutionary relations that supposedly exist between linguistic components that compete to serve communicative functions (MacWhinney, 2015). The two types of language emergence are also mixed up in MacWhinney's description of structured hierarchies. MacWhinney (2009) introduces six hierarchical levels in language: auditory phonology, articulatory phonology, lexicon, syntax, embodied roles and communicative structure. However, whereas some of these levels are within the realm of language, others have a non-linguistic nature (e.g., embodiment). Finally, the same mixing happens when MacWhinney describes the different timeframes associated with the different levels of his hierarchy. MacWhinney (2015) suggests four timeframes for various levels of language production: the timeframe of processing that happens at the moment of speaking, the timeframe of consolidation of experiential traces into memory, the timeframe of social diffusion of linguistic forms, and the timeframe of diffusion and consolidation of genetic basis of linguistic abilities.³ This list is a mixture of biological, social and linguistic mechanisms. As noted above, the two types of language emergence are related and, therefore, it is not necessarily wrong to mix them together. But unless this is explicitly acknowledged and properly characterised, the amount of mixing and generalisation in MacWhinney's characterisation precludes informing a precise understanding of the phenomena pertaining to the biological machinery of language versus the phenomena pertaining to language (and accordingly, to the first or the second types of language emergence).

Besides this issue, the main problem with MacWhinney's proposal is that, similar to O'Grady's thesis, it is completely compatible with a non-emergentist approach to linguistics. One can agree that evolution has played an important role in language development, that the underlying causal mechanisms of language have a hierarchical structure, and that different causal mechanisms work on different timeframes without being obliged to accept that language has an emergent nature in the sense we characterised *emergence* in Section 2. In the absence of further evidence, there seems to be no need to bring emergence up.

Perhaps one of the most elaborate emergentist proposals of this 'positive' type is Deacon's (Deacon, 2005, 2014), who promotes the view, specifically, that articulated, that is, linguistic thought depends on unarticulated thought. According to Deacon (2005), there are infra-linguistic hierarchies of non-linguistic cognitive, semiotic and pragmatic units of thought that are precursors to the articulated linguistic components. These precursors are present and active synchronically all along the formation and articulation of linguistic components. As the final products of language articulation are built on this concurrent infrastructure of precursors, they are hierarchical, rather than temporal precursors of language. Actually, Deacon suggests that the non-linguistic infrastructures operate on slower timeframes compared to language articulation. Accordingly, one can utter several sentences while being in the same general mood or have the same general unarticulated thought. In line with current neurolinguistic hypotheses, Deacon associates different brain areas with different elements of these infra-linguistic hierarchies, so that language ultimately depends on several of these functions working together. Finally, he also suggests that while language is an exclusively human phenomenon, many forms of

³To be more precise, these are space–time frames and have spatial, as well as temporal, aspects.

unarticulated thought seem to be common between humans and non-humans such as primates. Again, as with MacWhinney's proposal, it is not clear in which sense Deacon's view benefits from bringing *emergence* to the forefront. However, Deacon has more to say about language emergence, and below we will discuss his other views in more detail.

In the next section, we will show that it is possible to support the view that language is emergent by nature. But for this we need to pass on these general characterisations and follow the conceptions of emergence more closely, with the aim of probing not only that language can be dependent on non-linguistic infrastructures, but particularly, that it can be independent from them too (i.e., what we have called a *positive* characterisation of language emergence). The characterisations above only attend to the dependence of language on the underlying infrastructure and non-linguistic precursors. Many other examples can be found in the modern biolinguistic literature, particularly about how language evolved. One case is the claim that language evolved in connection to other non-linguistic adaptations such as adoption of a bipedal gait, developing control over phonation, increased brain size, the formation of social support for child rearing and so forth (Benítez-Burraco & Nikolsky, 2023; MacWhinney, 2002). Another example, related to this, is the claim that there are no qualitative systematic differences between the human brain that shows linguistic abilities, and the brains of other primates that lacks any such abilities (Deacon, 2005; Lecours et al., 1983), so that language evolution, like the evolution of many other human-specific abilities, can be mostly viewed as the outcome of the kludge process that put into contact, and perhaps optimised, previously evolved brain mechanisms (see Marcus, 2008), actually, in the line of Chomsky's MP. But these dependence relations are not enough for language to be emergent in the sense characterised in Section 2. We also need to probe, as noted, that language has some sort of independence from the non-linguistics precursors and infrastructure.

4 | CHARACTERISING LANGUAGE EMERGENCE BY INDEPENDENCE RELATIONS

In this section, we characterise language emergence of the first type by looking for different ways that language is described to be independent of its non-linguistic infrastructure in the emergentist literature. We further discuss the various understandings of those relations and their philosophical consequences.

Consider several core units in the structural characterisation of language: phonemes (sensorily identifiable units of sound that allow distinguishing words from one another); morphemes (indivisible meaningful linguistic units within words), syntactic rules (instructions about combining words to convey complex meanings), and so forth. As discussed above, diverse non-linguistic infrastructures underlie the representation of these core units and their computation: mathematical principles of information encapsulation, thoughts and moods, cognitive mechanisms of learning, biological sensory mechanisms, and so forth. We now wish to understand what it means that linguistic components are independent from non-linguistic infrastructures, as independence relations are crucial, as noted, for distinguishing truly emergentist proposals from other characterisations of language that also claim that language develops and evolves from the interaction between different non-linguistic components: perceptual, cognitive and behavioural, as the proposals discussed in the previous section.

