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Book Review: Impossible Languages

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Impossible Languages, written by the Italian linguist and neuroscientist Andrea Moro (2016), takes a new look at the biological foundations of language and explores what makes human language distinct from any other communication system—the “fingerprint” of human language, as the author puts it. The book is divided into 11 chapters and, together with the list of references and an index at the end of the book, contains a total of 145 pages.

Moro begins his book by arguing that the ultimate goal of linguistics is to define the class of possible human languages, and then he poses two main questions to be addressed in the book: “Do impossible human languages exist at all? What is a language made of

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that there can be an impossible one?” (p. 1). The author then goes on to say that by posing this issue, we have in fact raised a twofold question—a formal question (related to rules) and a physical one (related to matter)—, and the aim of this book, he maintains, is to focus on both sides of this question and to eventually argue for their possible unification.

The notion of “impossible” for languages, however, is difficult to formulate. As the author points out, in biology, for instance, it is relatively easy to imagine an impossible animal—for example, an animal that produces more energy than it absorbs, or an animal that can have indefinite growth—, because all living beings are constrained by physical laws, such as entropy or gravity. With regard to languages, however, “it is hard to think of a physical law or an equivalent of a physical law that would make a language impossible” (p. 3). Moro discusses some historical views about the nature of human language, noting that the hypothesis that there may be impossible languages has not always been considered a plausible one within the Western tradition, and in fact, except for some speculations by medieval philosophers such as Roger Bacon, a very different view prevailed for centuries: that there are no impossible languages, simply because there are no formal principles to which languages must adhere; they can follow any conceivable rule, freely and without any limits (p. 3). At the end of Chapter 1, the author states that in his book he examines evidence for the hypothesis that impossible human languages exist and shows how the very concept of impossible languages has helped shape research in the field.

Chapter 2 addresses the unique way in which a first language is acquired by children, described as one of the distinguishing properties of natural human languages. In this regard, we know that, despite all the differences in languages, all children acquire their language(s) in

more or less the same amount of time; and this simple fact can help identify and define a possible human language: A possible language is one that is naturally and spontaneously attainable by every child in (more or less) the same amount of time, independently of all other (emotional, social, historical, environmental, etc.) conditions, and in the absence of specific pathologies (p. 14). Moro refers to the child's mind as a "stem mind" that is "potentially able to specialise in any human language" (p. 15).

The author points out that these facts about first language acquisition in children lead to only one possibility: that, contrary to what appears, all human languages do share a common structure. This theory is well in line with the assumption that human languages are manifestations of biological restrictions, just as analogous systems have been discovered to be so in other fields. As an interesting example of such analogous systems, Moro talks about immunology. He describes that an important turning point in understanding how antibodies are formed has been the assumption that the immune system is similar to language acquisition: instead of generating an ad hoc response every time an antigen enters the organism, nature has provided humans with a huge repertoire of different types of antibodies. Some of them may never play an actual role—that is, if they never encounter a disease they can prevent—but some are already gathered in our bodies to allow the immune system to function and react quickly, as was first suggested in the seminal work of Niels Jerne (Jerne 1985). Moro argues that the same thing happens with languages, and that Jerne was in fact inspired by Chomsky's theory, as is clearly evident in the title of Jerne's Nobel speech: "A Generative Grammar for the Immune System". Just as we are designed to acquire many more languages than those we encounter—and, more broadly, more languages than will ever be spoken on our planet—, so we are

designed in such a way to neutralise many more antigens than those we really encounter. In both cases, we cannot defend ourselves from this invasion, whether it is of antigens or sentences; “just as our body cannot help but react to an antigen, so it cannot avoid understanding a sentence it is exposed to, once it has been endowed with the code to decipher it” (p. 19).

In Chapter 3, the syntactic structure of human languages is likened to a tapestry: If we look at it on the surface, it appears like a simple sequence of words arranged next to each other in a linear fashion. But if we can look at it from behind, we find a hidden and complex structure that connects the words from a distance. Thus, the structure of syntax, and the relationships and dependencies within sentences, are such that a mere linear sequence is not sufficient for its representation and description; and given that linear order is a one-dimensional space, so it can be said that “no syntactic phenomenon can be explained without referring to a two-dimensional space” (p. 25). In this chapter, Moro refers to two characteristics of the syntactic architecture of human languages: First, that part of a structure may have the same architecture as the whole structure; second, syntax can generate infinitely large structures. These two distinct characteristics are referred to as “quasi-autosimilarity” and “recursion”, respectively (p. 26). It is argued that this specific way of combining discrete elements infinitely, via recursion, is one of the core aspects of human language syntax and one that has never been found in the communication code of any other animal. The author states that, in this sense, when we look at the structure of a sentence in a human language, we may come to the strange analogy with snowflakes: Minimal components, combined with simple rules that are applied recursively, create very complex geometric patterns. The major difference with respect to snowflakes is that sentences must undergo

a process of linearisation that turns the hierarchical two-dimensional structure into a flat linear one (p. 28).

