Multidisciplinary Approaches to Language Production

Edited by
Thomas Pechmann
Christopher Habel

Mouton de Gruyter
Berlin · New York
Thematic information, argument structure, and discourse adaptation in language production

Heike Tappe, Holden Härtl, and Susan Olsen

1. General considerations

In the minds of language users situations are represented as states, processes, and events. Each such representation originates from perception, imagination, or illusion (cf. e.g., Glasersfeld 1972) and includes the partaking entities and the respective relations holding between them. Since situations cannot be represented by linguistic means in all their aspects, verbalization always requires schematization, i.e. the reduction of information. In the consequence, in linguistic expressions some of the information inherent in the situation to-be-verbalized is left implicit. Naturally, this entails that speakers have to make choices between alternate linguistic realizations; the more so as the to-be-verbalized conceptual structures can be expressed in a variety of ways depending on what facets of a situation a speaker wants to focus on, e.g., the examples in (1).

(1)  
   a. *Sam kissed Norah on the hand with affection.*  
   b. *Sam kissed Norah on the hand.*  
   c. *Sam kissed Norah with affection.*  
   d. *Sam kissed Norah.*

One main goal in language production research is to explain the said transition from conceptual structures to linguistic representations and to provide answers to questions like: How is the reference to situations made available through the linguistic resources of the human language production system and what is the nature of the different information sources and knowledge types involved?

In this context it is a commonly held assumption that the transfer from highly complex, multimodal conceptual structures to linear linguistic representations involves three main processing stages: message formation,
grammatical encoding, and phonological realization (Fromkin 1971; Garrett 1975, 1980, 1988; Kempen 1977; Stemberger 1985; Dell 1986; Levelt 1982, 1989, 1992; Dell and O'Seaghdha 1991, 1992; Bock and Levelt 1994; Bock 1995). During the stage of message formation (conceptualization), the speaker generates non-linguistic conceptual structures, i.e. preverbal messages each of which represents a content she intends to verbalize by one utterance. The preverbal message serves as input structure to the grammatical level of processing, where language specific encodings take place (formulation). The output structure of grammatical encoding is fed into phonological realization, during which the phonological (segmental, prosodic) and phonetic shape of the utterance are generated, so that eventually articulation can take place (articulation).

The research reported on in the current paper focuses on specific aspects relevant in the transition from conceptual structures to linguistic representations. Using several linguistic phenomena, we characterize conceptual input-structures underlying formulator-internal grammaticalization processes. Our emphasis lies on the role of thematic roles and their conceptual content during this early phase of the verbalization process and the issue of whether and what kind of thematic information is visible to the linguistic system, i.e. the formulator in Levelt’s (1989) terms. Specifically, we address the following questions: What rules underlie the assignment of thematic roles? How are thematic roles encoded in preverbal structure? In order to account for a systematic mapping from conceptual to linguistic structures, a thematic processor was introduced as a new interface component to a sequential language production model. The thematic processor makes use of both conceptual structure (CS) and contextual structure (CT). A series of experiments empirically validated the workings of the thematic processor by investigating the processing of conceptual structures (CS); i.e. in suppressing CT to the largest possible extent. We found evidence for the differentiation between entities that are conceptualized as belonging to event-representations on the one hand and linguistically obligatory arguments on the other. In the third part of the current paper, we specifically discuss the interaction of the thematic processor with CT, thus further specifying which knowledge domains are involved in the production of the pre-verbal message structure. We reanalyze some of the empirical results obtained in the experiments and sketch the influence of contextual, i.e. discourse related information.

Our overarching goal is to contribute to language production research with a twofold refinement of a sequential language production model.
Thematic information, argument structure, discourse adaptation

(Levett 1989; Bierwisch and Schreuder 1992; Herweg and Maienborn 1992): First, we introduce and empirically motivate a thematic processor at the interface between conceptual structures and linguistic (i.e. semantic and lexical) representations (cf. Härtl 2001a, 2001b). Second, we systematically integrate discourse structural weights into the verbalization process that are operational in the preverbal message structures and lead to specific consequences in grammatical formulation.

2. Thematic roles

If you’re going to break up, it’s better to be the leaver than the leavee. Because the leaver gets to leave, but the leavee gets left. (Woody Allen, in Every one says I love you)

Verb: leave: v.t.
Thematic roles: leaver, leavee

<agent> <patient>²

Thematic roles have been widely and controversially discussed over the past decades.³ In this context, one question is crucial, namely, whether thematic roles have direct reflexes on the formation of grammatical structures. In the literature, this question is approached from two antithetic positions: While the one ascribes an important impact on the formation of grammatical structure to thematic roles (Trueswell and Tanenhaus 1994; McRae, Ferretti, and Amyote 1997), the other—being based on the assumption that grammatical structures are impenetrable—denies any such influence (Friederici 1984; Chatterjee, Maher, Gonzales Rothi, and Heilman 1995; Friederici, Hahne, and Mecklinger 1996).

We subscribe to the latter standpoint, because the association of thematic roles with genuine linguistic entities meets two interrelated drawbacks. First, under the assumption that thematic roles are primitives that characterize verbs (cf., e.g. Fillmore 1968), it should be possible to reduce the extra-linguistic information that is associated with thematic roles to those aspects that are of relevance for syntactic structure building. This is, however, not the case. Second, thematic roles are not straightforwardly definable as primitives in a decompositional semantics. In the consequence, a one-to-one mapping from semantics to syntax cannot be established as is evidenced by the fact that in the languages of the world we find no cases of an isomorphism between a thematic role and a specific
grammatical marker (cf. Palmer 1994). This is not to deny language specific tendencies like, e.g., to express the BENEFACTIVE role in the dative case in German. Since the said tendency is not a fixed relation, however, the determination of thematic roles is only feasible in taking episodic and situational knowledge into account. In sum, we can conclude, that thematic roles enter grammaticalization even though they are themselves not part of grammar (cf. Härtl 2001: 76–80). Therefore, we hold with Jackendoff (1983), that rather than being associated with syntactic positions, thematic relations correspond to particular configurations in conceptual structure. As such, they have to be characterized as strictly extra-linguistic relations, reflecting the embedding of entities in event structures and permitting most of the basic inferences which we can draw about participants in an event.

2.1. Theoretical implications: The model architecture

In contrast to Jackendoff, we deny the possibility of a direct linking between the conceptual level and syntax. Rather, we adhere to the conception of a semantic form (SF) that systematically mediates between conceptual representations and syntactic structures (cf. Bierwisch 1983; Bierwisch and Lang 1987). The mediating function is inherent to SF as it constitutes a level of meaning independent of contextual, i.e. extra-linguistic influences. A current semantic form representation (SR) is generated during language production in the transition from conceptual to linguistic representations by accessing the mental lexicon, which contains and organizes the genuinely linguistic meaning of lexical entries in compliance with their argument structure as well as event structural and idiosyncratic aspects. Semantic constants (e.g. the predicates CAUSE and BECOME), encoded in the lexical entries and operated on in SR, enable a direct linking between SR and syntactic structure.

