WORD MEANING, UNIFICATION AND SENTENCE-INTERNAL PRAGMATICS

TORGRIM SOLSTAD

University of Oslo
`torgrim.solstad@ilos.uio.no`

Recent important developments within Discourse Representation Theory include a more elaborate formalisation and account of presuppositional phenomena, as well as the integration into the theory of unification as a mode of composition. Focusing on these issues, the following claims are made: (i) the varying compositional impact of some adverbials, ranging from merely constraining the properties of a predicate to radically altering them, is suitably modeled applying unification, and (ii) pragmatic mechanisms like bridging, presupposition verification and accommodation can apply mainly sentence-internally for some lexical items. To substantiate these claims, the analysis will centre around the German causal preposition 'durch' ('through').

1. Introduction

An adverbial can be said to be a free syntactic constituent which modifies a predicate semantically. However, some adverbials not only modify a predicate, but may even (radically) alter its properties. Prepositional adjuncts headed by the German causal-instrumental preposition *durch* ('by', 'through') are examples of one such type of adverbial. One of the main functions of *durch* is marking its complement as the causing event in a causal relation between two events, as exemplified in (1) and (2):

(1) *Der Polizist wurde getötet durch einen Schuss aus der eigenen Dienstwaffe.*
'The policeman was killed by a shot from his own service weapon.'

(2) *Der Polizist starb durch einen gezielten Schuss.*
'The policeman died through an accurate shot.'

In (1), the causative predicate *töten* ('kill') is used, which implies the existence of a causing event without specifying it, i.e. it is non-manner-specific. The modifying *durch* adjunct provides this specification: the death of the policeman is caused by the event of a shot from his own service weapon. In (2), the inchoative predicate *sterben* ('die') is used. Inchoatives like *sterben* are not generally assumed to imply a causative relation. Still, in combination with the *durch* adjunct, a semantics parallel to the one indicated for (1) is desirable: a shooting event is the cause of the policeman's death. Additionally, an inchoative like *sterben* does not associate with

an agent on its own. But sentence (2) clearly implies the presence of an agent, as the specification of the shooting event as being 'accurate', indicates. Thus, the *durch* phrase can be said to have altered the properties of the inchoative predicate *sterben*.

Accordingly, the semantics of both (1) and (2) can be represented as indicated in (3), leaving out information not relevant to the discussion here:

(3) $\lambda e_1 \exists e_2 [\text{BECOME}(dead(p))(e_2) \wedge \text{CAUSE}(e_2)(e_1) \wedge \text{SHOOT}(e_1)]$

However, since inchoatives are not assumed to imply causation, there must be two different sources for the abstract predicate CAUSE: with causatives it originates in the predicate itself, but with inchoatives, the preposition seems to be the most plausible candidate for its introduction. But if *durch* in some cases should include a CAUSE of its own, principles of strict compositionality would seem to force us to assume an ambiguity between two *durch* prepositions since no two CAUSE predicates are assumed after the composition of *durch* with causatives. Assuming ambiguity would however clearly be somewhat counter-intuitive, given the parallel interpretation of (1) and (2). Thus, other means of composition for *durch* phrases and the predicates they modify, should be explored.

2. A unificational analysis

To deal with this challenge, the semantics of *durch* will be analysed by means of unification in Discourse Representation Theory (Bende-Farkas and Kamp 2001), applying principles of the presuppositional analysis of Kamp (2001, pp. 221-231) and Sæbø's (2005) analysis of *by*. Building on work by van der Sandt (1992), Kamp assumes that semantic information in a sentence is processed bottom-up via a storage algorithm. Semantic information represented preliminarily in the store part enters a main content part as it is bound, verified or accommodated. The general representational format of Kamp (2001) for a semantic node in a tree structure is shown in (4):

$$
\text{STORE}
$$

(4) $\left\langle \left\{ \langle \text{Variable}, \boxed{\text{Constraint}}, \text{Binding condition} \rangle \right\}, \boxed{\text{CONTENT}} \right\rangle$

A semantic node representation consists of a pair of a content and a store element. The content is always a Discourse Representation Structure (DRS). The store is a set of one or more elements, each being a triple of a variable, a constraint (a DRS) and a binding condition. Binding conditions determine which variables can enter a binding relation, and constraints contain semantic information which may also be of importance for binding. In addition to the binding mechanism, a principle which unifies variables and constraints when possible, is assumed.