In Chapter 4, the author points to the fact that in different languages, for any given set of words only a very small number of combinations among its potential sequences are acceptable, arguing that another way to define a possible human language is through understanding why not every combination of words is acceptable (p. 34). Through providing case studies, Moro refers to two important properties of human language syntax: First, there is a sieve that filters out several types of dependencies of which (the sieve) we are not directly aware; second, the effects of this sieve cannot be explained by appealing to logical reasoning or common sense; rather, one has to rely on formal grammatical notions such as complement or adjunct to explain them (p. 36). It is argued that the existence of such an “unreasonable sieve”, which selects from potential dependencies only those that comply with certain configurational constraints, is surprising not only because this sieve is inaccessible to our immediate introspection, but also because it is based on the only phenomenon inaccessible to our senses—i.e., hierarchy. Moro concludes that “whatever impossible languages are, their properties do not seem to match any obvious computational reasoning based on communication; rather, they obey a different computational reasoning, hidden in the human mind, which demands further exploration yet may lie forever beyond the reach of our understanding” (p. 40).

The next chapters of the book, based on what has been presented in previous chapters on the basis of theoretical and formal dimensions, deal with how the difference between possible and impossible languages can be examined on an empirical ground as well. In Chapter 5, the author, referring to “Lenneberg’s problem” in disputing the idea that languages are made of arbitrary and cultural conventions

(Lenneberg 1967), notes that Lenneberg believed that there was sufficient evidence based on clinical observations of pathologies to prove such an assumption wrong. In view of that, in this chapter, Moro aims to go even further and show that “there is now sufficient neurobiological evidence to support the hypothesis that the distinction between possible and impossible languages is reflected in the way our brain works or, in other words, that the boundaries of Babel are not just arbitrary, cultural conventions, without necessarily referring to pathologies” (p. 45). Moro points out that our advantage over Lenneberg’s time is twofold: First, we can rely on a refined notion of syntax (specifically, on the notion of recursion); and second, relying on new technologies, we now have new empirical access to the brain’s activity that does not require pathology (p. 46).

In order to address Lenneberg’s problem, it is argued, we need to examine whether some of the main properties that lead to the distinction between possible and impossible languages induce differential activity in the brain that cannot be described as arbitrary, cultural or conventional. Moro presents the results of a number of experiments that compared the brain’s function during the learning and processing of possible and impossible linguistic rules (the latter referring to made-up rules with rigid dependencies based on the position of words in a linear sequence). These experiments had convergent results: The brain distinguished between the two types of rules—recursive versus linear (non-recursive) rules—as it turned out that Broca’s area reacted differently to them. Thus, this conclusion is inevitable that, since we have no control over the brain’s circuit activity, it is hardly possible to claim that language rules are made of arbitrary and cultural conventions; hence, Lenneberg’s claim in favour of a biological interpretation of language structure is supported here (p. 57).

Chapter 6 deals with the issue of syntactic representations (in tree diagrams) and their ontology and level of abstraction. Regarding the alleged abstractness of syntactic representations in linguistics, Moro raises the question of whether any other empirical science provides less abstract representations of the way their object of study is structured. As an example, he refers to the so-called solar representation of the structure of atoms in physics (also known as the *Rutherford-Bohr model*), and the fact that we now know that quantum physics has radically altered this representation. Nevertheless, he argues, “this representation is an attempt to capture the results of experiments in a unified, synthetic (and telling) way.” (pp. 62–63). In this chapter, the author points out that neuroimaging techniques have allowed us to make empirical arguments that link the representation of a syntactic tree to neuropsychological processes in the brain, and goes on to describe two of these experiments. At the end of the chapter, it is concluded that syntactic representation is important for at least two reasons. The first reason has to do with its synthetic power: A tree representation captures a set of properties in a formal way that would otherwise need a much longer description. The other reason for the importance of syntactic representation lies in its deductive-heuristic value. As is also the case in other disciplines, especially in physics, formal representation may suggest generalisations that would otherwise go unnoticed or would at least be much more difficult to see (pp. 68–69).

Chapter 7 addresses the source of order in language and compares the syntax of language with other areas of human cognition. There are some cognitive competencies in humans that have much in common with syntax, such as mathematics and music, which are briefly discussed in this chapter. Moro points out that in these areas, too, we have a formal system that generates an infinite set of structures

through combining discrete elements in a recursive manner; in other words, “discrete infinity is shared by these three domains.” (p. 73). Although there are some similarities between the syntax of language and music, and neuroimaging studies have also shown the involvement of Broca’s area in music, the linear nature of music signals is a complex matter: Music is in fact linear when only melody is concerned, but it is not so when it comes to harmony. Harmony includes the possibility of two independent and different melodies being simultaneously processed as they happen—what is referred to as *counterpoint* in music—and thereby conveying a unique meaningful and complex content (p. 74). However, language is different in this respect, because the human mind is not able to process two simultaneous sentences: Unlike in music, in language there is no possibility for a harmony in which two sentences could be combined and interpreted simultaneously; in language, we are faced with melodies. Mathematics also has different characteristics in terms of its cognitive status. While it can be argued that mathematical computation and basic arithmetic require linearity, their notation can certainly be two-dimensional, as in calculus or linear algebra matrices (p. 74). Outside the domains of music and mathematics, Moro refers to recent proposals suggesting a link between syntax and other cognitive domains and discusses in particular two distinct lines of research, both of which rely on an extension of Giacomo Rizzolatti’s mirror neuron theory.