In spite of SF’s mediating function between the extra-linguistic and the linguistic level, the interaction between conceptual representations and the current semantic form representation (SR) is less clear. This follows from the assumption that SR is a strictly linguistic – i.e. formulator internal – representation and leads to two consequences: First, SR cannot itself be an interface representation placed between the conceptualizer and the formulator. Second, questions about the transition from conceptual structures to linguistic representations more precisely concern the interaction between conceptual structure and SR. This interaction has to meet specific require-
ments, foremost of which, the proposed representations have to capture the fact that language users are naturally able to explicate all predicates used in SR by means of conceptual conditions in conceptual structure; i.e. they can encode and decode mental representations of situations and draw a variety of inferences. How can this condition be encompassed in a modular and sequential language production model, in which the individual components operate on level-specific structures only, i.e. where information from either preceding or subsequent components is inaccessible?

In their response to this question, Bierwisch and Schreuder (1992) suggest a generalized verbalization function (VBL). In observance of contextual adequacy, VBL maps the conceptual input-structure CS onto SR. Since VBL is regarded as an integral part of the linguistic system, it is assigned the function of adapting CS to the exigencies of linguistic encoding. In turn, the conceptualizer need not have access to any kind of linguistic knowledge. Under the suggested conception, neither linguistic requirements in general, nor those of a specific language must be considered in the planning of CS.

Bierwisch and Schreuder (1992: 35) define VBL by way of the interpretation function INT, which they understand as the inverse function to VBL. Accordingly, VBL has to meet two conditions: First, a conceptual structure (CS) extending a contextual background (CT) is mapped onto a SR, only if the SR is an instantiation of the semantic form (SF) of a given expression (E). Second, the CS in question has to be the value of INT for SR relative to the current context CT (i.e. the expression has to be related to the context). From this follows that VBL is based on and controlled by INT (ibid).

Within the overall architecture of the model, where INT is instantiated as the speaker-internal interpretation of her utterances – i.e. monitoring in Levelt’s terms –, the interconnection between VBL and INT becomes apparent. Their mutual conditionality is mirrored in the relatedness between CS and SR: CS serves as input-structure to context sensitive production and as target-structure for context-sensitive interpretation; SR is the input-structure to context sensitive interpretation and target-structure for context-sensitive production (cf. Herweg and Maienborn 1992: 12–13).

These premises are crucial for empirical access to the respective representations. If VBL is the inverse mapping of INT (albeit not simply its mirror image), evidence from carefully designed comprehension studies, which attain unconscious processing levels (ERP-studies, reaction time studies), can – with caution – also be interpreted from the production per-
spective. Even though this conclusion may seem daring, it receives cor-
roborating support from research on aphasic patients, suggesting that there
is at least a substantial overlap between the two systems (cf. e.g. Garrett
1982; Chatterjee 1995).

While our model builds on Bierwisch and Schreuder’s, one point of dis-
crepancy between theirs and our own conception can be pinned down to
the verbalization function VBL itself. Both from a theoretical point of view
and for processability assumptions it is desirable that the input to VBL
should be precisely specified. Otherwise, we would have to presume that
the verbalization function interfacing the conceptual and the grammatical
system operates over any type of information that the cognitive system
provides. Such an assumption, however, has two drawbacks: First, such a
powerful mechanism is beyond theoretical justification. Second, Bierwisch
and Schreuder propose that VBL is an integral part of the formulator. Yet,
how can we assume that conceptual information is visible to the linguistic
system and at the same time uphold the sequential and modular architec-
ture of the language production model?

A solution to these problems is presented in Härtl (2001a, 2001b),
where a thematic processor (TP)\textsuperscript{4} is introduced into the model as an opera-
tive instantiation and specification of the VBL function. TP ensures that
conceptual structures are systematically mapped onto lexico-semantic, i.e.
grammatical, structures. As a more restricted instantiation of VBL, TP is
conceived of as an interface processor in a narrow sense: It does neither
belong to the linguistic or the conceptual system, nor does it produce TP-
internal structures. Rather, it “blindly” maps conceptual structures onto
semantic structures (SF) by means of a restricted rule system. The concep-
tual structures CS/CT – which are equivalent to Levelt’s preverbal
messages – are defined in the current framework as pairings of constrained
sets of conceptual and contextual information (viz. Figure 1).

In creating CS, the conceptualizer draws on perceptual sources that pro-
vide representations in multimodal formats and checks them against stored
representations in the conceptual knowledge base. The conceptual proc-
cesses of segmentation, grouping, and structuring provide a subset of those
conceptual entities, which are to enter verbalization, in that they transform
the ubiquitous, continuous stream of experience into highly structured of-
ten non-sequential event representations. (cf. Habel and Tappe 1999;
Habel, Tappe, and Guhe, in prep.). While CS thus directly triggers the
creation of the propositional content underlying a single utterance, CT is
based on prior discourse knowledge and global text-planning aspects, like
Thematic information, argument structure, discourse adaption 145
perspective taking (cf. v. Stutterheim 1999) and topic continuity (Givon 1984), which affect the informational weight assigned to the selected conceptual entities.

In parallel to and in interaction with these processes, the relations holding between the entities partaking in the situation 'to-be-verbalized' are verified; i.e. the thematic roles of the entities involved are established. Based on a rule system that originates in the conceptual knowledge base, the conceptualizer establishes two prototypical thematic roles: PROTO-AGENT and PROTO-THEME. This is achieved by checking a sub-set of conceptual features that are directly connected with the concepts of CHANGE and CAUSE. The relevant features are accessible via basic and in part innate cognitive principles.

Figure 1. Part of the overall model architecture depicting the interactions between the conceptual knowledge base, the conceptualizer, and the formulator. Conceptualization and mapping of thematic information onto SR (cf. Härtl 2001b).
The perceptual basis of CHANGE is change detection, which involves mechanisms central to the way we perceive our surroundings (cf. Rensink 2002: 1). Change detection and motion detection are sub-types of the perception of transformation. In perception, both types of transformation are tightly correlated and can only be distinguished with elaborate experimental techniques.

In this view, then, the transformation of any external entity is picked up by two concurrent perceptual systems: one describing motion (variation referenced to location), and the other change (variation referenced to a structure) [...]. Although the outputs of these systems are often correlated, they can sometimes be decoupled, e.g., by their differential response to different stimuli (Seiffert and Cavanagh 1998), or by using transformations that occur beyond the temporal window of most motion detectors, a window of approximately 50–80 ms (e.g., Woodhouse and Barlow 1982; van de Grind et al. 1986). (ibid: 6).