This machinery allows a unified analysis of the above uses of *durch* where the preposition indeed includes a CAUSE of its own. When combined with a causative

predicate, the implicit CAUSE of *durch* is not added to the content part since there is a CAUSE present in the predicate. However, the combination of *durch* with an inchoative leads to the projection of the CAUSE element in the content part. The actual formalisation is illustrated briefly below. *Durch* may be represented as in (5):

(5) **durch:**

$$
\left\langle \left\{ \begin{array}{l} \langle e_1 , \boxed{\begin{array}{l} \text{CAUSE}(e_2)(e_1) \\ e_1 \subseteq t_{loc} \end{array}} , \lambda_1 \rangle, \\ \langle e_2, \boxed{\text{CAUSE}(e_2)(e_1)} , \lambda_2 \rangle, \\ \langle t_{loc}, \qquad , \text{loc.t.} \rangle \end{array} \right\}, \boxed{\begin{array}{c} \\ \hline \\ \end{array}} \right\rangle
$$

Durch has no content of its own – its content part is empty –, but includes two event variables and a temporal variable in the store. The two event variables are further specified as entering a CAUSE relation. The binding conditions λ_1 and λ_2 indicate that the variables need to bind. When the complement of the preposition is added, as in *durch **einen Schuss***, the event expressed therein is bound by e_1 and the information in the noun is added as a further constraint on the causing event: SHOT(e_1) (cf. Chung & Ladusaw (2004), where the term *restriction* is used). When a *durch* phrase is combined with a causative predicate which has a completely parallel store part, the variables of *durch* and their constraints will eventually be unified with or bind the variables of the causative predicate. The causing event e_1 of *durch*, which has already bound the event in the complement of *durch*, will be unified with the causing event of the predicate, whereas the caused event e_2 will bind the caused event of the predicate. Additionally, the constraints of the predicate and the preposition are merged and - where applicable - unified. After binding and unification have occured, the actual contribution of a *durch* phrase, as compared to the information provided by the predicate alone, is restricted to the specification of the causing event given by the constraint SHOT(e_1). Turning next to the inchoative predicate, its store part includes only one event, which will be bound by e_2 of *durch*. In this case, the variable of the causing event of *durch* will be added to the content, since there is no event for it to be unified with. Furthermore, the CAUSE relation of which the bound event variable of the inchoative predicate will be a part, will also enter the content, along with the aforementioned constraint derived from the complement of the preposition.

3. Sentence-internal pragmatics

This treatment of *durch* amounts to analysing its implicit CAUSE element as an *intrasentential* presupposition. A *durch* phrase can be said to *assert* the event included therein and *presuppose* that this event is a cause of some other event. The common basis for generally assumed mechanisms for presuppositional behaviour and the compositional unification-based analysis of *durch* is as follows: When combined with causatives, *durch* seems to lack a meaning of its own. This is due to the unifi-

cation of the CAUSE of *durch* with the CAUSE of the predicate, which is parallel to presupposition verification. In combination with inchoatives, however, *durch* does seem to make a greater contribution, where a CAUSE predicate is introduced by the causal preposition itself. Here, a parallel to context accommodation can be observed.

Importantly, a pragmatic account of the combinatorial potential of *durch* can capture some further properties of the preposition which have previously been ignored or not correctly identified. Two additional pragmatic mechanisms involved are *bridging* and *acceptability*. In (6), bridging (in the wider sense of Bittner (2001)) can be argued to take place, where the CAUSE associated with the preposition forces a reinterpretation of the state described in the predicate *hoch* ('high') as being a caused resultant state:

(6) *Auch der durch diese Haltung hohe Luftwiderstand kann auf längeren Strecken ganz schön schlauchen.*
'The high air resistance due to this posture may put you through the mill over longer distances.'

In (7), it can be seen that claims made in the literature that *durch* generally cannot be combined with manner-specific causatives (Härtl 2001) are not correct:

(7) *Er wurde* $\left\{ \begin{array}{l} {}^{??}\textit{durch einen Schuss} \\ {}^{\text{OK}}\textit{durch einen Genickschuss} \end{array} \right\}$ *erschossen.*
'He was shot dead $\left\{ \begin{array}{l} {}^{??}\text{with a shot} \\ {}^{\text{OK}}\text{with a shot to the neck} \end{array} \right\}$,'

The well-formedness of such combinations should not be explained by reference to the semantics of *durch*. A more general account of the distribution in (7) is achieved by assuming that composition is restrained by a general pragmatic mechanism of acceptability as described by van der Sandt (1992, pp. 367 ff.). Modifying a predicate such as *erschießen* ('shoot dead') by an adjunct like *durch einen Schuss* ('with a shot') is uninformative and thus unacceptable. However, a specification such as *durch einen **Genick**schuss* ('with a shot *to the neck*') renders the adjunct more specific than the shooting event described in the predicate, adding to the content. Thus, the distribution of *durch* phrases in combination with manner-specific causatives does not bear on the semantics of *durch*, but is determined by acceptability restrictions.