The independence of language becomes manifest in its distinctive features, if any, that are peculiar to language and are absent from the non-linguistic infrastructures. Such distinctive features have been referred to as the hallmarks of emergence even by those linguists who define language emergence in a rather technical way. For instance, we saw at the beginning of the paper that even O'Grady associates emergence with a 'system with its own novel

properties' (O'Grady, 2021: 1). In the emergentist literature within linguistics, one can identify at least four ways that language is described to be distinct and independent with respect to its underlying non-linguistic infrastructures: (1) unpredictability by the underlying mechanisms (Bates et al., 1998; Deacon, 2003; MacWhinney, 2015; O'Grady, 2021); (2) unexplainability in terms of lower-level entities (Deacon, 2005; MacWhinney, 2015; McClelland, 1987); (3) possession of new causal powers and performance of distinctive functions (Deacon, 2003); and (4) having unique properties such as an organismic life in a linguistic ecosystem (Croft, 2000; Frank, 2008; Piattelli-Palmarini & Uriagereka, 2004; Ritt, 2004). In what follows we analyse each of these types of putatively distinct characters of language. In each case, we discuss various ways that one can understand these claims of distinctness and independence, and the ensuing philosophical consequences.

4.1 | Unpredictability

Unpredictability is frequently cited in philosophical discussions as a hallmark of emergence (Bedau, 1997; Huneman, 2008). The idea is that in non-emergent systems, understanding the underlying mechanisms suffices for predicting how the system would behave. For instance, if I know exactly how my car works, I can predict what happens when I turn the steering wheel to the right. In emergent systems, however, even a complete understanding of the underlying mechanisms is claimed to be insufficient for predicting how the system would behave. The weather is an example. Even if we know all the underlying factors contributing to a weather system, so the thought goes, we cannot predict the weather for the next week with 100% certainty. In this line, some emergentist accounts of language have sometimes claimed that even if one identifies and understands all the non-linguistic infrastructures that contribute to language, one still cannot predict the final shape of language that results from those mechanisms (Bates et al., 1998; O'Grady, 2021). O'Grady, for instance, writes:

A defining feature of complex systems is the presence of emergence; they become more than the sum of their parts, taking on properties and manifesting effects that could not have been predicted in advance (O'Grady, 2021: 7).

Unpredictability is closely tied to unexplainability. So, we discuss its various interpretations and philosophical implications along with unexplainability.

4.2 | Unexplainability

Another related type of independence that emergentists have attributed to language is its unexplainability by non-linguistic infrastructures. This unexplainability is best understood in terms of the indecomposability of emergent phenomena. Decomposition is the method of understanding a phenomenon or entity by disintegrating it into its constituent parts and the interactions between those parts (Bechtel & Richardson, 2010). It is probably the most prevalent method of explanation for composite entities. In simple terms, decomposition means understanding by reverse-engineering. Accordingly, an entity or phenomenon that is fully decomposable to its constituent parts and their interactions is not emergent. Being fully decomposable means that the entity or phenomenon is basically nothing but the parts and their interactions and, therefore, cannot have any independence and distinctness with respect to those parts and their interactions. On the other hand, indecomposable entities cannot be explained away by decomposing them to their constituent parts and their

interactions and, consequently, show some sort of distinctness and independence with respect to their parts and their interactions. This independence makes them emergent.

The philosophical literature on emergence divides on the *in principle* vs *in practice* unpredictability and unexplainability of emergent phenomena. Some theorists ascribe the apparent unpredictability and unexplainability of emergent phenomena to our limited understanding of those phenomena at this present time. For this group, the emergent properties of systems are unpredictable and unexplainable only in practice. They suggest that as our understanding of emergent phenomena progresses over time and we build stronger experimental, computational and modelling tools, we will eventually be able to explain and predict the purportedly emergent phenomena by means of their lower-level infrastructures. At that point in time, emergence would fade away (Hempel & Oppenheim, 1948). For this group of theorists, emergence is merely a theoretical placeholder until we figure things out. This is an anti-emergentist position that explains away the appearance of emergence as a side effect of a passing situation.

Some other theorists, on the other hand, suggest that the difficulties associated with explaining and predicting emergent phenomena are insurmountable in principle. For instance, theorists of computational emergence suggest that the unpredictability of emergent phenomena arises from certain computational characteristics of emergent systems such as their so-called computational irreducibility that make their emergent features ever-unpredictable, either by us, or by any other natural intelligence (Bedau, 1997, 2008; Huneman, 2008). In the domain of physics, some theorists have suggested that the fusion of some particles can result in new (emergent) entities that are not decomposable and, thus, not explainable any more by the isolated individual constituents (Humphreys, 1997). Finally, in the domain of biology, some researchers have proposed that complex systems such as organisms are inherently indecomposable and, thus, can be correctly explained only if we go beyond their constituent parts and acknowledge their irreducible systemic characters (Shapiro, 2011; Walsh, 2015).

It is important to understand where theories of language as an emergent phenomenon stand on this debate of *in principle* vs *in practice* unpredictability and unexplainability. In general, the reasons that emergentist linguists cite for unpredictability of language are mathematical and point towards an *in principle* unpredictability of the emergent features of language. They attribute the unpredictability of emergent features to the mathematical framework that produces those features. Bates et al., for instance, write:

In an emergentist theory, outcomes can arise for reasons that are not predictable from any of the individual inputs to the problem. ... [I]t has been argued that grammars represent the class of possible solutions to the problem of mapping hyperdimensional meanings onto a low-dimensional channel, heavily constrained by the limits of human information processing (e.g., MacWhinney & Bates, 1989). Logic, knowledge and grammar are not given in the world, but neither are they given in the genes (Bates et al., 1998: 590).

Another example is Deacon (2003) who has referenced the chaotic nature of systems such as non-linguistic infrastructures and the unpredictability that follows from the so-called butterfly effect (Lorenz, 1993).