In place of 'transformation', the term 'change' is generally used in cognitive psychology and in linguistics as cover term. Thus, under this view we understand CHANGE ontologically to involve the variation of properties over time, including MOVEMENT (cf. Härtl 2001a: 97–117 for more detail). CHANGE is indispensable in the conceptualization and consequently for the verbalization of events, because events are established by changes. This statement follows from the understanding that events are mental entities, which are constructed internally by segmenting the ongoing stream of real-world activities into meaningful units instead of real-world objects. (For detailed accounts, cf. the cut hypothesis proposed by Avrahami and Kareev 1994; Habel and Tappe 1999; Zacks, Tversky, and Iyer 2001; Zacks and Tversky 2001; Zacks, Braver, Sheridan, Donaldson, Snyder, Ollinger, Buckner, and Raichle 2001).

The conceptualization of a CAUSE-relation between two situations is afforded if one situation 'brings about' the other. This interrelation implies that there is some kind of tangency between two event participants – i.e. [CONTACT] – that is further characterized by the one entity exerting force on the other entity. In accordance with Leslie (1995) we capture this specification by introducing the feature [FORCE] (cf. Härtl 2001: 124–125). The consequence of the force-effect is that both participants undergo some kind of change. Additionally, the conceptual prerequisites for CAUSE imply a temporal precedence relation: The event that is conceived as carrying the causation has to be understood as happening before the event that is conceived as embodying the effect. Moreover, the time span that elapses
between the two events needs to be conceptualized as a point in time rather than a time interval\textsuperscript{5}. Axiomatically, this characterization is captured in (2).

\begin{equation}
\begin{align*}
\text{CAUSE}(x, e) & \rightarrow \text{FORCE}(x, y) \\
& \rightarrow \text{CHANGE}(x, T_1) \& \text{CHANGE}(y, T_2) : T_1 < T_2 \\
\text{FORCE}(x, y) & \rightarrow \text{CONTACT}(x, y)
\end{align*}
\end{equation}

According to Härtl (2001a), all the thematic dependencies necessary for event representations are directly encoded by means of the CAUSE and CHANGE features: The assignment of a CAUSE feature to a salient entity promotes it into the rank of a prototypical AGENT. If this same entity is assigned a CHANGE feature and the corresponding event precedes another event in time, then the entity involved in the latter event has to be integrated into the respective preverbal message as prototypical PATIENT. In this sense, thematic information constitutes a necessary part of the propositional content of a preverbal message. By establishing thematic dependencies, distinct occurrences of events are correlated such that a meaningful and interpretable connection between different events can be deduced and projected onto a conceptual representation.

Taken together the information assembled in CS/CT serves as input to the thematic processor. While thematic information is demoted in the course of formulation and consequently ‘invisible’ in grammar, information relevant to event structure is grammatically encoded. Consequently, extra-linguistic thematic properties of the event conceptualizations must be unambiguously inferable from event structural information. As linguistic output-representations of TP ‘Aktionsarten’ endorse such inferences by means of their grammatical – i.e. morphological – reflexes so that language users can correctly reconstruct the thematic constellations underlying propositions. Along these lines, thematic roles form the basis of the regular mechanisms underlying the mapping of conceptual structures to linguistic representations.

The VBL rules which operate on the preverbal input structures (CS/CT) and which generate the linguistic output representations, i.e. a lexical-semantic and the corresponding syntactic representation, are rigid and limited. Bearing on contextual information, they blindly translate the propositional content of a preverbal message into a grammatical structure. Take, for example, a preverbal message containing the features $[-\text{CAUSE}]$ and $[+\text{CHANGE}]$, where the latter represents an event that is only true in an unrestricted time span (i.e. atelic and durative; $[-\text{TEL}]$ and $[+\text{DUR}]$), is real-
ized as an activity expression in the Vendler sense (cf. Härtl 2001a; Herweg 1990; Vendler 1967). In the resulting SR the corresponding ‘Aktionssart’ features are explicitly encoded by the syntactically realized DO-constant predicing over one argument such that the event participant can be configurationally identified as AGENT, cf. (3).

(3) Jimmy tanzt.
‘Jimmy is dancing.’

CS/CT:
DANCE(e) & AGENT(e, jimmy)
¬CAUSE(jimmy, e)
+CHANGE(jimmy) = +TEMP(e) & ¬TEL(e) & +DUR(e)
→ SR: λx λe [e INST [DO(x), DANCE(x)] (jimmy)

Thus, the mapping mechanism developed in Härtl (2001a) can be used to determine the interplay between thematic and event structural properties of a conceptualized preverbal message on the one hand and its grammaticalization on the other. Furthermore, the operational devices can be employed to characterize the means of how and where in the process of verbalization certain types of conceptual information – such as thematic information – are demoted and left implicit. In this sense, we consider the thematic processor as an instantiation of the generalization function of language: The language system generates highly compact linguistic strings, which however, must enable the recipient to infer the intended message, i.e. a complex conceptual structure, from a linear grammatical sequence (cf. Härtl 2003b).

3. Implicit information and argument structure

Leaving information implicit in language is a ubiquitous method of producing efficient linguistic strings. Good examples for this mechanism in the domain of verb complexes are, first, psych-verbs like fear, which do not realize information on causality grammatically and, second, complex verbs with an incorporated, intransitivized preposition, like the German auswerfen (‘throw out’, to eject), which do not project the internal argument of the preposition. With regard to the informational status of implicit information, three main questions are at issue:
What is the conceptual status of implicit information?
How does grammar reflect implicit information so that it is inferable from the linguistic string?
Which contextual strategies support the inference operations?

3.1. Psych-verbs

To address these questions, we first turn our attention to psych-verbs. Psych-verbs can be divided into two subgroups, which differ with regard to the syntactic realization of the thematic arguments involved: While with verbs like fear, it is the experiencer-entity that is projected into the subject position, with frighten-complexes the same position is filled by the stimulus-entity. We argued above that thematic information is realized implicitly in linguistic representations that reflect the relevant event structure. If this assumption holds, then the difference in the thematic structure of the two groups of psych-verbs is a difference in varying event structural properties. First evidence that this is indeed the case comes from the fact that most frighten-verbs can be realized in the progressive aspect – a property typical for activities – while fear-verbs cannot, cf. (4).

(4) a. ??John is fearing Mary.
   b. Mary is frightening John.

If frighten-verbs share a property with activity verbs then a motivation for the difference in the thematic structure is straightforward: The STIMULUS-entity of a frighten-complex is conceptualized as a prototypical AGENT involved in a durative and atelic event while the STIMULUS of a fear-event is embedded in a non-durational state. Empirical evidence for this assumption comes from Härtl (2001b). A German questionnaire study revealed a significant difference between the two verb groups. Härtl found that two types of subordinate because-sentences differentially relate to the two types of verb complexes: Participants preferentially allocated because-sentences expressing a stative property (e.g. John adores Mary because he has a certain quality) to fear-verbs. In contrast, they favored to assign activity-sentences (e.g. Mary fascinates John because he is doing s.th.) to frighten-verbs.

