1 Introduction: compounds and their meaning

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When we consider a compound such as *steamship*, we have two types of information that can be used to find out the meaning. On one hand, we have the meaning of the components, *steam* and *ship*. These components are words, which makes it relatively easy to determine what their meaning is in other contexts. On the other hand, we have the relation between the two components. This relation is not overtly expressed and determining it is a central question in the semantics of compounding. In section 1.1, I describe how this question was treated in early generative approaches. They constitute the background for the three frameworks at the basis of the present volume. Section 1.2 introduces each of these frameworks and places them in their historical context. These frameworks are presented by their initiators in Chapters 2–4. Section 1.3 presents the other chapters, explaining how the data they discuss and the theoretical assumptions they make fit in with the general theme of the volume.

1.1 RDPs and Variable R

In the history of generative grammar, the question of the semantics of compounds was caught up in what Newmeyer (1986) called the “Linguistic Wars”: the conflict between generative semantics and interpretive semantics. An important difference between the two sides was the place they attributed to semantics in the architecture of grammar. In generative semantics, the semantic representation was the starting point for syntactic processing. The syntactic level of Deep Structure had been merged with the underlying semantic representation. In interpretive semantics, the semantic representation was derived from a syntactic representation by means of interpretation rules. Originally, this syntactic representation was Deep Structure, but with the introduction of trace theory, the relevant aspects of Deep Structure were also visible at Surface Structure.

When we look up *steamship* in *COED* (2011), we find the definition in (1).

(1) a ship that is propelled by a steam engine
The oldest generative account of compounds, Lees (1960), assumes that steamship and phrases such as (1) have the same Deep Structure. This means that all the information represented in (1) has to be present in the Deep Structure of steamship. The transformations that produce (1) maintain information that is deleted in the process of deriving steamship.

In the discussion of early generative grammar, it was soon realized that a grammar in which transformations could delete content words such as propel or engine in (1) would be too powerful. Katz and Postal (1964: 81) give the example of (2a).

(2) a. John is reading.
   b. John is reading a book on morphology.
   c. John is reading an inscription on a tombstone.

As Katz and Postal note, (2a) is not indefinitely ambiguous and cannot mean the same as (2b) or (2c). They propose a “constraint on transformational derivations” (1964: 81), which makes it impossible to derive (2a) and (2b) from the same Deep Structure. It does not exclude deletion transformations, but a deletion transformation must state explicitly what is deleted, so that the material from the Deep Structure can be recovered. In the case of (2a), the deleted material must be a pro-form corresponding to something or it. Chomsky (1965: 144–145) also adopts this constraint.

As a side effect of Katz and Postal’s constraint on deletion in transformations, it is no longer possible to maintain that steamship and the paraphrase in (1) have the same Deep Structure. When we reject this type of phrasal origin of compounds, we need a different way of accounting for their meaning. The crucial part of the meaning is the relation between the two components. This is the part for which the deleted material in the corresponding phrase was invoked. For this component of the meaning, three factors can be used as a basis, as listed in (3).

(3) a. The semantics of the components.
   b. The semantics of the compounding rule.
   c. Information added in the lexical entry when it is lexicalized.

In the case of steamship, (3a) means that we can use the information that ship refers to a means of transport that needs a force to get moving and that steam can refer to a source of energy that can be used to run an engine. In addition, for (3b) we can use the knowledge that in many compounds [N1 N2], N1 indicates something that is used by N2, e.g. windmill, machine translation, handbrake. Finally, for speakers who have steamship in their mental lexicon, there may be additional information stored with the expression. For me, steamship evokes the image of an ocean liner.
Levi (1978) offers an account of the semantics of compounding that is still referred to as a benchmark today. She uses all three of the sources in (3), but with a particular emphasis on (3b). Cases where (3a) is used to determine the relation between the components include verbal compounds such as *taxi driver* and compounds such as *car thief*. In both cases, there is a verb in the underlying Deep Structure. In Levi’s generative semantic framework, *thief* has the same Deep Structure representation as *stealer*, so that *steal* is available for the interpretation of *car thief* in the same way as *drive* in *taxi driver*. Levi (1978: 167–172) gives four separate nominalization rules, depending on the relationship of the meaning of the compound to the meaning of the predicate. They are listed and exemplified in (4).

(4)  
\[
\begin{align*}
\text{(a)} & \quad \text{Act} & \quad \text{dream analysis} \\
\text{(b)} & \quad \text{Product} & \quad \text{oil imports} \\
\text{(c)} & \quad \text{Agent} & \quad \text{taxi driver} \\
\text{(d)} & \quad \text{Patient} & \quad \text{student invention}
\end{align*}
\]

In (4), it is important to note that the relation expressed by *Act* and its alternatives is not the relation between the two components, but between the verb and the entire compound. Thus, in (4a), *dream analysis* is the act of analysing dreams.