Chapter 8, “The Sound of Thought”, explores what happens to electric waves in our brains when we produce a linguistic expression without emitting any sound, citing results of experiments done by means of the so-called awake surgery method. The main results obtained in these experiments show that, unexpectedly, the shape of the electric waves recorded in a non-acoustic area, such as Broca’s

area, when linguistic expressions are being read silently, retains the same structure as that of the mechanical sound waves of air that would have been produced if those expressions had actually been uttered. Thus, the two families of waves (electric and mechanical) where language is physically present are closely related to each other; “so closely in fact that the two overlap independently of the presence of sound” (p. 92). Therefore, it can be concluded that the acoustic information is not added later, when a person needs to communicate with someone else; rather, it is part of the code from the beginning, or at least before the sound is produced.

Chapter 9 aims to conceive of a neurobiological structure that allows the human brain to acquire, manifest, and use language in the same way a neurobiological structure allows for other capacities, such as the sensory capacities to see and hear (p. 99). Moro compares the question of why syntactic rules are the way they are to the one faced by future archaeologists finding an electronic keyboard with a QWERTY layout. These archaeologists might be curious about what led to the QWERTY layout on the keyboard, as the alphabetical order would provide a better-known and more common way of arranging letters. With a brief reference to the history and reason for the formation and use of the QWERTY layout on the keyboard (having to do with early mechanical typewriters), Moro maintains that the reason behind this layout will probably be unknown to future archaeologists and will therefore pose an enigma to them. It is argued that if we adopt the same view about language, we can consider the structure of human languages, similarly to the QWERTY layout on the keyboard, to be merely a case of “kataptation” (Moro 2013): That is, “there is a feature, selected for reasons unknown, which does resist disappearing, even if it is no longer useful, even if the function it was selected for has been abandoned or has become completely irrelevant and no new

function is born or manifested by that feature.” (p. 103).

Chapter 10 deals with artificial languages. Moro points out that although the temptation to create a better language—or the hope of creating one—has never actually led to desired results, it has always provided an interesting laboratory of ideas, because to long for a better language one must first realise in what ways the already existing possible languages have failed. This chapter gives a general classification of the reasons behind creating artificial languages based on their goals and domains of application. Moro argues that two major aspects of artificial languages are relevant to the distinction between possible and impossible languages: first, “the tension between expression and thought”; and second, “the facilitation of communication” (p. 108). In the rest of the chapter, through presenting some examples and case studies, these related aspects of artificial languages and their comparison with natural human languages are discussed.

Chapter 11, the final chapter, wraps up the discussions and arguments made throughout the book. In this chapter, the author propounds that language can be thought of as the big bang for *Homo sapiens*, and that exploring it will tell us important things about ourselves (p. 120). Moro argues that the theoretical and empirical challenges related to the exploration of language have changed dramatically since the idea of impossible languages was adopted as a guideline for research; but the real challenge, he asserts, does not pertain to an object; rather, it pertains to us; as “we are part of the data.” (p. 122).

In summary, *Impossible Languages* is written in a succinct and easy-to-follow style, focusing on what makes human language distinct from any other communication system. Throughout the different chapters, the author presents interesting theoretical and empirical arguments in favour of a biological interpretation of language

structure and the rules governing it—in line with a Lennebergian view—which include some of the latest findings from neuroscience studies over the past two decades. In parts of the book, as briefly mentioned above, the author compares the exploration of language with studies of other empirical sciences (in particular, physics and biology) and provides examples of empirically more tangible phenomena to help better understand the nature of the study of language and the methodological considerations surrounding it. In the second half of the book, Moro presents results of experiments performed on the brain—by means of the latest neuroimaging techniques and the so-called awake surgery method—that reveal unique characteristics of human language syntax. In fact, presenting the results of such experiments is one of the merits of the book, as these experiments could form the basis and inspiration for further research in the field and contribute in turn to a better understanding of the biological foundations of human language.

References

- Jerne, N. 1985. The Generative Grammar of the Immune System. *Science* 229, 1057–1059.
- Lenneberg, E. 1967. *Biological Foundations of Language*. New York: Wiley.
- Moro, A. 2013. *The Equilibrium of Human Syntax: Symmetries in the Brain*. New York: Routledge.
- Moro, A. 2016. *Impossible Languages*. Cambridge, MA: MIT Press.