It is important to note that the causality of frighten-verbs as opposed to the non-causality of fear-verbs is not the crucial reason for the realization
of the STIMULUS-entity in the subject position of \textit{frighten}-complexes. The causality intuitively associated with psych-verbs is rather an instance of \textit{implicit} verb causality. Implicit verb causality is not grammatically realized, neither argument structurally nor morphologically. Therefore, \textit{frighten}-verbs cannot be considered causative verbs, which has been argued for repeatedly in the literature to explain the linking these verbs exhibit (cf. e.g., Grimshaw 1990). The non-causativity of \textit{frighten}-verbs is reflected in grammar, for instance, in that they do not allow a modification with so-called time span adverbials like \textit{in an hour}. These adverbs refer to the telicity of causative change-of-state verbs like \textit{build a sandcastle} and we can therefore use them as a test criterion for determining causativity, cf. (5).

\begin{enumerate}
\item[(5)]
\begin{enumerate}
\item Mary frightened/ fascinated/ bored John \textit{in an hour}.
\item Mary \textit{built a sandcastle in an hour}.
\end{enumerate}
\end{enumerate}

Based on examples like the one in (5) one may also argue that \textit{frighten}-verbs are to be characterized as stative expressions (e.g. \textit{to sit, to know}) as opposed to \textit{fear}-verbs, which evidently display agentive activity properties (cf. Rapp 1997). Following this line of thought, the syntactic realization of the EXPERIENCER in \textit{fear}-complexes would be explained by its agentivity, which might not combine with the (stative) non-agentivity associated with \textit{frighten}-verbs. This, however, cannot be the case as \textit{frighten}-verbs do permit means clauses like \textit{by a hysterical laughing}, which statives do not allow. Moreover, \textit{fear}-verbs are modifiable by a time-frame adverbial only with difficulty, while activities canonically combine with this modification (cf. Härtl 2001a):

\begin{enumerate}
\item[(6)]
\begin{enumerate}
\item Mary frightened John \textit{by her hysterical laughing}.
\item John knew the answer \textit{by thorough thinking}.
\item John chased the deer \textit{for an hour}.
\item John feared Mary \textit{for an hour}.
\end{enumerate}
\end{enumerate}

Because of this evidence, we argue that \textit{fear}-verbs express genuine states while \textit{frighten}-verbs denote non-causative, atelic activities. Thus, Härtl (2001a) considers the causality of psych-verbs an implicit property that is to be inferred from non-linguistic, conceptual information. Numerous empirical studies (see Fiedler 1978; Rudolph 1997) reveal that the property of implicit verb causality holds for both verb types. It is reflected in the as-
Thematic information, argument structure, discourse adaption

Assignment of because-sentences, which explicate the causality inherent in psych-verbs. Canonically, they express causal qualities, which are attributed to the STIMULUS-entity. Thus, because-sentences assigned to the EXPERIENCER-entity render a deviant construction like in (7).

(7)  

a. Mary frightened John because she/he is clever.
b. John feared Mary because she/he is clever.

To verify the assumption that psych-verbs denote implicit verb causality, Härtl (2001b) conducted a study on event-related brain potentials (ERP) elicited by constructions of the type in (7). Electro-physiological activity was measured on the pronoun. The results indicate processing difficulties in those cases where the pronoun refers to the EXPERIENCER-entity as compared to the STIMULUS-entity with both frighten- (eliciting a negativity after 400ms) as well as with fear-verbs (eliciting a positivity after 600ms). These processing difficulties indicate that the conditions of implicit verb causality are indeed at work with psych-verbs thus confirming the above mentioned hypothesis.

3.2. Decausative verbs

The implicitness of causal relations can also be associated with other types of verbs. For instance, causative verbs of the type to break or to burn allow a demotion of the causal component thus rendering an intransitive, unaccusative variant. The question again arises, whether with this type of verb the causal features need to be inferred from non-linguistic conceptual information or whether they are explicitly expressed in the linguistic string. Evidence for the former assumption comes from decausative constructions containing a free dative, where we can interpret the corresponding dative constituent as a potential (though unintentional) causer. No such interpretation of a free dative is available with the corresponding passivized causative construction that supposedly encodes a causal relation grammatically (see Härtl 2003a).

(8)  

a. Der Teller zerbrach ihm.  
   ‘The plate broke on him.’
b. Der Teller wurde ihm zerbrochen.  
   ‘The plate was broken on him.’
Accordingly, we propose that with decausatives no causal relation is inherently denoted. It can, however, be re-introduced into the verb complex via the predicate linked to the dative argument. In the case of the passivized causative – where the causal entity, i.e. the agent, is also denoted though morphologically signified – two causes producing one and the same effect would conflict. Thus, we can assume that decausative verbs really are non-causative and consequently do not express a causal relation grammatically. The question then is whether a corresponding causal relation is to be considered a necessary part of the interpretation of the expression and should therefore be regarded as active in the construction’s underlying conceptual representation – that is the preverbal message. An answer to this question is given in Härtl (2003a), where evidence from several tests indicates that causality in the narrower sense cannot belong to the meaning of decausatives. For instance, only decausatives (see (9a)) allow because-sentences denoting the direct source of the effect (a causa efficiens) expressed in the matrix clause while they are somewhat odd with the corresponding passives, see (9b).

(9)  

a. The plate broke because John threw it against the wall.

b. The plate was broken because John threw it against the wall.

Härtl’s explanation is straightforward: The unacceptability of the passive in (9b) can be attributed to the fact that the causa efficiens expressed in the subordinate sentence clashes with the direct causal component – also a causa efficiens – already inherent in the verbal complex of the matrix clauses. With the decausatives we get a different result, which indicates that no direct cause is inherently expressed in the verb complex. As expected, a because-sentence expressing the purpose of the action (a causa finalis) should be acceptable with passives but anomalous with decausatives, cf. (10).

(10)  

a. The plate broke because John didn’t like it.

b. The plate was broken because John didn’t like it.

Again, we trace back this difference to the divergent causality patterns underlying the two constructions: While decausative verb complexes do not contain an intentionally acting entity causing a certain result, which could serve any purpose, the corresponding passives do signify these mean-
ing components. However, even though decausatives are inherently non-causal, some unspecified kind of impact bringing about the change-of-state is part of their interpretation. This is reflected in findings from numerous studies on the perception of changes, which indicate that in general any change is perceived as caused by some entity even if in the actual situation there is no overt or visible causal relation between the entities involved (cf. Housssiadas 1964). In this sense, the causality understood with decausatives does not differ from the causality expressed with non-alternating change of state verbs like to decay or to rust as regards the truth conditions the corresponding conceptual representations have to fulfill.