Cases where lexicalization as in (3c) plays an essential role are all those cases that appear in the lexicon with a specialized meaning. Levi (1978: 10, 236) gives examples such as *eggplant* and *honeymoon*.

Levi’s (1978) theory is referred to mostly because of the way she implements a solution for activating (3b) while still observing Katz and Postal’s (1964) constraint on transformations. As Katz and Postal (1964) allow named elements such as *it* or *something* to be deleted in the derivation of (2a), Levi (1978) proposes a range of so-called *recoverably deletable predicates* (RDPs) to characterize the relationship between the two components of a compound. In her system, there are nine RDPs. Three of them can be used in an active or passive interpretation, doubling the number of readings they generate. The RDPs are listed with an example in (5).

(5)  
\[
\begin{align*}
\text{(a)} & \quad \text{CAUSE}_1 & \quad \text{tear gas} \\
\text{(b)} & \quad \text{CAUSE}_2 & \quad \text{drug deaths} \\
\text{(c)} & \quad \text{HAVE}_1 & \quad \text{picture book} \\
\text{(d)} & \quad \text{HAVE}_2 & \quad \text{student power} \\
\text{(e)} & \quad \text{MAKE}_1 & \quad \text{honey bee} \\
\text{(f)} & \quad \text{MAKE}_2 & \quad \text{daisy chain, chocolate bar, student committee} \\
\text{(g)} & \quad \text{USE} & \quad \text{windmill} \\
\text{(h)} & \quad \text{BE} & \quad \text{chocolate bar, pine tree, queen bee, student friend} \\
\text{(i)} & \quad \text{IN} & \quad \text{field mouse, government employment, winter sports}
\end{align*}
\]

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1 Examples are taken from Levi (1978: 280–283). Where Levi distinguishes subtypes, one example from each subtype has been selected, so as to illustrate the intended range of meanings.
If we now consider a new compound, e.g. *crisis book*, it will have twelve possible readings, corresponding to the twelve RDPs in (5). Some of these are more likely than others, but all are equally possible. For a new compound with a deverbal head, e.g. *crisis writer*, the four readings with *write* as the predicate are additional to the twelve RDP-based readings. Some of the readings can overlap, as the double occurrence of *chocolate bar* in (5f) and (5h) demonstrates, but as long as all possible readings are accounted for, this is not a problem.

The problems associated with Levi’s (1978) system of RDPs are well known. Ten Hacken (1994: 44–49) gives an overview. A first problem is that the description of the meaning by means of RDPs is highly impoverished. The three examples in (5i) represent rather different relations between the compound and the non-head element. The RDP for is particularly vague. It indicates purpose, but in most cases the purpose needs specification of a predicate to be understood properly. A well-known example of this underspecification is the contrast between *headache pills* and *fertility pills*, where the pills are intended to achieve opposite effects with respect to what is indicated in the non-head.

A second problem is the way RDPs exploit the polysemy of the corresponding English words. An example of a predicate where this is obvious is *have*. Levi (1978: 281) gives examples such as (6).

\[
\begin{align*}
\text{(6) a. picture book N}_2 & \text{ contains many (or only) N}_1 \\
\text{b. apple cake N}_2 & \text{ whose special flavour is caused by N}_1 \\
\text{c. gunboat N}_1 & \text{ mounting N}_2 \\
\text{d. colour television N}_2 & \text{ representing images including N}_1 \\
\text{e. fruit tree N}_2 & \text{ on which N}_1 \text{ grows} \\
\text{f. cream sauce N}_2 & \text{ based on N}_1 \\
\text{g. college town N}_1 & \text{ in which an N}_2 \text{ is based} \\
\text{h. bear country N}_2 & \text{ where N}_1 \text{ live}
\end{align*}
\]

The paraphrases I give in (6) indicate that it is rather unlikely that in other languages, all these would be placed together. If we take ‘possession’ as the basic reading of the RDP, at least (6b), (6d) and (6f) do not fit. For the others, the type of possession is rather different from one example to the next.

