Recursion and the Language Faculty

12. NLK, Braunschweig, 4./5. März 2010

Sven Kotowski/Holden Härtl
Universität Kassel
Institut für Anglistik/Amerikanistik, Linguistik
Why do we find such long sentences in many languages?

He went to the house by the lake in the woods south of the city.
The putative necessity of a recursive syntax in natural languages

Language in generative grammar:

1. A limited number of symbols
2. A limited number of rules
3. The possibility to recursively apply rules

If a grammar has no recursive steps [...] it will be prohibitively complex [...] If it does have recursive devices, it will produce infinitely many sentences. (Chomsky, 1956: 115-116).
What is the role of syntactic recursion in human language?

- Is syntactic recursion a linguistic universal?

- Is recursive structure building hardwired in the human language faculty / a genetic endowment?

**Conclusion:**

- necessary distinction between the description of recursive structures and recursively operating processes
- semantics need to be taken into account when analyzing recursive surface structures
1. Recursion as a general principle

2. Recursion in syntactic theory

3. Conclusion
Recursion as a general principle

• Core feature: all recursive instances include some form of self-embedding or nesting
• Sameness condition (e.g. a story within a story within a story); potentially infinite

(Hofstadter, 1979)
Recursion in non-linguistic fields

The *Droste effect* on Droste’s cocoa boxes

Self-similar structure of a *Romanesco* broccoli
General descriptive account of recursive structures

[[category x_n]...[[category x_3] [[category x_2] [category x_1]]]]
Computational perspective on recursion

Natural numbers

a  1 = [1]
b  2 = [[1]+1]c  3 = [[[1]+1]+1]

Recursive function

1. Base case: 1 ∈ N
2. Recursive Clause:
   For any element x in N, x + 1 is in N
3. Extremal clause:
   Nothing is in N unless obtained from 1. and 2.
Two different notions of recursion

Intermediate conclusion:
1. a descriptive account of a certain structure that identifies recurring, nested categories
2. a computational definition that regards processing mechanisms as such as recursive
Recursion in syntax

1. \[ A \rightarrow B \; C \]
2. \[ C \rightarrow D \; A \; (B \; C) \]

John knew Einstein discovered relativity theory.

\[ \begin{align*}
    a. \quad S & \rightarrow \quad NP \; VP \\
    b. \quad VP & \rightarrow \quad V \; S \\
    c. \quad VP & \rightarrow \quad V \; NP \\
    d. \quad NP & \rightarrow \quad N
\end{align*} \]
Recursion in different syntactic constructions

• multiple genitive constructions:
  John’s mother’s car’s engine.

• In multiple relative clauses:
  The dog that fought the cat that chased the mouse that hid behind the sofa.

• In propositional complements with verbs of speech and thought:
  John believed that Carla was aware that Pete claimed that Kate doubted...
Semantic relevance of recursive structures

Recursive structures have a SEMANTIC core:

- Reference:
  
  specification of one ultimate referent via increasing embedding depth; only one truth value (Arsenijević/Hinzen, 2010; Parker, 2006)

- Conceptual structures:
  
  underlie syntactic recursion and can be best captured in recursive terms themselves (Heine/Kuteva, 2007; Hurford, 2004)
Recursion vs. iteration

Iteration does not display this semantic core:

• yields flat output structures – there is no embedding depth, but repetitive sequences are on the same depth level as the first instance
• is based on mere concatenation:

a. Peter, Jane, Tom, and Judy went to the cinema.

b. Peter went to the cinema and Judy did the dishes.

(Heine/Kuteva, 2007)
Recursion as a linguistic universal?

Reportedly recursion-less languages:

- Pirahã does not display any recursive surface structures due to cultural constraints
- Recursion, therefore, cannot be a linguistic universal

(Everett, 2005)
Minimalist assumption of recursion underlying all syntactic structures

- if non-recursive structures are also generated by recursive processes, this claim is not contradicted by the existence of languages without syntactic surface structures

- recursion could then again be argued to be the central component of the human language faculty / a linguistic universal

(Hauser, Chomsky & Fitch, 2002)
Recursion in Minimalism / Bare Phrase Structure

• Any syntactic structure is generated recursively, independently of phrase structure
• Sameness condition is fulfilled by the notion of an abstract category ‘SYNTACTIC OBJECT’:

\[
\text{Tom loves Jane} \\
\text{Jane (syntactic object)} \\
\text{loves Jane (new syntactic object)} \\
\text{Tom loves Jane (new syntactic object)} \\
\text{(Chomsky, 1995/2007)}
\]
Is everything recursive then?

By means of choosing an appropriate category, any hierarchical structure can be described in recursive terms:

Category: geometrical object
• Recursive surface structures seem to directly map to recursive conceptual structures
• We need to distinguish between recursive structures and recursive processes – only a form of the latter seems appropriate as a candidate for linguistic universality
• Any syntactic structure can be claimed to be recursive as long as you get the categories right – the presupposition of Bare Phrase Structure is necessary

- Assumptions on recursion as a genetic endowment, therefore, are entirely theory-driven
THANK YOU!
Literature:

• Pinker, Steven & Ray Jackendoff (2005). The faculty of language: What’s special about it? *Cognition* 95, 201-236