Non-linguistic information not explicitly expressed in the linguistic string can be associated with entire predications, as in the case of the causal relations just discussed, or with individual entities that would be realized as nominal arguments in grammar. Here, examples are the aforementioned demoted AGENT in passives or the intuitively understood THEME (e.g., a book) in the intransitivized verb complex of John is reading. We have evidence that with intransitivized verbs a corresponding entity is accessible via the sortal restrictions of the predicate. These are satisfied by a vacant argument slot being grammatically, that is syntactically, transparent. Thus, a corresponding entity can be addressed referentially in discourse by means of e.g. a so-called weak bridging pronoun as the German das (see Härtl 2003b for the details):

   'John is reading. That will surely be nonsense.'

b. Das Buch wird durchaus gelesen. Das können nur Fanatiker sein.
   'This book is quite read. This can only be fanatics.'

The question then is whether morphologically or lexically assembled predicates equally reduced in their argument structure exhibit a parallel behavior. In this respect, complex verbs like in etwas einwerfen ('in-drop', to drop s.th. in) represent a relevant test case. They contain an incorporated intransitivized preposition (i.e. a particle) that differs from its transitive pendant (to drop s.th. in s.th.) in that it does not realize the reference object. Since this reduction of the argument or the prepositional object, respectively, can be considered a morphological operation computed in the lexical system (cf. Olsen 1997), we suppose a higher degree of opaqueness of the corresponding argument slot. Again, the unacceptability of bridging
constructions provides evidence for this assumption because they do not afford a referential relation between the pronominal item and the potential prepositional object in the case of the verb group in question (cf. 12).

(12)  
\[ \text{John warf einen Brief ein.} \]  
\[ \text{That will surely be operated today.'} \]

Note that although the potential reference object has to be a mailbox in (12), a bridged inference permitting a referential relation is not viable with particle constructions. Thus, there is no reason to assume a grammatical reflex of the unrealized argument (cf. also Härtl and Witt 1998).

This leaves open the question whether the argument is also absent in the underlying conceptual representation. Härtl (2003b) shows that indeed no reference object is conceptually active with particles. Evidence comes from two reaction time studies with an object categorization task, where participants had to judge the size of objects, i.e. a non-linguistic property. The objects were depicted as line drawings and either represented a potential reference object (congruous objects), or, an object that could not function as a reference object in the given context (incongruous). The respective objects were presented after both prepositions and particles. Crucially, only full prepositions prime a potential reference object as the accordant reactions to situationally congruous target line drawings reveal. These results show that participants were sensitive to the difference between congruent versus incongruent objects with prepositions but not with particles. This confirms the hypothesis that with particle verb constructions the reference object is not only absent from the semantic representation but that it is furthermore not a necessary part of the non-linguistic representation.

In seeming contrast to this statement and the previous argumentation, we find examples, however, that seem to indicate the presence of the implicit argument in both the conceptual and the semantic representation of particle verb constructions. As the examples in (13) show the crucial factor for this effect is the recoverability of the implicit argument.

(13) a.  \[ \text{There is a bottle on the floor. John stuck a label on.} \]

b.  \[ \text{Hans klebte ein Etikett auf, aber ich sage dir nicht worauf.} \]

   'Hans stuck a label on but I won’t tell you where-ON.'
Here, it seems as if the particle-verb construction – contrary to our previous conviction – does provide an implicit argument as the sentence in (13a) implies that the label is stuck on the bottle mentioned in the preceding sentence. Similarly, the sluicing construction in (13b) contains an interrogative worauf (where-on) somehow referring back to an entity not explicitly mentioned before. Do we want to consider this as evidence for the presence of an implicit argument or is recoverability rather the outcome of a more general discourse mechanism at work with other types of constructions as well? This question is addressed in the next section: There we clarify the issues of what strategy the system employs to create (a specific kind of) coherent discourse structure and what anchor points the contextual coherence operations can tie up to.

4. Discourse adaptation

In the previous section, we presented a variety of experimental results that account for the processing of linguistic material in idealized 'null-contexts'. We conducted these in order to gain insights in the interaction between conceptual structures (CS) and linguistic representation, and therefore deliberately reduced the influence of contextual information (CT).

In the current section, we turn to discourse, i.e. context effects, and thus account for the fact that as soon as linguistic strings are embedded into discourse structures, information can be construed that is neither directly represented in the linguistic string nor straightforwardly accessible from CS via inferential processes on isolated linguistic strings. We argue that the construal of implicit information, i.e. implicit arguments in the present case, is an even more powerful process than widely held (e.g. by McIntyre 2001) and that it largely unburdens the language production system of having to encode conceptually and contextually recoverable information linguistically. This issue directly relates to the question of how much of the information that is available from perceived or conceived situations is explicitly encoded in the linguistic representation, i.e. in this case semantic form. It also concerns the content of both the preverbal message and the interface representations treated by the thematic processor. We hold that linguistic processing is kept as sparse as possible. At the actual moment of speech, information that is to be left implicit in the linguistic output is, first of all, not made part of the preverbal message and second, does not enter
the semantic representation, i.e. it is not part of the speaker intention (cf. Olsen 2003a: 12).

4.1. Unrealized argument slots and their recovery in discourse

Specifically, we take up the issue of implicit thematic roles and implicit arguments, respectively. It is a common assumption that implicit arguments are a necessary part of the linguistic representation (e.g., Roeper 1987; Williams 1987; Mauner, Tanenhaus, and Carlson 1995). In section 3, we presented experimental evidence indicating that this assumption is not tenable in the case of intransitivized prepositions, i.e. particles, and their underlying conceptual representation: The propositional value of the prepositional reference object is discarded with particle verb constructions. Consequently, we propose that the semantic form of a particle verb includes a free variable, cf. the formula in (14) for the German aufkleben (‘on-stick’, to stick s.th. on).

\[
\_ \lambda z \ldots (\text{BECOME} \ (\text{LOC} \ z, \ \text{AUF} \ w))
\]

As mentioned above, there is evidence, however, that in some cases the system succeeds in constructing a referential relation that holds between an explicit linguistic element, e.g. a noun phrase, and an implicit entity potentially referring to the unrealized reference object:

\[
\text{Draussen steht ein LKW. Ein Arbeiter ist gekommen, um die Tür einzuhöben.}
\]

‘There is a truck outside. A worker came to hang in the door.’
(cf. McIntyre 2001: 265)

Effects of this kind led e.g. McIntyre (2001) to the conclusion that particle verb constructions denote an implicit reference object that is stored as a necessary part of a complex concept. Thus, expressions like aufkleben (stick on s.th.) or einheben (‘in-lift’, to hang in s.th.) are considered memorized concepts in which an unspecified reference object provides a region the theme can relate to. Under this view, the theme fulfills an obligatory part of the memorized concept and this particular quality of the particle construction makes it accessible to pre-determined inferential operations. For example, a phrase like to put a record on would then convey a complex
concept containing a turntable as the goal of the respective activity, because records have to be placed there in order to play music (for a detailed discussion see also Olsen 2003a, 2003b).

In addition to the contextual effects illustrated in (15), sluicing constructions seem to provide further evidence that a reference object can be conceptualized with particle verb expressions, cf. (13b), repeated as (16).

   ‘John stuck a label on. But I won’t tell you where-ON.’

