



Introduction

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April 20, 2007

In its simplest and possibly most widespread form the principle of semantic compositionality can be captured in one sentence: *The meaning of a compound expression is a function of the meanings of its parts and of the way they are syntactically combined.*

The principle of compositionality is often attributed to the logician Gottlob Frege (although the question whether Frege believed in it throughout his scientific work has been debated). In the basic form quoted above it occurs in virtually every introduction to truth-conditional semantics in linguistics. However, after many years of discussion it has also become clear that the content and value of the principle for linguistics depends to a large extent on its technical formulation in the context of precise linguistic theories and concrete analyses. One of the earliest and most influential implementations that combined mathematical explicitness of a grammar with a concrete analysis was given by Richard Montague in his theory of universal grammar. It is this version of the principle that has subsequently often dominated the more mathematically oriented discussion in the linguistic literature.

There are at least four factors that keep the question concerning the status of the principle of compositionality from being settled: (i) we find an increasing diversity of mathematically precise and successful grammar frameworks with different syntax-semantics interfaces, (ii) there is growing interest in the development of grammars with desirable computational properties, (iii) a large number of substantially different lines of research in formal semantics have evolved, and, last but not least, (iv) our understanding of natural language has been improved by increasingly more sophisticated linguistic analyses of subtle semantic and pragmatic facts about meaning. These developments have led to new answers to old problems, but also to new questions. Despite, or perhaps because of, the multiplicity of perspectives we observe that the principle of compositionality has repeatedly served as a compass needle to get an understanding of the relations between different formal systems or to identify interesting empirical domains.

Looking at current work in semantics, we see all possible attitudes towards the principle of compositionality represented. On the one hand, there are strong research traditions in which the requirement that a good semantic analysis be compositional is central. There also are research areas in which the principle of compositionality tends to be neglected or ignored in favor of other research interests (much of the literature on applications of computational semantics belongs here). Scholars in these areas seem to take an agnostic and possibly indifferent position towards the principle. In other very lively research communities such as constraint- or unification-based grammar frameworks, the question of the relationship of semantic representation theories to the principle of compositionality has hardly been addressed with mathematical rigor, although proponents of these frameworks might welcome results which show that the syntax-semantics interface can be defined compositionally.

In the call for papers for this volume, we tried to address all of these research communities:

“Compositionality has been a key methodological theme in natural language semantics. Recently, a number of innovative systems for combinatorial semantics have been proposed which seem not to obey compositionality at first sight. Such systems are based on unification, underspecification, linear logic, categorial grammar, variable free semantics, extensions of Montague Grammar, dynamic semantics, and Tree Adjoining Grammar, to name the most prominent research areas. The motivation behind these systems is often computational in nature, but the mechanisms they employ also provide new insights and analytical alternatives for outstanding problems in the combinatorial semantics of natural languages. These include scope ambiguities, multiple exponents of semantic operators, cohesion, ellipsis, coordination, and modifier attachment ambiguities.”

The papers which are collected in this special issue approach the overarching theme of compositionality from different theoretical angles, with varying methodological assumptions, and on the basis of diverse data. Their focus is on particular empirical challenges which are tackled with a variety of analytical tools in a variety of frameworks.

Bonami and Godard's contribution discusses the analysis of parentheticality at the syntax-semantics interface, focussing on French evaluative adverbs such as *bizarrement* ('oddly'). The issue is to model the fact that parenthetical content can appear syntactically embedded and its scope depends on its syntactic position. Nonetheless, the adverb is interpreted outside the main content, on which it provides a comment. They show that previous accounts, while addressing many of the crucial properties of evaluatives, fail to account for their semantic embeddability. They propose an analysis within Head-driven Phrase Structure Grammar (HPSG), and their semantic theory is based on a modified version of Minimal Recursion

Semantics, which is widely employed in HPSG. In this framework, parenthetical content can be ‘set apart’ from the main semantic composition and interpreted at a higher level. The tight integration of syntax and semantics provided by HPSG allows the authors to introduce appropriate interface constraints on where the parenthetical content can take scope.

The paper by **Ebert, Endriss and Gärtner** investigates a special class of relative clauses in German. The authors show that integrated verb second relative clauses (IV2) exhibit a semantic behavior which cannot easily be reconciled with an analysis that is based on a semantics driven by the syntactic structure of attaching the IV2 relative clause to a matrix clause. They argue that the relevant structure for the semantics is not syntax but information structure. IV2 clauses only combine with a certain class of quantifiers. Those quantifiers lead to an information structure in which the matrix clause is topical and the IV2 relative clause contributes a comment. The semantic contribution of the topical material ends up in the restrictor of the quantifier, whereas the comment is in its nuclear scope. The authors conclude that the truth-conditional semantics of the construction is determined by its information structure rather than by the syntactic rule which combines the relative clause with the matrix clause, defying the traditional notion of a compositional syntax-semantics interface.