That said, unpredictability by itself, even if it is *in principle*, is not enough to capture the significance of language as an emergent phenomenon. A random pattern resulting from a random generator might be unpredictable in principle for the same mathematical reasons. Emergence of language should be something more significant than mere unpredictability. Unexplainability fares better in capturing this significance. The reason that emergentists sometimes bring for unexplainability of language, namely its indecomposability, makes language unexplainable *in principle*. If language is indecomposable by nature, then by definition, it

cannot be explained by decomposing it into its underlying non-linguistic infrastructure. For instance, Deacon (2005) refers to the failure of many attempts to reverse-engineer the formal structure of language to neurological, genetic or algorithmic infrastructures and takes this as evidence that language is not completely decomposable to lower-level non-linguistic infrastructures. Similar partial indecomposability is also highlighted by MacWhinney (2015).

Paradoxically, despite their claims of indecomposability of language, emergentists constantly try to explain language by decomposing it to non-linguistic infrastructures. MacWhinney (2002), as one example, tries to explain language by reference to various biological and social underlying mechanisms. Such reductionistic approaches are so prevalent in the emergentist approaches to language that O'Grady (2008) sees explaining language in terms of non-linguistic causes to be the unifying theses of these approaches (see his 'emergentist thesis' discussed above), and Jordan (2003) finds those approaches 'dangerously' reductionist (see the quote towards the end of Section 3.2). Considering the prevalence of such reductionist explanatory attempts in the emergentist approaches to language, we should give a very weak interpretation to many such emergentists' claims of indecomposability and unexplainability. On a weak interpretation, indecomposability of language could merely mean that language cannot be directly linked to isolated causes, and it results from multiple causes acting together with reciprocal interactions. But this weak interpretation does not make language unexplainable in principle and, accordingly, not emergent either. Arguably, almost any phenomenon of scientific interest results from multiple causes acting in complicated ways and non-emergentist, mechanistic explanations have successfully explained many such phenomena. We need more than this to justify allocating language to a special 'emergent' category.

One may underline that scientists need to go beyond traditional mechanistic approaches to explain complex phenomena and suggest that this methodological necessity shows that those phenomena are emergent. A good example is capturing complex biological links in systems biology: contrary to other approaches to biological phenomena, which are methodologically reductionist, systems biology tries to understand and explain the organismal structure and function by focusing on properties of the whole system (Kitano, 2002). Systems biology has been accordingly claimed to capture better than other approaches how language develops, and particularly how language breaks down in many clinical conditions (Benítez-Burraco, 2020). However, while some have cited the success of systems biology as evidence to support emergentism (Mazzocchi, 2011; Noble, 2008), such methodological constraints warrant emergentism only on strong interpretations (see Tabatabaei Ghomi, 2023 for an example). On alternative weaker interpretations, they are compatible with the reductionist view that biology as well as language are, in principle, decomposable to their underlying mechanisms, and ultimately to chemistry and physics.

The alternative strong interpretation of indecomposability is a promising basis for an emergentist programme, although linguists have generally not pursued this path. One problem with this alternative is that if one sticks with the reductionistic metaphysics that is prevalent among scientists, it is hard to justify that any phenomenon is indecomposable in principle. If everything is ultimately a result of physical atoms and their interactions, the view called generative atomism (Humphreys, 2016a), why would a cognition with sufficient resources not be able to decompose everything to those atoms and interactions? Atoms in this context refer to the most fundamental units of physics, whatever they are, and they do not necessarily correspond to chemical atoms as we know them. The idea is that a strong enough cognition would be able to decompose the world to the most fundamental physical units.

Hypothetically, supporters of the emergentist programme could reject generative atomism, and claim *in principle* indecomposability of language. But rejecting generative atomism detaches the emergentist programme from the mainstream scientific worldview that takes everything to be ultimately governed and explained by physics. This is a cost that most language emergentists are not ready to pay. This challenge is not peculiar to language emergentism; it is facing many

modern emergentist approaches. For instance, consider Dupré's *promiscuous realism* as a well-known emergentist view. Roughly speaking, Dupré posits that there are many ways one can 'cut' the world into legitimate, real and objectively identifiable natural kinds and, therefore, the special sciences such as biology that describe the non-physical 'cuts' cannot be reduced to physics that cuts the world in a different way. It follows that science as whole is not unifiable (Dupré, 1993, 1996). The challenge, as Ereshefsky notes, is that '[i]f ... the world is as disunified as Dupré maintains, then many current research programs are based on false metaphysics' (Ereshefsky, 1995: 143).⁴ This is not a knock-down argument against Dupré's promiscuous realism or any other emergentist view. After all, a hardcore emergentist may suggest science needs a paradigm shift in its core metaphysics. What we want to emphasise though is that those who are not ready to embrace such a metaphysical paradigm shift will have a hard time defending their strong emergentist views. This applies particularly well to the majority of language emergentists.

One possible way for language emergentists to claim indecomposability of language to atoms without rejecting the physicalist worldview is to place the locus of indecomposability and, hence, emergence in the physics itself. If physics itself warrants some sort of indecomposability and emergence, and if we can somehow connect language to that physical emergence, then claims of language indecomposability and emergence might not be physically unorthodox after all. Language emergentists' best bet here is quantum physics which, some believe, warrants indecomposability and emergence. For instance, Humphreys (1997, 2016c) has claimed that quantum physical fusions result in emergent entities that are indecomposable to their precursors before fusion. One example are the properties of electrons after they form a covalent bond, which are not decomposable and explainable in terms of their properties before that fusion. Humphreys calls this *transformational* emergence. Emergentist linguists might want to somehow connect the indecomposability and emergence of language to such quantum transformations.