Here, the interrogative element *worauf* seems to refer back to a prepositional reference object – like, e.g., a bottle – that appears to be introduced with the preceding sentence (cf. Härtl 2003b). In section 3, however, we presented experimental evidence indicating that *no* reference object is conceptualized with particle verb expressions. The question then is how does the system achieve a construal of the unrealized entity? And, more importantly, why does the system seem to prefer a tie-up strategy requiring a presumably costly recovery instead of a numerated discourse sequence?

In presenting our answers to these questions, we assume that the conceptual system prefers a coherent discourse structure to a disjointed numeration of assertions. For sluicing constructions like the one in (16) this cognitive coherence strategy is straightforward because an explicit discourse marker (*but*) enforces the establishment of a corresponding discourse link. This illustrates that the system can be compelled to identify an anchor point in the linguistic string like the unrealized argument variable in the case of intransitivized predicates.

The coherence strategy, however, does not necessarily depend on the existence of an implicitly represented argument as is shown in the examples (17) to (19). Here, we do not want to assume that an explicit signal of any implicit information is canonically encoded in the initial linguistic string.

   ‘Hans is sleeping. But I won’t tell you how.’

Nevertheless, the system is able to establish a coherent discourse structure by establishing a modificational projection in the verb phrase *post hoc* so that an adverbial constituent (represented by *wie* in the second clause) can be attached. There is a wide range of constructions exhibiting this type of
extension and re-analysis. In cases like (18), the coherence condition may even initiate a costly re-interpretation of the initial linguistic string.

(18) \[\text{Hans ist intelligent. Aber ich sage dir nicht, wo.}\]

‘Hans is intelligent. But I won’t tell you where.’

Individual-level predicates like \textit{intelligent} do not allow a local modification like the one expressed by the interrogative \textit{wo} in (18). Therefore, we can construe a coherence-relation between the two sentences connected by the discourse marker \textit{aber} (‘but’), if \textit{intelligent} is coerced into a stage-level predicate. Only under this condition the truth-conditional scope of the predicate can be restricted to a specific locus. Even though it is possible, it is not preferable to assume a canonical stage-level reading for \textit{to be intelligent}. We can conclude that these discourse effects are instances of re-analysis rather than based on default grammatical constellations. This view is supported by cases like (19), where the grammatical representation blocks attachments of the kind described above.

(19) \[\text{Der Teller zerbrach.}\]

??\[\text{Aber ich sage dir nicht, wer/von wem.}\]

‘The plate broke.

But I won’t tell you who/by whom.’

Here, the coherence condition is not operative because the system cannot identify an appropriate anchor point in the initial discourse fragment. The reason is that unaccusative verbs of the type in (19) are truly intransitive. Thus, although they alternate between a transitive and an intransitive version, intransitive verbs like \textit{to break} cannot be considered intransitivized in the sense that the subject argument of the transitive alternative can be re-activated (see Härtl 2003a).

In sum, the contextual effects described above provide no compelling evidence for the existence of an implicit argument or implicit information in the corresponding linguistic string \textit{per se}. They can be used, however, to test whether information of this type is recoverable or coercible to achieve a coherent discourse structure while adhering to the limits of grammar.
4.2. The interaction between degree of inferability of implicit arguments and discourse coherence

We defined the coherence condition sketched above as the general preference of the cognitive system to construct a coherent discourse representation. This implies the following regularity: The lower the cost is of constructing linguistically unrealized information, the stronger the tendency will be to establish a coherent discourse. If this is the case, we should be able to detect an interaction between the degree of inferability of an unrealized argument and different types of discourse coherence.

What we mean by degree of inferability here, relates to how straightforwardly an unexpressed entity can be inferred. For clarification, let us compare three types of verb complexes, which differ according to the degree of sortal specificity of their potential reference objects, cf. the examples (20–21) in Table 1.

First, adverb-verb constructions (cf. 20a and 21a) contain an anaphoric element morphologically, e.g. the da(r-) ('there') in the German adverb daran ('there-on'). We capture the fact that adverbs demand one definite reference object with the feature [+RO]. More pointedly, the grammaticality of adverb-verb complexes depends on a co-reference relation to an antecedent, e.g. to a previously mentioned goal argument as in (20a), so that the absence of an antecedent in the previous discourse yields an ungrammatical phrase in the case of (21a). We signify this property with the subscript j.

We also assign the [+RO] feature to the second type of verb complexes, namely to lexical-functional particle verb constructions (cf. 20b and 21b). Härtl and Witt (1998) coined this term for a sub-group of particle verbs, which only take an extremely limited number of entities as reference objects and thus are considered quasi-compositional. For example, the phrase to put a record on brings in a turntable as precisely the one available reference object. Consequently, the reference object of lexical-functional particle verb constructions is sortally highly specific [+RO], but it need not be given in the previous discourse (cf. 21b), hence the subscript a.

Table 1. Degree of inferability (Inf.)—(a) adverb-verb-complexes, (b) lexical-functional particle verb constructions, and (c) compositional particle verb constructions.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>[In the room there is an apparatus.]</td>
<td>[John enters the room.]</td>
<td></td>
</tr>
</tbody>
</table>
Third, *compositional* particle verb constructions (cf. 20c and 21c) are entirely productive in nature (see footnote 6) and can be applied to any entity matching the sortal and spatial restrictions the predicate imposes on its arguments. Therefore, they are both sortally unspecific about their reference object and do not require an antecedent relation, cf. (21c), thus we assign the feature combination $[\alpha RO_\alpha]$.

These differences in degree of inferability of their potential reference objects are reflected in the semantic representations (SR) of the respective verbal complexes (cf. Table 2), where in the case of verb-adverb constructions the reference object – i.e. the anaphoric reactivation of the antecedent – is lexically encoded via the $\iota$-operator. For lexical-functional particle verb constructions the existential quantifier indicates that a prototypical reference object is available, i.e. easily recoverable from CS via default world knowledge, whereas in the SR of compositional particle verb constructions the respective argument slot is empty, reflecting the – experimentally attested – unavailability of a sortally specific reference object.

Table 2. Construction types – the different degrees of inferability and their reflexes in semantic representation (SR).