Egg points out that compositionality often presupposes a notion of opacity in that the combination of the meaning of subconstituents of a syntactic expression into the meaning the whole expression must be blind to the inner structure of the subconstituents. However, examples like *John’s former car* and *a beautiful dancer* do not show such a direct 1-1 mapping between (surface) syntactic and semantic structure. Instead, the semantic contributions of the syntactic subconstituents are intertwined in the meaning of the whole expression. Consequently, opacity seems to be too strong a restriction on semantic construction. Egg argues that the more relaxed notion of compositionality advocated in the framework of Constraint Language for Lambda Structures, which relinquishes opacity, allows semantic construction from the syntactic surface even if there is no direct 1-1 mapping between the two. In particular, it allows a constituent to refer to only a part of its syntactic sister constituent. This property is the key to account for the problematic cases mentioned above.

Han discusses the syntax and semantics of pied-piping in English relative clauses from the perspective of the framework of Synchronous Tree Adjoining Grammar (STAG). The basic lexical elements of Tree Adjoining Grammar are elementary trees. They are combined by two operations, substitution and adjunction, to form larger syntactic units. The process of substituting and adjoining trees is recorded in the derivation tree, and the derivation process leads to a derived tree structure. STAG extends the basic units of Tree Adjoining Grammar by taking elementary trees to be pairs of lexical

syntactic trees and semantic term trees. The derivation of the syntactic tree structure proceeds in parallel to the derivation of a semantic tree structure, using synchronized substitution and adjunction operations to produce the syntactic and semantic derivation and derived structures simultaneously. The paper shows that STAG's conception of the syntax-semantics interface leads to a straightforward compositional analysis of pied-piping constructions in English without appealing to otherwise unmotivated intermediate steps such as the syntactic reconstruction of the pied-piped material at an abstract syntactic level.

In the last contribution, **Solstad** investigates the behavior of the German causal preposition *durch* ('by', 'by means of', 'through'). In combination with a causative predicate, *durch* simply contributes additional information concerning the causing event in the causal relation expressed by the predicate. When combined with a non-causative change of state predicate, however, *durch* may also introduce such a causal relation by itself. The paper demonstrates that this varying contribution of *durch* poses a challenge to formal semantic analyses which apply standard composition mechanisms such as functional application. Solstad presents an alternative formalism based on recent developments in Discourse Representation Theory which includes unification as a mode of composition as well as a more elaborate analysis of presuppositional phenomena. He further argues that the analysis can be restated in pragmatic terms, providing an argument for presuppositions applying solely to the sentence-internal level.

With just five papers discussing possible architectures of the syntax-semantics interface and problems of compositionality, the present special issue can only provide a glimpse at current research in these areas. It is all the more remarkable that these five papers succeed in illustrating all four factors which we listed at the beginning of this introduction – the factors that keep the question concerning the status of the principle of compositionality open and relevant.

This volume has its roots in the workshop *Empirical Challenges and Analytical Alternatives to Strict Compositionality*, which was held as part of the *17th European Summer School in Logic, Language and Information (ESSLLI)* in 2005 at Heriot-Watt University in Edinburgh, Scotland. The papers by Egg, Bonami & Godard, and Ebert, Endriss & Gärtner, are extended versions of their workshop contributions. The articles by Han and by Solstad are new papers not presented at the workshop.

We would like to use the opportunity to thank all the reviewers for their work and their valuable contributions. The reviewing committee consisted of Gosse Bouma, Regine Eckhardt, Markus Egg, Graham Katz, Fritz Hamm, Wilfrid Hodges, Theo M. V. Janssen, Laura Kallmeyer, Albert Ortman, Adam Przepiórkowski, Ingo Reich, Roland Schäfer, Mark Steedman,

Henriëtte de Swart, Zoltán Szabó, and Thomas Ede Zimmermann. Janina Radó helped with proofreading, formulations and countless creative suggestions. Many thanks are also due to Ruth Kempson for suggesting to us to put this volume together in the first place, for her constant encouragement and support during the entire editing process, and for her patience with delays and many organizational questions.

Frank Richter and Manfred Sailer
Tübingen and Göttingen, April 2007