A third problem is that the RDPs do not cover all compounds. As mentioned above, for compounds such as *eggplant* and *honeymoon*, Levi (1978) claims that they are lexicalized. At the other end of the spectrum, there are what Downing (1977) calls *deictic compounds*. These are compounds with a contextually clear meaning that identifies an object rather than naming a concept. Downing gives the well-known example of *apple juice chair*. The meaning
'chair with a glass of apple juice in front of it' is much more specific than RDPs can express, although it could plausibly be grouped under (6). Other difficult cases include lifeboat ('boat for rescuing people’s lives’) and Downing’s earthquake school (‘school that is safe for earthquakes’). Levi might claim they can be characterized by for, but they stretch the meaning of this already vague RDP. At least for earthquake school, it would be awkward to resort to lexicalization, because Downing actually gives it as an example of a newly formed compound. Also lifeboat, however, is much less obviously lexicalized than eggplant or honeymoon, because it is a boat related to life.

A fourth problem is that the system of RDPs leads to a large number of non-occurring meanings. For our initial example, steamship, Levi’s theory predicts that it can have twelve meanings corresponding to (4). They are listed in (7).

(7) a. CAUSE1 % the ship causes steam
   b. CAUSE2 # steam causes the ship
   c. HAVE1 % the ship has steam
   d. HAVE2 # steam has the ship
   e. MAKE1 % the ship makes steam
   f. MAKE2 & steam makes the ship
   g. USE % the ship uses steam
   h. BE & the ship is steam
   i. IN & the ship is in steam
   j. FOR & the ship is for [V-ing] steam
   k. FROM & the ship is from steam
   l. ABOUT # the ship is about steam

In (7), I used three symbols to indicate the status of the paraphrases. The # symbol indicates that (to my mind) the paraphrase does not make any sense. The & symbol indicates a reading that is possible, but does not correspond to the actual interpretation as in (1). There are five such meanings. The % symbol indicates a description that covers part of the meaning. There are four readings marked %, but none of them is a particularly good description of the actual meaning.

As described in ten Hacken (2009), the most important reason why Levi’s (1978) system was such a favoured aim for attacks was probably that it is based on generative semantics. However, the problems sketched here demonstrate that also independently of this background it cannot be considered a satisfactory account of the meaning of compounds. Allen (1978) proposes an alternative based on two principles, which I paraphrase here as (8) and (9).

(8) IS-A Condition:
    If [X Y]Z is a compound, Z is a Y.

(9) Variable R Condition:
    If [X Y]Z is a primary compound, the relationship between X and Y is variable. The meaning of Y makes a number of slots available and X may fill any of these slots that is compatible with its own meaning.
The condition in (8) is based on a much older observation that compounds are headed (cf. Bloomfield 1933: 235; Marchand 1969: 11). As Allen (1978: 105) states, it is “purposefully ambiguous between syntactic and semantic interpretations”, so that *steamship* is both a countable noun (like *ship* but unlike *steam*) and a type of ship.

The condition in (9) is an alternative to Levi’s RDPs. When we consider the three factors in (3), (9) represents a clear shift of emphasis from (3b) to (3a). Instead of an elaborate mechanism of RDPs connected to the rule of compounding, Allen (1978) uses the meaning of the components as the source of the relation.

There are two aspects of (9) that should be emphasized. First, (9) makes it possible to describe the relation much more precisely than RDPs. *Ship* has as one of its slots an indication of which power it uses for moving. This slot can be filled by *steam*. In this way, the description of the relation is much more specific than in (7).

A second observation is that (9) still assumes a degree of ambiguity in the relation. *Ship* opens a number of slots. One is for the source of power. As such, *steamship* contrasts with *sailing ship* and *diesel ship*. Some other slots are indicated by the examples in (10).

(10) a. cargo ship, container ship, passenger ship, slave ship  
    b. hospital ship, cruise ship, school ship  
    c. pirate ship, merchant ship, Viking ship

In (10a), the non-head indicates what is carried, in (10b) it describes the function of the ship, and in (10c) it specifies the owners. Whereas (9) excludes an interpretation of *steamship* along the lines of (10b) and (10c), because *steam* is not a possible service or owner, it does not exclude a reading parallel to (10a). We can only exclude such a reading by using our world knowledge, which tells us that there is no point in transporting steam by means of a ship.

In this way, (9) can be seen as an improvement on the RDP approach. Whichever set of RDPs is proposed, it will always have some of the disadvantages indicated for Levi’s (1978) system. However, for a theory based on (9) to realize the advantages in practice, it needs to be accompanied by a theory of slots. Allen (1978) does not provide such a theory, nor any reference to one. As indicated by ten Hacken (2009: 73–77), the development in generative morphology was rather away from the question of determining the relation of the components in primary compounds. Thus, Selkirk (1982) concentrates on syntactic aspects of compounding, giving rewrite rules and feature percolation mechanisms. Semantic aspects of compounds that cannot be accounted for by such mechanisms are ignored.
1.2 Three frameworks for the semantics of compounding

The main motivation for this volume is that new frameworks have emerged which promise a more sophisticated account of the semantics of compounding than Levi (1978) and Allen (1978) are capable of. The volume is based on three frameworks in which the semantic aspect takes an important or even central role. In Chapters 2–4, they are presented by their initiators: Ray Jackendoff, Rochelle Lieber and Pavol Štekauer.