Views diverge on the possibility and the correct physical and philosophical interpretation of quantum physical emergence (French & Redhead, 1988; Humphreys, 2016c; Joos, 2006; Kronz & Tiehen, 2002; Ladyman & Ross, 2007; Tegmark & Wheeler, 2001). In-depth discussion of that topic is out of the scope of this article. Let us grant, for the sake of argument, that quantum physics warrants some sort of indecomposability. Such a quantum physical indecomposability will form a basis for emergence of not only language, but everything that is built on quantum physics, which according to modern scientific reductionistic views includes everything in the world. This forms a strong basis for those emergentists who wish to establish emergence as a universal phenomenon (see, e.g., Cordovil et al., 2022). But it does not provide sufficient basis for language emergentists who seemingly claim that language belongs to the exclusive club of emergent phenomena because of its peculiar qualities. They need more than mere universal quantum mechanical indecomposability to make a particular case for emergence of language.

Perhaps one path to make a special case for emergence of language based on quantum physical indecomposability and emergence is through the sort of ideas posed by Gallistel and King (2010). Gallistel and King suggest that the brain functions similarly to a digital computer. By analysing the information processing constraints that the brain computer would face, they suggest that the computations must take place at the molecular level. Pushing this idea further, one might hypothesise that the brain is a quantum computer and language, as one output of this computer, is as instance of quantum computing. In this picture, any sort of emergence that happens at quantum physical level has the potential to directly permeate to language. The

⁴Ereshefsky is generally sympathetic to Dupré's ideas. For instance, after highlighting the point that if we accept that the world is disunified the underlying metaphysics of many research programmes would be wrong, he continues, "[o]ne area where this may be true, and where it could have dire social consequences, is the current human genome project" (Ereshefsky, 1995: 143).

problem with this line of thought is that it involves a few big steps, all of them on shaky grounds. First, as noted, the general idea that theories of quantum physics support emergence is debated (Bitbol, 2007; Castellani, 2002). Even its supporters widely disagree on the correct way to understand quantum indecomposability and emergence (Batterman, 2001; French & Redhead, 1988; Humphreys, 2016c; Joos, 2006; Kronz & Tiehen, 2002; Ladyman & Ross, 2007). Second, the claim that the brain is a digital computer faces important opposition (Penrose & Gardner, 1989). In particular, Gallistel and King's (2010) characterisation of the brain as a digital computer is criticised for not being supported by the best available evidence (Donahoe, 2010). Third, even if we accept that the brain is a computer in general, we still need additional evidence before we can accept that it is a quantum one, and in fact there are some arguments and evidence to the contrary (Litt et al., 2006; Tegmark, 2000). Finally, after all these steps, there still remains the big challenge of showing how quantum emergence in brain quantum computing permeates to language and affects its shape. The supporters of this direction have yet miles to go. They might eventually succeed, but until then, we set the idea of basing language emergence on quantum emergence aside.

Emergentist linguists may give up on indecomposability of language and take a completely different direction. They might accept that language is decomposable in principle, but contend that decomposing language to non-linguistic infrastructures would need an impossibly large amount of epistemic resource that is ever beyond human epistemic capabilities, making language unexplainable by its non-linguistic infrastructures. On this approach, emergence of language would be an instance of epistemic, as opposed to metaphysical, emergence (Chalmers, 2008; Wilson, 2021). As noted in Section 2, metaphysical emergentists see distinctive characters of the emergent as genuine, real features of emergent phenomena. Epistemic emergentists, on the other hand, regard the distinctive characters of the emergent phenomena not as their genuine features, but as side effects of our limited knowledge and epistemic abilities. As also noted in in Section 2, epistemic limitations could be deemed surmountable or insurmountable, and it is only the insurmountable limitations that provide a proper basis for a substantial theory of emergence. In the case of language, if the limitations are surmountable, language emergence would be only a passing placeholder until linguists overcome the limitations. But if they are deemed insurmountable, one would be obliged to acknowledge that language cannot ever be explained by its lower-level constituents and, thus, will remain forever *epistemically* emergent.

A linguist who wants to pursue this path should put forth arguments to establish that the epistemic barrier against decomposing language to its infrastructure and precursors is, in fact, insurmountable. For that, our linguist can draw, for instance, on computational principles falling under Chomsky's third factor. Supporters of computational theories of emergence have argued that computer-theoretic limitations put a mathematical and, hence, insurmountable barrier against full explanation and accurate prediction of emergent phenomena (Bedau, 1997, 2008; Huneman, 2012). In the same line, our linguist could say that third factor computer-theoretic limitations imposed on language guarantee that language would remain ever unexplainable and unpredictable by its infrastructure and precursors. Actually, we already saw above that some advocates of language emergence such as Bates et al. (1998) and Deacon (2003) seem to move in this direction when they cite the mathematical character of language as the reason behind its unpredictability by the non-linguistic infrastructure and precursors.

That said, computational theories of emergence are open to serious objections (Tabatabaei Ghomi, 2022). But let us suppose, for the sake of argument, that some computer-theoretic characters of language establish an insurmountable epistemic barrier that guarantees unexplainability of language in terms of its infrastructure and precursors. Under this supposition, one would find any attempts to explain language by non-linguistic infrastructures to be useless. The emergentist programme that would follow would be totally different from the emergentist programme in its present shape, or the general approach in biolinguistics, here

loosely understood as the study of the biological aspects of language. Once one accepts that language is, metaphysically or epistemically, forever unpredictable or unexplainable by its underlying non-linguistic infrastructure and precursors, one has to consequently redirect one's efforts to implement theories of language that are essentially restricted to the level of language itself. But almost all emergentists such as Deacon (2005), MacWhinney (2015) and O'Grady (2008) seem to be going in the opposite direction, as they try to explicate language in terms of its biological bases. On the other hand, if the emergentists see the unpredictability and unexplainability of language as a surmountable limitation, that is, only as a passing side effect of the current limited theories and tools of linguistics, then they are justified to stick to emergentism only until advances in our understanding of the biological (and perhaps physical too) foundations of language renders emergentism obsolete. This view diminishes the emergentist programme to a temporary palliative until reductionistic biolinguistics find the main remedy.