<table>
<thead>
<tr>
<th>Construction type</th>
<th>Semantic form (SR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>verb-adverb</td>
<td>$\iota w \lambda z \ldots$ (BECOME (LOC z, AUF w))</td>
</tr>
<tr>
<td><em>Peter klebt das Etikett darauf</em></td>
<td>‘THERE-on’</td>
</tr>
<tr>
<td>lexical-functional particle verb</td>
<td>$\exists w \lambda z \ldots$ (BECOME (LOC z, AUF w))</td>
</tr>
<tr>
<td><em>Peter legt die Schallplatte auf</em></td>
<td>‘put a record on’</td>
</tr>
<tr>
<td>compositional particle verb</td>
<td>$\lambda z \ldots$ (BECOME (LOC z, AUF w))</td>
</tr>
<tr>
<td><em>Peter klebt das Etikett auf</em></td>
<td>‘glue a sticker on’</td>
</tr>
</tbody>
</table>
We argue that these divergences between the respective verb-complexes systematically interact with rhetorical connections. Rhetorical connections are established between discourse segments based on the background knowledge of language users about how syntax, compositional semantics, Gricean style pragmatic maxims and real world knowledge affect the interpretation of discourse (cf. Lascarides, Copestake, and Briscoe 1999: 7). Rhetorical connections are held to add information to discourse that is otherwise left implicit and underlie the establishment of discourse relations. Discourse relations have been proposed in order to model the way segments of discourse rhetorically connect with one another to form a coherent whole (viz. e.g. by Mann and Thompson 1987; Lascarides and Asher 1993a; Asher and Lascarides 1995). While the number of discourse relations is still under investigation most researchers converge on seven: narration (cf. 22a), elaboration (cf. 22b), explanation, background, continuation, parallel, and contrast.

(22) a. Max stood up. John greeted him.
    b. Max painted a picture. He used acrylics and oils.

We follow the general idea advanced by Lascarides, Copestake and Briscoe (1999), that the rhetorical connections between the meanings of segments of text might be ranked according to the ‘tightness’ of connection between discourse segments and that the underlying cognitive coherence principle generally favors a coherent discourse structure to a more loosely jointed numeration of assertions.

Here, we concentrate on one specific instantiation of this general principle in contrasting the interaction between the discourse relations narration and elaboration – which are especially frequent – and the two aforementioned types of particle verb constructions, i.e. lexical-functional and compositional, respectively.

The two conditions posed on narration are, first, that the descriptive order of events matches their temporal order and that, second, there must be a distinct common topic that summarizes what the narrative describes. This straightforwardly entails that the main eventuality described in a discourse segment DS temporally precedes the main eventuality described in a discourse segment DS (cf. Lascarides and Asher 1993b). Given these conditions, narration is the default discourse relation that may be characterized by a sequence of discourse segments jointed by an iteration of the discourse marker ‘then’. In the least case, narration may hold between dis-
course segments simply expressing temporal precedence between events without there being a distinct common topic that otherwise conjoins the respective events. This then is an occurrence of a weak rhetorical connection, where narration does not contribute to coherence over and above temporal precedence.

Elaboration, accounts for the fact that the main eventuality described in a discourse segment $DS_2$ is about the same situation as the main eventuality described in a discourse segment $DS_1$ and that it adds something relevant to that situation. In this sense elaboration does not entail a temporal precedence relation between the two eventualities; it rather adds some sort of conceptual linkage to the coherence of the discourse segments in question.

Against this theoretical background, we propose, first, that the conceptual coherence condition leads to a general preference of strong rhetorical connections over weak ones and that, second, lexical-functional particle verb constructions support an elaboration on a RO-related eventuality given in the previous discourse, while compositional particle verb constructions do not. In a questionnaire study we presented participants with discourse fragments of the type in (24).

(24) a. *An der Haltestelle steht ein Briefkasten und Regina wirft eine Karte ein.*
   ‘At the bus stop stands a mail box and Regina drops a post card in.’
   *Wirft Regina die Karte in den Briefkasten?*
   ‘Does Regina drop the post card in the mail box?’

   ‘On the floor stands a wine bottle and Thorsten sticks a label on.’
   *Klebt Thorsten das Etikett auf die Weinflasche?*
   ‘Does Thorsten stick the label on the wine bottle?’

Even though in both cases the discourse context highly favored the instantiation of an elaboration relation, we found significantly more elaborations with lexical-functional particle verb constructions (LF-PV) than with compositional particle verb constructions (C-PV); i.e. participants tended to answer the respective question for LP-PV (cf. 21a) positively, whereas for C-PV (24b) they did not.
In sum then, the example cases we presented illustrate a general division of labor between different components of the language system in transferring situations into linguistic meaning, cf. Table 3 for a schematization.

Table 3. Interaction between (a) linguistic means plus (b) their degree of inferability as (c) expressed in the argument structure and (d) the discourse relation plus (e) the inferential effort in reference object construal.

<table>
<thead>
<tr>
<th>Linguistic Means</th>
<th>Degree of Inferability</th>
<th>AS</th>
<th>Rhetorical Coherence</th>
<th>RO-Construal</th>
</tr>
</thead>
<tbody>
<tr>
<td>adverb</td>
<td>explicit RO</td>
<td>Ǝw</td>
<td>strong &gt;&gt; weak</td>
<td>+</td>
</tr>
<tr>
<td>daran lehnen</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lexical-functional particle</td>
<td>stereotypical RO</td>
<td>1w</td>
<td>strong &gt;&gt; weak</td>
<td>++</td>
</tr>
<tr>
<td>ein-werfen</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>compositional particle</td>
<td>no RO</td>
<td></td>
<td>strong &gt;&gt; weak</td>
<td>+++</td>
</tr>
<tr>
<td>an-lehnen</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The more explicit the linguistic means chosen – like in the case of adverb-verb constructions – the less effort is exerted on the inferential system in order to recover or reconstruct the reference object. Consequently, the discourse relation established can be more complex, e.g., an elaboration. If, on the other hand, a reconstruction of the reference object is enforced, as in the case of compositional particle verb constructions in our test cases (cf. 24b), the discourse relation established is rather the weak variety of the default case, namely, a weak narration, because the inferential effort is high. This strengthens our finding that in a canonical situation the reconstruction of the reference object is not required, as C-PV constructions are employed precisely to defocus the RO in the semantic representation. As we already pointed out earlier, the RO is not part of the speaker intention in the case of C-PV constructions.

The interaction between semantic representations and discourse principle thus ensures the principled accessibility of information underlying the linguistic output. In this way, the aforementioned (cf. section 1) mapping
from conceptual representations of situations, which originate from perception, imagination, or illusion, to linguistic representations and vice versa is guaranteed.

5. Conclusion

In the current paper, we reported on specific aspects relevant for the interaction between conceptual structures and linguistic representations in the conceptual mapping of situations to verb meanings. Based on theoretical considerations, we proposed a refinement of a sequential language production model by the integration of an empirically motivated thematic processor that systematically takes into account conceptual content on the one hand and discourse structural notions on the other. The thematic processor 'blindly' maps constrained pairings of CS/CT information (preverbal messages in Levelt's (1989) terminology) onto semantic representations. TP is conceived as an operative instantiation and specification of the VBL function proposed by Bierwisch and Schreuder (1992).

By means of three types of verb complexes – psych-verbs, decausatives, particle verb constructions – we clarified what kind of thematic information is visible to the linguistic system. Specifically, we investigated the role of thematic relations and their conceptual content during this early phase of the verbalization process and used experimental evidence to motivate the thematic processor. Since TP accesses both conceptual structure and contextual structure, we considered these in turn. In the first part of the paper, we presented evidence for the differentiation between the conceptual event representations – including event participants – and linguistically obligatory arguments and specified the interaction between thematic information and argument structure. Here, we showed that the information tightly related to event structure is filtered out of the conceptual information available and grammatically encoded in argument structure and the 'Aktionssarten' of the verbs. Consequently, we specified the conceptual input-structures underlying grammaticalization processes internal to the formulator as constrained pairings of CS/Ct complexes. Moreover, we derived the semantic representations triggering further linguistic realization.