Jackendoff’s (2002) Parallel Architecture (PA) is a framework that is intended to cover all aspects of language. As explained in ten Hacken (2007: 253–258), Jackendoff adopts a number of central assumptions of Chomskyan linguistics, but diverges from this model in other respects. The most important difference in the context of this volume is the place of semantics with respect to the system of language.

Whereas Chomsky assumes that language is first of all syntax, in PA, syntax is considered one of three parallel representations of an expression. As opposed to, for instance, generative semantics, neither in Chomsky’s nor in Jackendoff’s models is semantics treated as a representation that underlies syntax. However, for Jackendoff, semantics is modelled in a conceptual structure that is linked to phonological and syntactic structures by means of interface rules. This means that the three representations can mutually inform each other. In both Chomsky’s and Jackendoff’s models, semantics is outside of language. However, in Chomsky’s model, syntax is the unambiguous starting point for the derivation of linguistic expressions, whereas in PA, conceptual structure is connected to phonological and syntactic structures in such a way that the information flow is in both directions.

A striking feature of Jackendoff’s (2009, 2010) system for representing the meaning of compounds is the use of predicates that remind one of Levi’s (1978) RDPs. As explained in Jackendoff’s chapter in this volume, his basic functions are not meant as a replacement of RDPs. They are just one component of a much more sophisticated system that accounts for the semantics of compounds by exploiting general properties of conceptual structure and the meaning of the components of the compound in interaction with these basic functions. In particular, the basic functions are embedded in a generative system that makes a more precise characterization of the relationship possible. This means that among the factors in (3), (3b) is less predominant than in Levi’s system and (3a) gains in importance.

Lieber (2004) presents an alternative framework within generative morphology. As opposed to Jackendoff’s PA, Lieber’s starting point is word formation. She presents word formation rules as operating on lexical entries. There are lexical entries for words, for affixes and for intermediate types of lexical material. The semantic component of a lexical entry is divided into a skeleton
and a body, both consisting of features. In a way she explains in her chapter in this volume, coindexation between the skeletons of the items combined in a word formation rule is an essential component of the interpretation of the meaning of the result.

With its emphasis on the slots in the skeletons, Lieber’s system can be seen as providing the theory of slots presupposed by Allen’s generalizations in (8) and (9). Whereas Allen does not go beyond a statement of the general intuition, the system Lieber proposes makes it possible to explain the meaning of compounds and other products of word formation. Compared to Jackendoff’s PA, Lieber’s system assigns a greater role to (3a) at the expense of the role of (3b). In Lieber’s system there are no predicates corresponding to Levi’s RDPs and Jackendoff’s basic functions.

Neither Jackendoff nor Lieber proposes a systematic approach to the third factor listed in (3) – lexicalization. This is the main focus of the third model presented here – Štekauer’s onomasiological approach. As the name indicates, his model is oriented towards finding the form to name a particular concept. This orientation is not common in generative approaches, but it is much more prominent in theories evolving from the Prague School of Linguistics. Dokulil (1962) is the first systematic account of word formation in this approach, but because it is written in Czech, it was not widely taken up in English-speaking areas. Grzega (2009) gives a historical overview of the development of onomasiological theories, of which Štekauer’s (1998, 2005b) theory is perhaps the most developed representative.

In Štekauer’s theory, the word formation component consists of a sequence of levels that gradually narrow down the naming options until a single, pronounceable name is determined. A central notion in this theory is the so-called onomasiological type (OT). Whereas in earlier presentations of his theory, Štekauer (1998, 2005b) presented five OTs, in his chapter in this volume he presents a more fine-grained approach involving eight OTs.

1.3 Extensions and comparisons

After the presentations of the three frameworks in Chapters 2–4, the remaining chapters present work within these theories. Chapters 5–8 concentrate on noun-noun compounds, which present a rather homogeneous set of problems. In Chapter 5, Pierre Arnaud discusses noun-noun compounds in French. In the delimitation of his domain, the examples in (11) are important.