4.3 | Causal distinctness

One other type of independence attributed to language components is their causal or functional distinctness. In particular, in Deacon's (2003) theory of emergence, language components can do things that the non-linguistic infrastructures cannot. For example, language conveys complex thought in a way that none of its precursors and no part of its infrastructure could. To understand this causal claim more accurately, we need to take one step back from language and look at Deacon's general theory of emergence.

Deacon (2003) claims that all instances of emergent phenomena can be explained as various types of what he calls *topological reinforcement* or *amplification in pattern formation*, where amplification means recurrent superimposition of the same forms. For him, all emergent phenomena are consequences of some sort of a circular causality such as a negative feedback loop. Configurations that result from circular causality get amplified, meaning that the same topology is repeated over larger space and time scales. In some cases, the amplified topologies converge into specific attractor patterns. Deacon thinks that these patterns can have their own causal capacities beyond the causal capacities of the infrastructures and, thus, can perform unique functional roles. He classifies emergent phenomena into three levels of increasing complexity, but at the core of all these three levels are the patterns resulting from amplification by circular causal interactions (Deacon, 2007).

It is hard to construct a consistent and substantial concept of emergent causation from Deacon's various descriptions of these causes. But here are a few key points about these emergent, or, as Deacon (2007) calls them, 'configurational' causes. These causes do not originate from new fundamental physical laws (Deacon & Cashman, 2012). Rather, they originate from the particular way that matter and energy are organised (Deacon, 2003). The particular organisations, or topologies of constituents of a system, constrain the way that energy can flow in that system and give that system new causal capacities (Deacon, 2007).

On a lightweight interpretation of these causal claims, Deacon's theory would not be a theory of emergence. Think about your bicycle. The various parts of the bicycle have the causal property of being able to carry you only because they are put in a certain arrangement and design corresponding to a bicycle. If the parts were not in that arrangement, they could not carry you. Therefore, in a way, it is the topology of the bicycle that gives it the causal and functional capacities of being a bicycle. Nonetheless, what actually bears your weight and moves you around is not the topology, but the parts that form that topology. The causal capacities of a bicycle are not really above and beyond the properties of the parts of the bicycle. In fact, any system that is comprised of more than one element shows the causal capacities that it shows because of the particular way that its elements are organised. But this is not enough to claim

that the system has some configurational causal powers beyond the elementary causal powers of its parts. Applying Deacon's terminology to the case of language, if we understand new linguistic causal powers the same way that we understand the causal capacities of being a bicycle, then these putative new causal powers do not make language an emergent phenomenon. A non-emergentist linguist could not agree more that, similar to her bicycle, the non-linguistic infrastructures can have linguistic functions only when they are interacting in some particular way. But this acknowledgement does not make her subscribe to any emergentist thesis.

It is only on a stronger understanding that Deacon's theory becomes a substantial theory of emergence. On this stronger understanding, the arrangement of matter and energy in a certain topology results in properties that are completely different from the sum of the properties of matter and energy outside of that topology. Think about life, as an example. One might claim that once the biological parts get arranged in certain organismic topologies, the organism as a whole shows the property of life and its associated causal capacities such as reproduction that are distinct from the properties and causal capacities of the biological parts. Deacon's theory becomes a substantial theory of emergence only with such a strong understanding of emergent causal properties. Such a strong understanding is also more consistent with Deacon's (2003) claim that his account is an instance of ontological emergence, which can be regarded as just another term for metaphysical emergence, while in some other places Deacon seems to distance himself from such strong interpretations by emphasising that emergent causal powers are nothing but manifestations of constraints on fundamental causes (Deacon & Cashman, 2012). A non-emergentist linguist might be fine with metaphoric references to linguistic causes as theoretical placeholders. But only a truly emergentist linguist can accept those causes as properties peculiarly belonging to components of language. Therefore, with the strong interpretation, Deacon's ontological emergence can form the basis for a truly emergentist programme for language that is substantially different from non-emergentist programmes. The resulting programme will also be different from the programmes promoted by negative accounts of language emergence such as O'Grady's emergence or the MP. Unlike those accounts which emphasise the dependence of language on non-linguistic factors, the strong interpretation of Deacon's emergence promotes a programme that emphasises the independent causal and functional roles of language. Also, in contrast to the emergentist programme promoted by MacWhinney in which the concept of emergence plays no significant role, emergence sits at the heart of this alternative hypothetical programme by bestowing on language all its distinctive causal and functional capacities.

Deacon's account, however, faces important challenges, such as Kim's exclusion argument, the problem of realisers for emergent causes and (which is very relevant for our concerns here) limitations in its applicability to language. We discuss the applicability limitations and the problem of realisers in this section and leave the discussion of Kim's exclusion argument to Section 5.