It should be emphasised that in the examples above, all pragmatic mechanisms assumed to account for the compositional behaviour of *durch* apply purely sentence-internally. Since presuppositions in general are assumed to be verified also inter-sententially, *durch* might seem like an exception. But there is at least one type of occurence where the presupposition of *durch* can be seen as being verified sentence-externally:

(8) *Sie hat Geld verloren. Es geschah durch Unaufmerksamkeit.*
'Sie lost some money. It happened due to lack of attention.'

In the second sentence in (8) containing the *durch* phrase, the abstract event predicate *geschehen* ('happen') is used, which asserts that some event took place. What *durch* modifies semantically however, is the predicate *verlieren* ('lose') in the first sentence. Thus, in the case of (8), part of the presuppositional information in the store of *durch* binds an event variable in the preceding sentence.

4.   A wider perspective

An approach as sketched above has applications beyond the analysis of *durch*. First, unification as a mode of composition has been applied in an analysis of the semantics of *by* in English (Sæbø 2005). Second, there are causal prepositions in other languages which show a similar behaviour to *durch*. In English, *through* can also be combined with both causative and inchoative predicates. More interestingly, given the close relationship between English *through* and German *durch*, a language more remotely related to German such as Bulgarian also has a preposition, *ot* ('from'), which combines with causatives and inchoatives:

> (9)   a. *Toj be ubit ot tri kurshuma.*
>   He   was killed from three shots
>   'He was killed with three shots.'
>
>   b. *Toj sagina ot tri kurshuma.*
>   He   died   from three shots
>   'He died from three shots.'

Third, there are other types of adverbial modification, where the above analysis can be applied plausibly, as illustrated in (10):[1]

> (10)   a. *Sie ging in das   Haus hinein.*
>   DIR+IN   DIR+IN
>   'She went into the house.'
>
>   b. *Sie ging in das Haus.*
>   'She went into the house.'
>
>   c. *Sie ging hinein.*
>   'She went inside.'

In (10a) the adverbials *in das Haus* ('into the house') and *hinein* ('inside' in addition to viewpoint information) specify a single path of movement. They are not interpreted as describing two paths which are combined. There is a double specification of an *in* movement (i.e. *into* as opposed to *out of*), once in the preposition *in* and once in the *hinein* element. In addition, directionality is specified twice: once in the combination of the preposition with accusative case, and once in the *hinein* element.

---

[1] Thanks are due to Christopher Habel for pointing my attention to this example.

243

As can be seen from (10b-c), either of the advberbials in (10a) can occur without the other. In the spirit of the analysis presented here, the *hinein* element would be assumed to carry the presupposition that there is an object into which movement takes place. In (10a) this presupposition is sentence-internally verified, whereas it will have to be verified in a wider context or accommodated in (10c). The information on directionality and inwards movement of the two adverbials is unified whenever they both occur.

In sum, these data suggest that the presuppositional analyses of Kamp (2001) and van der Sandt (1992) in combination with unification-based composition can be suitably applied in analysing lexical items other than e.g. particles and factive verbs.

5. Conclusion

In this paper, it was argued that unification is an adequate mode of composition in accounting for the varying compositional impact of adverbials. It was also argued that pragmatic mechanisms are important in describing the combinatorial distribution of some lexical items.

Acknowledgements

Bibliography

Bende-Farkas, A. and Kamp, H.: 2001, *Indefinites and Binding: From Specificity to Incorporation*, Revised version of the lecture notes from a course given at the 13th ESSLLI in Helsinki, Finland

Bittner, M.: 2001, Surface composition as bridging, *Journal of Semantics* 18(2), 127–177

Chung, S. and Ladusaw, W. A.: 2004, *Restriction and Saturation*, MIT Press, Cambridge, Massachusetts

Härtl, H.: 2001, CAUSE *und* CHANGE*: thematische Relationen und Ereignisstrukturen in Konzeptualisierung und Grammatikalisierung*, Akademie-Verlag, Berlin

Kamp, H.: 2001, The Importance of Presupposition, in C. Rohrer, A. Roßdeutscher, and H. Kamp (eds.), *Linguistic Form and its Computation*, pp 207–254, CSLI Publications, Stanford

van der Sandt, R. A.: 1992, Presupposition Projection as Anaphora Resolution, *Journal of Semantics* 9(4), 333–377

Sæbø, K. J.: 2005, The structure of criterion predicates, in J. Dölling and T. Heyde-Zybatow (eds.), *Event Structures in Linguistic Form and Interpretation*, Mouton de Gruyter, Berlin