

Autonomous Syntax and Compositionality: the bane of linguistics?

Andreas van Cranenburgh¹, October 17, 2008

Essay proposal for Language & Cognition course, University of Amsterdam

Contents

1	Research question	1
2	Elaboration, projected contents	1
2.1	Autonomous syntax and syntactocentrism	1
2.1.1	Processing autonomy: modularity	1
2.1.2	Representational autonomy: levels of description . . .	1
2.2	Principle of Compositionality	3
2.2.1	Formal semantics	3
2.2.2	Connectionist approaches	3
2.2.3	Construction and Cognitive Grammar	3
2.3	Methodological considerations: false dichotomies	4
2.3.1	Competence versus performance	4
2.3.2	Internalist versus externalist perspectives	4
3	Expected conclusion	5
4	Bibliography	5

1 Research question

Is the notion of autonomous syntax and its semantic counterpart, compositionality, philosophically tenable for a plausible syntax-semantics interface?

2 Elaboration, projected contents

2.1 Autonomous syntax and syntactocentrism

There exist at least two definitions of autonomous syntax:

processing autonomy Syntax is an independent module with input and output to other modules.

representational autonomy Syntax is an autonomous level logically distinct from phonology and semantics.

¹andreas@unstable.nl

It does not seem anyone still subscribes to the first version, namely the fanciful notion that syntax is a completely independent module handing over parse trees to some kind of semantic interpretation module. Counterexamples to such a hypothesis are numerous, such as the archetypical “eager to please” versus “easy to please” — where the former yields a different interpretation of “please” from the latter, active versus passive. Furthermore, the modularity of mind is at odds with the brain’s plasticity and the fundamental interconnectedness of the brain’s structure.

The second version, representational autonomy, is more pervasive in modern linguistics, yet this position also has its detractors, chiefly among proponents of Construction Grammar (eg., Tomasello 2003) and Cognitive Grammar (eg., Langacker 1998). They are able to deny this position by claiming that a grammar is a pairing of utterances with meanings, without a clear separation between syntax, semantics and pragmatics. They argue that all linguistic forms have a conceptual basis (though this basis can be very abstract).

This is opposed to interpretive semantics espoused by many generative grammarians, where grammar is taken to be a pairing of phonetics and semantics, ie., *meaning* in a narrow sense, ignoring connotations. Semantics would be derived from deep structure in parallel to derivation of syntax. Such a view amounts to positing an actual homomorphism between syntactic structure and semantic interpretation.

Generative linguistics, especially in the earlier syntactic structures and aspects period (Chomsky 1957, 1965) depends on a supposedly clear distinction between syntactic and semantic well-formedness. Without specifying where this difference lies Chomsky claims that a native speaker’s judgment will suffice to establish in which of these two dimensions any given mistake lies; that some kind of rule has been broken is assumed *a priori*. It should be noted that Chomsky’s famous example sentence, “colorless green ideas sleep furiously” is more often than not mischaracterized as being an argument for the irrelevance of semantics. In fact he was arguing that “the notion of [the probability of a sentence] is an entirely useless one, under any known interpretation of this term” (Chomsky 1969, p. 57). He devised a sentence which certainly was not part of any corpus or ever heard by anyone, and argued that, its novelty notwithstanding, a native speaker effortlessly recognizes it as syntactically grammatical. This was supposed to prove that statistical models of language (ie., Markov models) were hopelessly inept at explaining language. Other researchers have since claimed to have falsified this particular instant of the argument by showing that the probability of the sentence “colorless green ...” using a newspaper corpus is actually 20.000 times more likely than its ungrammatical, reversed version with a

Hidden Markov Model (Pereira 2000)². To summarize, there appears to be no clear distinction between syntax and semantics, and the single-minded emphasis on syntax is not warranted.

2.2 Principle of Compositionality

A natural counterpart to autonomous syntax is the principle of compositionality:

“The meaning of a complex expression is a function of the meanings of its immediate syntactic parts and the way in which they are combined.” – (Krifka 1999)

In a trivial sense this principle is necessarily true, if it is granted that language produces an infinity of meanings given a finite vocabulary and syntax. The strict version, that nothing else but syntax and lexical semantics determine the meaning of a sentence, however, is demonstrably false. Counterexamples are idioms with limited applicability, as well as anaphora and indexicals whose meaning depend on context.

This principle has been applied by Montague (1973) to develop a formal semantics for a fragment of English, by many accounts the most rigorous and elegant formulation of semantics to date. His approach is to augment a formal syntax with a semantic interpretation. The result is a Categorical Grammar that transforms a fragment of English into First-order Logic using the Lambda Calculus. Problems arise with arbitrary numbers of adverbial clauses, because the so called “meaning postulates” (which map words to predicates, connectives or quantifiers) need to be specified *a priori*, with a fixed number of (possible) arguments. An alternative is to use Davidsonian event semantics, which lets adverbs modify events (reifying them in the process!).

In general Formal Semantics substitute a narrow emphasis on syntactic rules with a focus on both syntactic and semantic rules, without reconsidering the insistence on rules. However, regularities in language are not sufficient to prove that actual rules are being followed.

Problems for compositionality arise through polysemy: how can mere structure determine *which* meaning of a polysemous word should make up the meaning of a sentence? It seems that this is determined by the shifting context wherein a sentence occurs, which compositionality should abstract over. Lakoff (1987) rejects compositionality and argues that polysemy can be explained by radial categories: concepts with more than one center of gravity.