Deacon promotes his theory as an all-encompassing theory of emergence. But because he takes pattern amplification to be the core source of emergence, his theory is applicable only to those cases where emergence happens because of pattern amplification. Nonetheless, many classic examples of emergence do not involve the sort of pattern amplification that Deacon associates with emergence and, thus, fall out of the scope of Deacon's theory. Game of Life (Berlekamp et al., 1982) is one such example. Game of Life is a special computer simulation setup in which a random configuration of dead (coloured white), and alive (coloured black) cells following a few simple rules, eventually evolves into elaborate structures of dead and alive cells with unexpected regularities. These structures are so conspicuous and stable that they are identified and characterised as different *species* by the community of Game of Life researchers. Game of Life species are famously used as models of epistemic (Bedau, 1997) as well as metaphysical emergence (Dennett, 2008; Wilson, 2021). Formation of Game of Life species, however, does not involve pattern amplification as described by Deacon. The role of pattern

amplification is also not clear in formation of prime real-world examples of emergence such as mental phenomena. For instance, what is the role of pattern amplification in the formation of the introspective feeling of pain? And most importantly for our present purpose, the role of pattern amplification in the emergence of language is not clear. For instance, what role does pattern amplification play in recruiting non-linguistic machineries for linguistic articulation? Therefore, it is not obvious if Deacon's theory can explain emergence of language—or that language can be truly regarded as an emergent phenomenon, should we adopt Deacon's theory as our theory of emergence.

Deacon himself does not fully clarify how his general theory of emergence applies to the special case of language. Language appears only passingly in the conclusion section of one of Deacon's (2003) older theoretical papers, and his later works that are focused on emergence of language (Deacon, 2005, 2014) are also missing a clear connection between his general theory of emergence and his views on emergence of language. These works are primarily concerned with describing various sublinguistic levels and the connections between them, but they do not clarify how the core of Deacon's theory of emergence, namely, recurrent superimposition of the same forms, generates emergent linguistic causes from these sublinguistic levels.

All that being said, let us grant, for the sake of argument, that Deacon's theory can somehow be applied to the case of language emergence. Still, an important problem is that a key feature of Deacon's theory of emergence is that he denies that emergence is about new 'things' coming into existence and claims, instead, that what emerges are mere properties, such as higher-level causal capacities and functions which result from low-level causes constrained in specific patterns: '[a]mazing new properties have been, and are being, emerged, and there is nothing new being added. There is no thing new' (Deacon & Cashman, 2012: 204). If this is true, we should then acknowledge that there is no such thing as language, only functions that are performed by language. One important function of language, or causal capacity if you like, is conveying thoughts. So, following Deacon, we should say that there exists the function of conveying thoughts as a real fact of nature, but there is no such thing called language. Eventually, we would end up with a linguistics that does not acknowledge the existence of language to begin with. Philosophically speaking, the problem here is that the emergent functions and properties cannot exist in a vacuum. They need realisers; things that show those functions and properties.

Deacon proposes a solution to this problem. He associates the emergent functions and properties with topologies, that is, the way the lower-level components are arranged. So, for him, it is the special arrangement of the infra-linguistic components, that is, their topologies, that realise the emergent linguistic functions. But taking the topologies to be the realisers of emergent causal powers has an important and potentially uncomfortable consequence that should not be ignored. Topologies are non-physical, abstract concepts. One who ascribes causal powers to topologies implicitly claims that abstract concepts can have causal powers. This is a hefty metaphysical claim with a lot of philosophical and scientific consequences that should not be overlooked. For instance, this commitment is opposed to the widely accepted view among physicalist scientists that the only causal powers in the world are those of physical matter. Ultimately, Deacon's account would no longer be compatible with the prevalent scientific materialist physicalism about causes.

A dedicated emergentist linguist can bite the bullet and reject that the only causal powers in the world are those of physical matter. Such a linguist can subscribe to the alternative metaphysics of ontic structural realism (Cordovil et al., 2022; Ladyman, 1998; McKenzie, 2017; Santos, 2015), according to which structures are real natural objects capable of exerting causal effects. One who accepts this metaphysics can safely attribute causal powers to structural topologies. But accepting ontic structural realism instead of the standard materialist physicalist metaphysics is a significant deviance from the widely held metaphysics among scientists, and

language emergentists such as Deacon do not seem to be comfortable with it.⁵ Language emergentists seem to be half-hearted when it comes to making difficult decisions that are required for constructing a philosophically coherent view of language emergence.

What if we construct a modified version of Deacon's theory by accepting, contra Deacon, emergence of language and its components as emergent 'things' and ascribing emergent causal powers and properties to those entities? Such an account would be exposed to Kim's exclusion argument (Kim, 1992, 1998, 1999), which we discuss in detail below. Before going to Kim's argument, however, we will discuss the last way that language can be described to be distinct and independent with respect to its underlying non-linguistic infrastructures, that is, their organismic life. This type of property is also exposed to Kim's exclusion argument.

4.4 | Linguistic organismic life

As noted, a final way that emergentists have described the distinctness and independence of language with respect to non-linguistic infrastructures is by ascribing an organismic life to the components of language (Frank, 2008). One of the pioneers of this view was August Schleicher, who, on top of being a linguist, was also a botanist and a gardener, and ended up merging views from all his different fields of interests by describing language as a living organism (Austin, 2021). This view has been pursued by modern theorists who characterise language components as species that behave somehow like genes or viruses (Ritt, 2004). One of the most elaborate examples is Piattelli-Palmarini and Uriagereka's (2004) description of the evolution of language morphology by reference to the corresponding details in the evolution of viruses. More broadly, language items can be seen as instances of so-called *memes*, the cultural units of Dawkins' memetic theory, which he claims spread in societies via the process of imitation, similar to how genes spread in biological populations (Dawkins, 2016). According to this organismic view, the components of language follow their own life and evolutionary dynamics. Importantly, this evolutionary dynamics of language items should not be confused with the evolutionary dynamics that happens on the biological level. The evolutionary dynamics of the diverse language species (and of language as such) happens in a linguistic ecosystem shaped by social and cognitive factors (Frank, 2008), and the fitness value in this ecosystem is determined by how well the species serves its functions: cognitive, communicative, interactional and so forth. This picture of language items (and of language) evolving in response to its environment finds support in the growing evidence that points to the effect of social transmission in shaping language features (Kirby et al., 2015) and, more generally, on the effect of the social (but also the physical) environment on language properties (Lupyan & Dale, 2016).

