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## The Human Linguistic System Engenders Creativity Through Recursive Operations

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Every human language has, at its core, a common engine for generating the structures that shape the linguistic expressions. This engine is referred to as “Universal Grammar,” and various models of it have been proposed since the 1950s when this way of looking at human language came into being through the works of Noam Chomsky. In the most recent instantiation, it is believed that there are two primary components to the engine:

- Binariness
- Recursiveness

These two components interact with each other to imbue the human linguistic system with the potential to generate unique and potentially infinite structures, endowing it with the power of creativity.

Binariness is found in the most fundamental operation of language, called Merge, which takes two linguistic elements (words or phrases or even parts of words), and merges them into a two-member set with a particular internal structure. The Merge operation makes strong predictions about what is possible and what is not possible in human language. It explicitly prohibits a three-member set. So, for example, the phrase *the big apple*, which is composed of three elements, (1) *the*, (2) *big*, (3) *apple*, would not have the three-member structure of *the-big-apple*, but rather, the structure is (*the (big apple)*), where *big* and *apple* first combine to form a two-member structure (*big apple*), and this single structure then combines with *the* to form another two-member structure. Using a variety of empirical tests, we can show that this structural analysis is the correct one. It has even been shown that a conjunction such as *John and Mary*, which appears obviously to be a three member set, in fact isn't. The conjunction *and* first combines with *Mary* to form the two-member set (*and Mary*), and this combines with *John* to form the structure (*John (and Mary)*). Again, there are tests to show this. We also predict that there should not be a one-member set. If there appears to be a one-member set, it must be that there is a “silent” element that combines with the pronounced member to form a two-member set. It is there, but it just isn't pronounced. A great deal of work in the past twenty years has been devoted to the study of these silent elements in human language, called *empty categories*. From this Merge component of the Universal Grammar, the creative aspect emerges with the potential of combining elements in novel two-member combinations, a potential we see realized often in the infant's ability to come up with imaginative utterances.

Recursiveness refers to the fact that the operation of Merge may take place without limit, making it possible to produce a potentially infinite structure that adheres to the two-member set structural description. The only reason why we don't hear infinitely long sentences in use is due to factors external to Universal Grammar, such as memory

**limitation, social etiquette, and so forth. Recursion contributes to the creative nature of human language by allowing a variety of structures big and small to be built.**

**One interesting consequence of viewing human language as described above is that, contrary to appearance, human language does not appear to exist primarily for communication. Although it is used for this purpose, binarity and recursiveness do not necessarily lead to an optimal design for communication. For example, we saw that recursiveness leads to infinite structures, which obviously would not be felicitous for communication. If not for communication, what could be the primary purpose of the human linguistic system? One possibility is that it is to represent human thought in some nontrivial sense. In that regard, and as pointed out by Noam Chomsky recently, when we reflect on everyday language use, it is a fact that the vast majority of the time, we use language in our own head instead of communicating with others. If this is anyway on the right track, we have a picture of human creativity that finds one underpinning — there are others — in the specific design of the human language composed of binarity and recursiveness.**