(11)  
   a. espace aérien (lit. ‘space aerial’, i.e. airspace)  
   b. chaise de jardin (lit. ‘chair of garden’, i.e. garden chair)  
   c. courrier avion (lit. ‘mail airplane’, i.e. airmail)
Traditionally, French grammar has preferred the use of relational adjectives, e.g. *aérien* in (11a), or prepositional constructions such as (11b) over noun-noun compounds as in (11c), but the latter type is more frequent than one would expect on this basis. Arnaud has collected a large number of cases and classifies them on the basis of the relationship between the two nouns. He proposes a detailed set of relationships and considers to what extent Jackendoff’s system of characterizing the relationship between the two components of compounds can be used to cover all of them.

Chapter 6, by Zoe Gavriilidou, is devoted to noun-noun compounds in Greek. She distinguishes two classes of compounds, illustrated in (12).

(12) a. ἀνθρώπος-κλειδί [ánthropos-kliédí] (lit. ‘man-key’, i.e. key person)  
    b. ἀρχιτέκτονας-άρχαιολόγος ([árchiťextonas-árkealógos] (‘architect-archeologist’)  
    c. βατραχάνθρωπος [vatraxánthropos] (‘frogman’)  

Compounds such as the ones in (12a–b) have two inflected components, each with their own stress, which is marked orthographically in Greek, and they are left-headed like (12a) or coordinative as in (12b). These compounds are the focus of Gavriilidou’s contribution. They contrast with compounds such as (12c), which she calls *purely morphological compounds*. They have one locus of inflection and one stress, and are right-headed. Gavriilidou then proposes a classification and an analysis in Lieber’s framework.

In Chapter 7, Ingmarie Mellenius and Maria Rosenberg discuss compounds in Swedish. Here the delimitation of compounding is not particularly controversial. In Swedish, noun-noun compounds are frequent in the same way as in English or German and they are generally written together. Mellenius and Rosenberg focus on the position of compounding in language acquisition. Their research question is whether there is evidence that some compounds are easier to learn than others. In their approach to this question, they use Jackendoff’s system of characterizing the relationship between the components of a compound as the basis of a classification. This classification is then applied to a corpus of child Swedish.

In Chapter 8, Jesús Fernández-Domínguez returns to English. His purpose is not to extend the domain of application of one of the models presented in Chapters 2–4, but to compare two of them. He starts with a brief contrastive characterization of Štekauer’s and Jackendoff’s formalisms and then selects a number of English noun-noun compounds to demonstrate how different aspects of their meaning are represented in the two frameworks. He concludes that both systems are valid approaches, but highlight different aspects of meaning.
Chapters 9–11 address other types of compounding. In Chapter 9, Carola Trips considers phrasal compounds in English and German. Examples are given in (13).

(13) a. day-to-day management
b. “chicken and egg” situation
c. Vor-Nobelpreis-Ära (‘before Nobel prize era’)

For English, Trips collected compounds with hyphenated non-heads as in (13a) and non-heads in quotation marks as in (13b) from the BNC. In German, hyphenation is normally used to mark such compounds, but as (13c) illustrates, the hyphenation also links the phrasal non-head to the head noun. Another interesting point is that the non-head in (13c) is not itself a grammatical phrase because it lacks a determiner. Trips proposes an analysis in Jackendoff’s formalism of conceptual structure.

Chapter 10, by Barbara Schlücker, is devoted to adjective-noun compounds in German. In contrast to many other languages, German has compounds such as (14).

(14) a. Blauhelm (lit. ‘blue helmet’, i.e. UN peacekeeper)
b. Buntwaschmittel (lit. ‘coloured washing substance’, i.e. coloured laundry detergent)
c. Nuklearwaffe (‘nuclear weapon’)

The expressions in (14) are marked as compounds orthographically, phonologically and morphologically. They are written as one word, have compound stress and the adjective is not inflected. Semantically, Schlücker argues that the adjectives have a classifying role. In addition, (14a) is exocentric and (14c) involves a relational adjective. Schlücker proposes an analysis of this set of compounds in Jackendoff’s PA.

In Chapter 11, Renáta Panocová discusses the analysis of neoclassical compounds in English and Russian. Some examples are given in (15).

(15) a. ethnomycology
b. laparoscopy
c. лапароскопия [laparoskopija]

Panocová proposes an analysis in Štekauer’s onomasiological theory of word formation. For English cases such as (15a–b), she shows how the system of onomasiological types can be applied. The only condition for the successful application of the framework is that neoclassical formatives are accepted as elements of the lexicon. This analysis is supported by the fact that many new neoclassical compounds appear in English, as illustrated by the recent formation in (15a). In Russian, we also find neoclassical compounds, but they often correspond directly to English counterparts, as (15c) does to (15b). Panocová argues that Russian