Dessalles, J.-L. (2004). About the adaptiveness of syntactic recursion - Commentary on F. Newmeyer: 'Cognitive and functional factors in the evolution of grammar'. *Coevolution of Language and Theory of Mind*. Interdisciplines: electronic conference.

About the adaptiveness of syntactic recursion (1)

Jean-Louis Dessalles 21 mars
2004 16:20 UT

In his stimulating paper, Frederick Newmeyer suggests that syntactic abilities evolved to serve cognitive purposes that are decorrelated from any communicative function. He identifies six features of grammar that he finds hard to explain if, as commonly supposed, syntactic abilities were designed to make communication optimally efficient. Among them, the ability to form recursive structures through language is claimed to be motivated by internal cognitive efficiency only.

The facts mentioned in Newmeyer's paper are disturbing and owe precise examination. The author's global position, if accepted, would undermine several efforts to reduce the paradox of language emergence during human evolution: since Monod (1970), several authors considered the hypothesis that human-specific thinking processes were a consequence of communication (e.g. Bickerton 1995). If Newmeyer is correct, we must account for two evolutionary unlikely events instead of one, and explain (1) why human ancestors did evolve enhanced cognitive abilities (while other primates did not); (2) why human beings did find a sudden advantage in communicating their enhanced thoughts to genetically unrelated conspecifics.

Since much is at stake here for those who want to understand what brought our species to existence, Newmeyer's arguments about the maladaptiveness of syntax for communication are worth studying. For the sake of concision, we will only examine the case of recursion.

A communicative function for recursion

The ability to form embedded phrases is a universal feature of human languages. Since there is always an alternative way to express the same content, Newmeyer concludes that recursion is a property of our mind rather than a requirement of communicative efficiency. We suggest the exact opposite. As analysed in (Dessalles 2000), syntactic embedding is used to connect predicates through variable sharing. The following sentence:

(1) Mary brought the book about Iran that her brother gave to her. can be glossed as:
(2) bring(Mary, x) & book(x) & subject(x,Iran) & give(y,x,Mary) & brother(y,Mary)

We may think of some extinct hominid species that evolved the ability to express thoughts that way, through simple unembedded clauses connected through variable sharing, as in (2) which computer scientists may regard as a Prolog program. This is not the evolutionary pathway that our lineage followed. We use a *semantic linking principle* that forces two syntactically connected phrases to share one variable. This avoids the burden of having to repeat variable names (Mary brought a thing; that thing is a book; someone gave that thing to Mary; etc.) and it makes the code more compact.

Recursion has a function: it gives a new role to predicates. The main predicate in a sentence expresses a thought for argumentative purposes. In (1), the good news is expressed through the primary predicate bring(Mary,x). The main predicate is what is really meant, what is offered to the addressees' critique (in the case of argumentation) or to their appraisal (in the case of event report). Thanks to recursion, other predicates can be introduced to *determine* arguments. These satellite predicates are expressed in (1) through the words book, about and give. They help addressees determine what x refers to in the scene. The satellite predicate expressed through brother helps them determine a supplementary argument introduced by give.

This function of recursion is purely communicative! There is no point for a human individual to determine predicate arguments for herself. When you have a thought, it is fully instantiated. Only when you want to make it public for other individuals, is the apparatus of recursion necessary. The author of utterance (2) wants to express an instantaneous thought, the good news that Mary brought that object he has in mind. He can't merely say "Mary brought it", since addressees won't be able to reconstruct what "it" refers to. In order to make his utterance intelligible to the audience, he strings satellite predicates in a recursive way until equation (2) is thought by him to be solvable by interlocutors.

If what precedes is correct, then a central feature of syntax, the ability to embed phrases in a recursive way, appears to be a communicative adaptation rather than a purely internal device.

Recursion and cognition

Some authors claim that the ability to form genuine (i.e. centrally embedded) recursive structures emerged by chance in our lineage, and that this new ability found a fortuitous use in the way we structure our linguistic utterances (Chomsky 1975; Hauser, Chomsky & Fitch 2002). Newmeyer's position undoubtedly opposes this extreme claim, but it still considers that the ability to embed linguistic structures is not motivated by communicative efficiency. If this were the case, then we could rightfully wonder why the tree-like branching of phrases happens to be a nice engineering solution to the problem of argument determination.

Our point is not to claim that recursion isn't a cognitive property. We do hold predicates in a mental stack until their arguments are considered sufficiently constrained for interlocutors. This cognitive device not only drives the generation of embedded phrases, but also generates larger portions of discourse, where sentences are connected to each other through anaphoric links. Our point is that even the very existence of this mental recursive ability, which is responsible for actual linguistic recursion, is only motivated by communicative requirements. The reason for this, again, is that predicate arguments are always internally instantiated when a thought is experienced. The various cognitive devices used to determine predicate arguments evolved for the purpose of making internal thoughts somewhat available to others. Linguistic recursion is one of these devices.

An unavoidable consequence is that human syntactic abilities are elements of an interface. This interface achieves the great task of establishing a link between separate minds. We suggested elsewhere that the human-specific part of our cognition, namely the ability to form genuine predicates (Dessalles & Ghadakpour 2003), was itself designed by natural selection to serve communication (Dessalles 2000).

Conclusion

The hydrodynamic efficiency of dolphins is a marvel of nature in the eye of engineers. Similarly, engineers dealing with automatic natural language processing acknowledge the complexity and efficiency achieved by human language. Despite the alleged maladaptiveness of grammar (Lightfoot 2000), no convincing suggestion was yet been made concerning syntactic universal aptitudes that could unequivocally improve their efficiency. Newmeyer's observation that syntactic structures are often ambiguous may be a problem, but as the author says, the vast majority of these ambiguities disappear in context. Moreover, their systematic suppression may have bad consequences on code compactness.

Previous papers in this conference considered the possibility that advanced cognitive abilities such as the ability to read others' mind could have granted conceptual powers to our ancestors, who subsequently began to talk to each other. Newmeyer's observations, by claiming that communication is of subordinate importance in determining syntactic abilities, comforts the idea that human cognition was shaped independently of language. By insisting on the essential role that syntactic recursion plays for making human communication possible, we want to suggest that the sequence of evolutionary events may have been quite different.

Bibliography

Bickerton, D. (1995). Language and human behavior. London : UCL Press.

Chomsky, N. (1975). Réflexions sur le langage. Paris : Flammarion.

Dessalles, J-L. (2000). Aux origines du langage - Une histoire naturelle de la parole. Paris : Hermès. http://www.enst.fr/~jld/papiers/pap.evol/99111703.html

Dessalles, J-L. & Ghadakpour, L. (2003). "Object recognition is not predication - Commentary on Jim Hurford: 'The neural basis of predicate-argument structure'". Behavioral and Brain Sciences, 26(3), 290-291. http://www.ling.ed.ac.uk/~jim/BBSNEURO/dessalles.html

Hauser, M. D., Chomsky, N. & Fitch, W. T. (2002). "The faculty of language: what is it, who has it, and how did it evolve ?". Science, 298, 1569-1579.

Lightfoot, D. (2000). "The spandrels of the linguistic genotype". In C. Knight, M. Studdert-Kennedy & James Hurford (Eds), The evolutionary emergence of language: social function and the origins of linguistic form. Cambridge : Cambridge University Press.

Monod, J. (1970). Le hasard et la nécessité. Paris : Seuil.