²On a more humorous note, there has been a competition to embed the famous nonsense sentence into meaningful verse, yielding (arguably) semantically plausible interpretations, albeit in a poetic sense, see <http://www.linguistlist.org/issues/2/2-457.html#2>

Another problem is even more basic: what is the meaning of a word? For concrete nouns and some verbs this seems sufficiently clear, one can refer to real world examples or specify necessary and sufficient conditions. Yet abstract nouns and other grammatical classes pose a problem. Jackendoff (1983) concedes these problems, and all but approaches a theory of prototypical concepts but wholly ignores sentence level integration³.

A different approach is to acknowledge that only complete sentences have stable meanings, which implies one should infer the meaning of words from their effect (syntactic, semantic and pragmatic) on example sentences (Brugman 1988). So instead of the principle of compositionality where words contribute to the meaning of a sentence one is left with the notion that words constrain the possible meanings of a sentence, not in a part-whole relation but in an abstract-specific relation.

From a connectionist perspective, Chalmers (1990) argues that maintaining compositionality means that a connectionist model could merely re-implement a classical symbolic theory; which is a favourite attack of Fodor & Pylyshyn (1988) against connectionism. Instead Chalmers presents a connectionist model that is able to perform syntactic transformations on distributed representations, which carry their meanings hollistically, without the need for extracting them as a separate step.

2.3 Methodological considerations: false dichotomies

Orthodoxy versus Orthopraxy: Theory without practice,
practice without theory

By attacking radical interpretation, Chomsky (2000) puts up a straw man bent on merely studying empirical phenomena. Whereas any theory must, by definition, attempt to offer a consistent and complete account of that which it is about, arguing that it should completely abstract over situations and social contexts is the other, equally misguided extreme. It is not that the dichotomy of competence and performance is necessarily flawed, but a linguistic paradigm cannot begin to claim that it has explained the former without clarifying or even incorporating the latter. Yet this is exactly what generative linguistics claim to be inevitable. By rigging the debate with a false dichotomy of empirical and theoretical approaches generative linguistics needlessly polarizes the field, which can unfortunately lead to both sides dismissing each other's results.⁴

³This mistake, focussing on words and neglecting sentential meaning has been made since time immemorial, cf. Locke and Leibniz; often it is even claimed that words must refer to objects!

⁴Compare the split between hydraulics and fluid mechanics in the 18th century: the former observing phenomena which could not be explained, the latter explaining phenomena which could not be observed, according to a humorous depiction by Nobel Laureate Sir Cyril Hinshelwood (cited in M.J. Lighthill (1956), "Physics of gas flow at very high

Another strange and narrow focus is that on an internalist perspective of semantics. An internalist (eg., Chomsky 1986) claims that meaning must be derived from causal connections to other parts of a system (eg., modules in a mind); this implies that meaning is only *in the mind*. An externalist (Putnam 1975) claims that meaning can only be derived from external reality, because there has to be a *division of linguistic labor* if words are to acquire an established meaning.

3 Expected conclusion

Linguistics would benefit of reconciling different approaches to language and integrating various results, be it theoretical or empirical, into a more coherent and less counter-intuitive whole. Autonomous syntax and the principle of compositionality clearly impede this reconciliation; they are thus liable to being rejected. Semantics should be a first-class citizen of a yet to be devised *intellectual* theory of everything.

∞

4 Bibliography

Brugman, Claudia (1988), “The Story of Over: Polysemy, Semantics and the Structure of the Lexicon.” New York: Garland.

Chalmers, David J. (1990), “Syntactic Transformations on Distributed Representations,” *Connection Science*, Vol. 2.

Chomsky, Noam (1957), “Syntactic Structures,” The Hague : Mouton.
— (1965), “Aspects of the Theory of Syntax,” Cambridge, MA: MIT Press.
— (1969), “Quine’s Empirical Assumptions, in Words and objections. Essays on the work of W. V. Quine,” ed. Donald Davidson and Jaakko Hintikka, pp. 53–68, D. Reidel, Dordrecht
— (1986), “Knowledge of Language, Its Nature, Origin and Use,” NY: Praeger.
— (2000), “New Horizons in the Study of Language and Mind,” Cambridge: Cambridge University Press.

Davidson, Donald (1985), “Adverbs of Action,” in Vermazen and Hintikka (eds.), 1985.

Krifka, Manfred (1999), entry on “Compositionality,” in *The MIT Encyclopedia of the Cognitive Sciences*, eds. Robert A. Wilson and Frank Keil.

speeds”. *Nature* 178: 343)

- Fodor, Jerry & Pylyshyn, Zenon** (1988), "Connectionism and cognitive architecture: A critical analysis," *Cognition* vol. 28, pp. 3-71
- Jackendoff, Ray** (1983), "Semantics and cognition," Cambridge, MA: MIT Press.
- Langacker, Ronald** (1998), "Conceptualization, symbolization and grammar," In Tomasello, Michael. 1998, "The New Psychology of Language: Cognitive and functional approaches to language structure," Mahwah, NJ: Laurence Erlbaum.
- Montague, Richard** (1973), "The Proper Treatment of Quantification in Ordinary English," reprinted in "Formal Semantics: The Essential Readings," by Paul Portner, Barbara H. Partee, eds.
- Pereira, Fernando** (2000), "Formal grammar and information theory: together again?", *Philosophical Transactions of the Royal Society* 358(1769): 1239-1253.
- Putnam, Hilary** (1975), "The meaning of 'meaning'," in *Language, Mind and Knowledge*, ed. K. Gunderson
- Tomasello, Micheal** (2003), "Constructing a Language. A Usage-Based Theory of Language Acquisition," Cambridge MA: Harvard University Press.