The question here is whether ascribing life and evolutionary dynamics to linguistic components is a metaphorical analogy or a realistic claim. Sometimes one single text reflects both understandings. For instance, Piattelli-Palmarini and Uriagereka say that '[w]e have *likened* morphology to a virus' (Piattelli-Palmarini & Uriagereka, 2004: 357, emphasis added), seemingly going towards the metaphorical understanding, but they also write, in the same article, 'natural languages are rich "objects" to which a variety of characterizations truthfully ... apply' (Piattelli-Palmarini & Uriagereka, 2004: 342), swinging to the realistic understanding. These conflicting inclinations sometimes show themselves even in one single sentence: 'we think our metaphor is productive and worth pursuing to its several interesting consequences. Indeed, there are reasons to believe that it may be more than just a metaphor' (Piattelli-Palmarini & Uriagereka, 2004: 365). The issue of realistic vs metaphorical understandings of the organismic

⁵Deacon emphasises time and again that he does not want to add anything to the physical causes as we know them. For instance, he writes: "No novel types of physical causes are evoked by this conception of emergence, only novel types of configurations and what might be described as 'configurational causes'" (Deacon, 2007: 109).

characters of language is a matter of debate (Austin, 2021), and we do not want to take sides here. So, we consider both options.

On the metaphoric interpretation, speaking of life and the evolutionary dynamics of linguistic components is merely an expressional tool. It does not show any genuine property on the language level and, therefore, it does not make language an emergent phenomenon. On the other hand, with a realistic interpretation, the linguistic life and evolutionary dynamics of linguistic components are genuine properties that are completely absent from the non-linguistic infrastructures and warrant taking language as an emergent phenomenon. Claiming that language components are real species means that they possess real organismic functions and causal capacities within the linguistic ecosystem which their non-linguistic infrastructure and precursors completely lack. These distinctive functions and causal capacities expose the emergence of language to Kim's exclusion argument discussed below.

5 | KIM'S EXCLUSION ARGUMENT

Kim's exclusion argument (Kim, 1992, 1998, 1999) is one of the most important challenges facing a wide range of different accounts of emergence. The first premise of the argument states that genuine scientific kinds are identified by their causal powers. If some kind of thing is not associated with any causal capacities, then it is not a genuine scientific kind. In the case of language, if a language component does not play any causal role, then it is not a genuine scientific kind and should be eliminated from scientific theorising. This premise of the argument might not be a big problem for some current emergentist approaches to language. As we already saw above, there are some emergentists such as Deacon who (at least on some interpretations) associate emergence with higher-level causal powers. These theories of language emergence pass through the first step of the exclusion argument. In fact, even theories that associate 'dysfunctions' to language (Piattelli-Palmarini, 1990) can pass through, as long as they associate language with whatever sort of function as a capacity to causally affect the state of the things, no matter how.

The next premise of the exclusion argument is that the lowest physical level is causally closed. This means that any lower-level physical phenomenon has an exclusively lower-level physical cause. Another premise of the argument is that any higher-level emergent phenomenon ultimately supervenes on the lowest physical level. *Supervenience* is a technical term, and it means that higher-level phenomena are necessarily realised by lower-level physical infrastructures, and there cannot be any changes in any higher-level phenomenon unless it is accompanied by a change in the phenomenon's underlying lower-level realisers. Now suppose that a higher-level phenomenon H_1 that is realised by a lower-level physical structure L_1 , causes a higher-level phenomenon H_2 that is realised by a lower-level physical structure L_2 . Because of the causal closure of the physical, L_1 causes L_2 with no input from H_1 . But since H_2 is realised by L_2 , L_1 would be causally sufficient to produce H_2 , and there is no need for any higher-level causation between H_1 and H_2 . Introducing the higher-level causation results in causal over-determination and is therefore unacceptable. It follows that the higher-level phenomenon H_1 cannot have causal powers and therefore, is not a genuine scientific kind.

The conclusion of Kim's exclusion argument is that postulating emergent entities such as language components is either unnecessary or problematic. If these components do not have any causal power, then they are not genuine scientific kinds and they are unnecessary for theorising. But if we claim that they do have causal powers, then we face the problem of causal over-determination. Going back to our main discussion, we saw above that some emergentist claims such as Deacon's emergent causes and organismic functions of linguistic elements can have two lightweight and strong interpretations. If Kim's exclusion argument is sound, then the lightweight interpretations do not add anything substantial to linguistics, and the stronger

interpretations are in conflict with the prevalent view that everything in the physical world is governed exclusively by physical causes.

Kim's exclusion argument is a general anti-emergentist argument that is facing any positive account of emergence, in linguistics or other contexts. As such, there is a vast philosophical literature on this argument from which the emergentist linguists can potentially borrow counter-arguments and formulate their responses accordingly (for some examples, see Kallestrup, 2006, and O'Connor & Wong, 2005). That being said, let us see how Deacon, as an example language emergentist, has reacted to Kim's argument.