In the second part of the paper, we sketched a division of labor between the different components of the language production system and indicated how inferential processes supported by coherence connections which underlie discourse relations accounts for sparseness in semantic
representation. We illustrated the principled recoverability of implicit information and how the degree of inferability of reference objects interacts with the strength of the rhetoric connections. We further explained that where recoverability of linguistically unexpressed information (e.g. of the reference object in the case of compositional particle verb constructions) is enforced, the discourse relation established is rather weak, because of the high inferential effort. This strengthens our finding that with these constructions the reconstruction of the reference object is usually not required because it is the precise function of C-PV constructions to defocus the reference object in the semantic representation. In sum the work presented sheds light on the question of how different knowledge sources and representations are intertwined during the process of language production; an issue that awaits further investigation.

Notes

1. We thank Annette Hohenberger, Helen Leuninger, Sophie Repp, Sahid Sahel, and Rüdiger Weingarten for their valuable comments on earlier drafts of this paper.

2. Cited and emphasis adapted from: [http://www.hku.hk/linguist/program/semantics7.html](http://www.hku.hk/linguist/program/semantics7.html)

3. In the interest of space, we cannot reiterate the theoretical discussion here; viz. Härtl 2001a: 67–96 for an extensive synopsis.

4. The term thematic processor is related to psycholinguistic findings as presented in Rayner, Carlson, and Frazier (1983) and Frazier (1987), which provide evidence for the assumption that TP regulates the second stage of language processing (the so-called second pass parse) by accessing argument structural properties of linguistic expressions as well as thematic information and pragmatic background knowledge. Particularly, the thematic processor operates on linguistic representations that are the result of the purely syntactic first pass parse and may revise them by drawing on the aforementioned knowledge sources.

5. This assumption is based on empirical evidence obtained by Leslie (1995). She found out that even six months old infants are sensitive to the causal billiard ball launching effect. Compare Härtl (2001a: 125) for schematic drawings of the stimulus material consisting of three scenes: 1) ball₁ rolling towards ball₂ that is lying still; 2) ball₁ in contact with ball₂ and 3) ball₂ rolling and ball₁ lying still. Even though, ball₁ does not hit ball₂ and thus does not cause the subsequent movement of ball₂ such a causal connection is established if the time during which both balls are not moving is sufficiently short.
6. This specialization in the meaning of lexical-functional particle verbs is discussed in detail in Olsen (2003b) showing on the basis of extensive corpus data that it is always the particle verb + NP combination that is specialized and not the verb in isolation. Therefore, as Olsen’s arguments imply, the compositional status can also be upheld for lexical-functional particle verbs as they are regularly computed by the lexical system of grammar and that particle verb constructions in general induce an inference operation to the effect that a functional relationship is established between the entities involved. The instantiation of this relationship is derived from complex extra-linguistic concepts, i.e. schemas and scripts (cf. Habel 1985 for an overview).

7. “Depending on the chosen theoretical approach, these can range from anywhere between two and about twenty-five. Altogether, there are over 350 relations available for use”, cf. Hovy 1990; cited from Scott and Kamp (1996 [no page numbers available]).

References

Avrahami, Judith, and Yaakov Kareev

Asher, Nicholas, and Alex Lascarides

Bierwisch, Manfred

Bierwisch, Manfred, and Ewald Lang (eds.)

Bierwisch, Manfred, and Robert Schreuder

Bock, Kathryn

Bock, Kathryn, and Willem J. M. Levelt
Chatterjee, Anjan, Lynn M. Maher, Leslie J. Gonzales Rothi, and Kenneth M. Heilman

Dell, Gary S.

Dell, Gary S., and Padraig G. O’Seaghdha

Fillmore, Charles J.

Frazier, Lyn

Friederici, Angela D.

Friederici, Angela D., Anja Hahne, and Axel Mecklinger

Fromkin, Victoria

Garrett, Merrill F.

Givon, Talmy

Glasersfeld, Ernst von

Grimshaw, Jane

Habel, Christopher

Habel, Christopher, Heike Tappe, and Markus Guhe

Habel, Christopher, and Heike Tappe

Härtl, Holden


Härtl, Holden, and James Witt
Herweg, Michael
1990  

Herweg, Michael, and Claudia Maienborn
1992  

Hobbs, Jerry R.
1985  

Houssiasdas, Lambros
1964  

Hovy, Eduard H.
1990  

Joshi, Aravind, and Scott Weinstein
1981  

Kempen, Gerard
1977  

Lascarides, Alex, and Nicholas Asher
1993a  

1993b  

Leslie, Alan M.
1995  
Leveldt, Willem J. M.
Leveldt, Willem J. M., Herbert Schriefers, Dirk Vorberg, Antje S. Meyer, Thomas Pechmann, and Jaap Havinga
Mann, William C., and Sandra A. Thompson
Marslen-Wilson, William, Erwin Levy, and Lorraine K. Tyler
Mauner, Gail, Michael K. Tanenhaus, and Gregory N. Carlson
McIntyre, Andrew
McRae, Ken, Todd R. Ferretti, and Liane Amyote
Meyer, Antje S.
Olsen, Susan

2003a The category verb particle and its semantic relationship to prepositions and adverbs in German. Ms., Humboldt University at Berlin.

2003b Specialization of particle meaning and its theoretical underpinnings. Ms., Humboldt University at Berlin.

Palmer, Frank R.
1994 Grammatical Roles and Relations. Cambridge, UK: Cambridge University Press.

Rapp, Irene

Rayner, Keith, Marcia Carlson, and Lyn Frazier

Rensink, Ronald A.

Roeper, Thomas

Seiffert Adriane E., and Patrick Cavanagh
1998 Position displacement, not velocity, is the cue to motion detection of second-order patterns. Visual Research 38: 3569–82.

Scott, Donia, and Hans Kamp

Stemberger, Joseph P.
Stutterheim, Christiane von

Trueswell, John C., and Michael K. Tanenhaus

van de Grind, Wim A., Jan J. Koenderink, and Andrea J. van Doorn

van Turennout, Miranda, Peter Hagoort, and Colin M. Brown

Vendler, Zeno

Williams, Edwin

Woodhouse, J. Margaret, and Horace B. Barlow

Zacks, Jeffrey M., and Barbara Tversky

Zacks, Jeffrey M., Barbara Tversky, and Gown Iyer

Zacks, Jeffrey M., Todd S. Braver, Margaret A. Sheridan, David I. Donaldson, Abraham Z. Snyder, John M. Ollinger, Randy L. Buckner, and Marcus E. Raichle