Recursion. How did it evolve?

“It was a dark and stormy night. The crew said to the captain, “Captain, tell us a story.” The captain said to the crew, ‘It was a dark and stormy night …”

-A story from popular culture

Recursion: What is it?

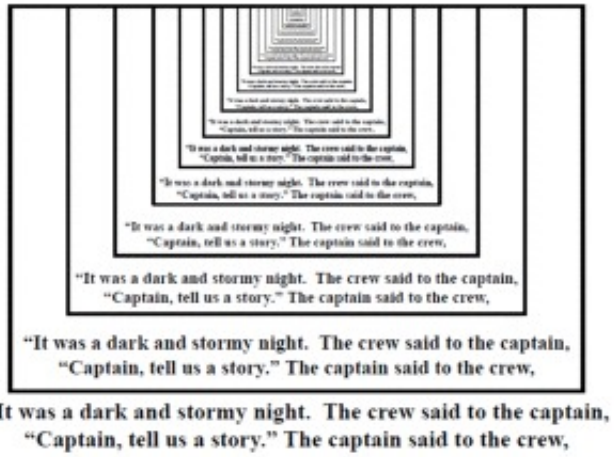

Fig. 1. An example of recursion

The topic of recursion causes considerable debate in the discipline of linguistics, the latter of which is the study of language and its structure. One simple definition of recursion is the previous story (Fig. 1): It is a story embedded within a story. Also, notice that the form of this story could repeat over and over (and over). Recursion can also be a phrase placed beside or embedded within another phrase. For example, “I said, I’m sorry!” Notice that the phrase, “I’m sorry!” could stand alone as an apology. However, in this case, the phrase “I said …” has been placed in front of the apology, and it somehow modifies the intent of the original phrase. Perhaps the apologizer is trying to emphasize the depth of the sorriness of his or her apology, or maybe has apologized before to no avail, and so has added, “I SAID…” to make the apology stronger and more persuasive. Regardless, the previous dark-and-stormy-night story and the form of this apology are both examples of recursion. The debate about the nature of recursion, in part, arises from its origins: mathematics, formal logic, and computer science. In those fields, recursion requires a way to shut itself off (called a *terminating condition*), and the parallel to a terminating condition in language analysis is unclear and debatable. Thus, at the outset of discussions of recursion, it must be admitted that there is no single, universal definition of recursion. It will vary according to one’s discipline, and it will even vary within the field of linguistics.

Recursion: Who has it?

Another source of controversy comes from the issue of who has recursion. American linguist Noam Chomsky and his colleagues claimed that only modern humans possess the ability to think and speak recursively. Chomsky also claimed recursion should be recognized as the hallmark of modern language. With regard to these claims, more linguists probably agree with Chomsky than disagree with him. He and his colleagues proposed that there are two general forms of language: A broad form of language that includes all kinds of communication, and thus, might include animals and insects; it would include very early forms of human communication that might have been spoken by the 3.3 million year old Lucy (*Australopithecus afarensis*) and her ancestors and descendants. The second form of language, according to Chomskyites, is narrower, only modern humans have it (in the last 100,000 years), and it contains recursive phrasing. In this case, the controversy arises because Chomsky and his colleagues claim that this second form of language did not evolve from the broader forms (also called *protolanguage*). They claim that modern language appeared suddenly in one human about 100,000 years ago and spread rapidly: In other words, modern language did *not evolve*; it just appeared suddenly. They also claim that the original purpose of this second language form was *not* communication. These latter two claims have little or no basis in modern genetics or evolution, nor do they have any support from any modern experimental human or animal language or communication studies.

Recursion: How did it evolve?

Most linguists, however, do believe that language evolved from earlier forms of communication for the purpose of expressing one's thoughts and intentions to others. They believe that recursive phrasing may have helped us be diplomatic ("I wonder if you would mind terribly moving over one seat, so that I could sit beside my wife"), persuasive ("I said, I'm sorry"), or make flexible plans for the future ("If it rains tomorrow, let's make spears. If it doesn't, let's go hunting). In short, recursion may have helped us adapt and survive in a variety of social and environmental conditions, and it is likely that natural selection favored brain mechanisms that helped support recursion.

Publication

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