In reaction to Kim's exclusion argument, Deacon and Cashman write:

Kim's criticism is almost certainly right, given the assumptions of this part/whole conception of causality, but rather than undermining the concept of emergence, it suggests that certain assumptions must be wrong. A number of contemporary emergence theorists have answered this criticism by arguing either that the notion of compositionality is not as simple as Kim and most eliminativists have assumed, or that the assignment of causal power to the lowest possible level of compositionality is a mistake. Determining simple decomposition into proper parts is, for example, a problem when it comes to the analysis of organism. ... With cessation of the life of the organism—that is, catastrophic dissolution of these critical reciprocal interrelationships—the components rapidly degrade as well. So their properties are in part derived from this synergistically organised higher-order dynamic (Deacon & Cashman, 2012: 197).

Despite his general attitude of clinging to physicalism, it seems that in reaction to Kim's argument, Deacon tends to adopt a stronger form of emergentism and to accept that the emergent properties such as emergent causal powers are at least partly sourced by a 'synergistically organised higher-order dynamic'. Language, therefore, could be taken to possess functions that are genuinely distinct from the causal powers of the non-linguistic infrastructures and, ultimately, the causal powers of the physical particles. This is a solid response to Kim's argument. However, the linguists who opt for such a response should be ready to accept some form of non-physicalism, which will make the resulting emergentist programme deviate from the common physicalist metaphysics of science. They should accept emergent causes that cannot be fully analysed to, and thus dissolved by, the physical causes. This is equivalent to accepting that the natural world is at least partly governed by non-physical causes which is contrary to the prevalent scientific physicalism. An ardent emergentist might be ready to accept all these consequences. In fact, this seems to be the correct choice for someone who is wholeheartedly committed to emergentism. But our review of the emergentist programme's literature suggests that many, if not most, emergentists have not adhered to, and would not be in fact ready to accept these conclusions. Despite their emergentist banner, the majority of them seem to stay fully committed to the prevalent reductionist and physicalist metaphysics of science. As O'Grady characterises their thesis, emergentists think that language is best explained by reference to more basic non-linguistic infrastructures. They are not ready to adopt a fully emergentist position that regards language as an irreducible, metaphysically distinct phenomenon. In fact, on some occasions they explicitly denounce such a full force emergentist approach. Even Deacon (2003: 274), for instance, writes, '[t]he concept of emergence probably has gained its worst reputation when it has been used in a primarily negative sense—to point to something missing in reductionistic explanations'. Philosophers such as Sober (1999) have been wary of this kind of half-hearted emergentism and have pointed out that physicalist anti-reductionists who hold that the only inherent causal powers are those of the physical lower-level are anti-emergentists at heart, no matter what they say. We showed that this kind of half-hearted emergentism does not add much to linguistics. And on the other hand, by clarifying the corollaries of wholehearted emergentism, we showed that it is probably not an attractive alternative for many language emergentists.

6 | CONCLUSIONS

In this paper, we examined the concept of language emergence in linguistics and neuroscience as a special case of scientific deployment of the concept of emergence. We discussed various philosophical challenges to different understandings of the concept of language emergence along with some possible solutions to those challenges. Although we focused on the emergentist programme within linguistics, one can generalise many lessons drawn to emergentist programmes in other disciplines.

Through our analysis, we repeatedly came to junctions where one could adopt a strong or a weak understanding of the concept of emergence. We saw that on weak understandings, the emergentist programme would not be that different from non-emergentist programmes. It is on the strong understandings that the emergentist programme finds its unique character, but that unique character comes at a hefty cost. Adopting strong stances on language emergence comes with consequences such as accepting causality of abstract concepts, endorsing non-physicalism or rejecting physical causal closure. Emergentists may well accept these consequences and in fact, this will contribute to developing a philosophically coherent theory of emergence. However, a programme based on such views would deviate from the physicalist reductionistic metaphysics held by the majority of the scientific community. Obviously, scientific facts and truth in general are not determined by majority vote and so the strong emergentist choices cannot be ruled out simply because they are not popular. Nonetheless, our review shows that many who hold the banner of language emergentism would probably avoid choosing those options.

A hypothetical ardent language emergentist who chooses to pick the strong options has two choices. One choice is to let go of the common physicalism and opt for a programme based on metaphysical emergence. The other choice is to opt for a programme based on epistemic emergence and regard language as epistemically ever-unexplainable by its non-linguistic infrastructure. We argued that both the metaphysical and the epistemic approaches would result in a kind of hypothetical emergentist programme that is different from the current so-called emergentist research and the general trends in linguistics, and biolinguistics and neuroscience of language more specifically. Such a hypothetical programme would be in the opposite direction to what O'Grady suggests as the unifying theme of all current so-called emergentist approaches, which is the claim that the phenomena of language are best explained by reference to non-linguistic factors. Such a hypothetical emergentist programme would either take the linguistic components to have independent irreducible metaphysics of their own, or take explaining them in terms of their underlying non-linguistic bases to be forever beyond our epistemic capacities. A programme with such theoretical commitments would focus on explaining language in terms of linguistic laws and regularities, acknowledging that those laws and regularities themselves will remain forever unexplained by reference to their underlying non-linguistic factors. The resulting programme would involve much less reductionistic mechanistic explanations, and much more holistic descriptions.

Language emergentism in its current form, as much as it deviates from a purely technical claim towards a philosophical position, wants to keep the reductionistic physicalist metaphysics untouched, and at the same time embrace emergentism. Our close analysis of the programme, however, shows that such a hybrid is not viable. We showed that there are junctions where one has to choose between emergentism or reductionistic physicalism, and those who want to go both ways end up nowhere. The core lesson of our analyses that guides this conclusion can be summarised in the following adage: Half-hearted emergentism is expendable. Wholehearted emergentism is expensive.

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