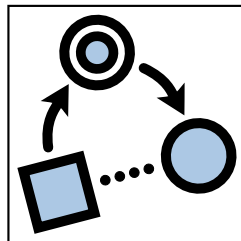


Collaborative Research Center 991

**The Structure of Representations in Language, Cognition, and
Science**

Heinrich-Heine-Universität Düsseldorf



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3.1 About Project B09

3.1.1 Title: Modifiers as a probe into the frame structure of events

3.1.2 Research areas:

104-01 Allgemeine und Angewandte Sprachwissenschaften, semantics, computational linguistics

3.1.3 Principal investigator(s)

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Sebastian Löbner: End date 30.06.2015. Further employment is planned until the end of the second funding period.

Wiebke Petersen: End date 02.11.2016. Further employment is planned until the end of the second funding period.

3.1.4 Legal issues

This project includes

1.	research on human subjects or human material	no
2.	clinical studies	no
3.	experiments involving vertebrates	no
4.	experiments involving recombining DNA	no
5.	research involving human embryonic stem cells	no
6.	research concerning the Convention on Biological Diversity	no

3.2 Summary

The proposed project seeks to determine the architecture that is needed for frame representations of events by analysing their interplay with adverbial modifiers, especially manner and agent-oriented event modifiers. The proposal thus includes both work in the area of verb meaning, i.e. constructing frame-based representations of semantic traits that are available as targets of adverbial modification, and work in adverbial semantics, especially with respect to composition rules that show how the meaning of an adjectival lexeme (in adverbial use) can be brought to bear on the verb's representation to modify it – sometimes in different ways for one and the same adjectival lexeme.

An account of modification is needed as a central component in any serious frame-based theory of verb meaning, because the modification potential of verbs provides a window into its attribute structure beyond the mere case frame. The exigencies of adverbial modification can lead up to the detection of attributes, or patterns of correlations, whose role might have been overlooked in a purely verb-centred view. In particular, the role of dynamic features of the representation can be studied in this way. At the same time, frame theory will be able to resolve a number of issues in adverbial modification that have remained ill-understood so far

because the lexical-semantic foundations of adverbial modification could hardly be addressed, for want of a suitable framework.

To reach this goal we will (a) develop a more fine-grained view on the delimitation of manner and non-manner adverbs, which has been a problem for existing approaches, (b) develop a frame-based representation of the manner component of verb meaning that is detailed enough to account for manner modification phenomena, (c) study the modification patterns from the backdrop of robustly defined verb classes, in order to assess the roles of lexical semantics and inferential processes as boundary conditions in the interpretation of verb-modifier combinations. The project also immediately cooperates with C10 on adjective-noun modification, relating adverbial verb modification to corresponding adjectival modification of deverbal nouns.

3.3 Research Rationale

3.3.1 Current state of understanding and preliminary work

The present project proposal reacts to three desiderata (D 1–3 below) that we identify in the field of adverbial semantics. Two initial concerns are:

(D 1) Unresolved issues in the classification of adverbs into event-related and sentential modifiers.

(D 2) Unresolved issues in the neo-Davidsonian representation of manner adverbs, which arise from problems inherent in the usual modelling of intersective modification as such.

These two issues jointly lead up to our third, and major, problem:

(D 3) The lack of a lexical-semantic theory of event-related modification or “manner” modification.

(D 1) Unresolved issues in adverb classification

The proposed project has the main goal of developing a theory of how adverbial modifiers interact with the frame representation of verb meaning. As our empirical domain, we concentrate on adverbial uses of adjectives in German and, to some extent, English (we see an extension of the cross-linguistic component as one of the possible long-term developments of the current proposal). Our research questions can therefore be framed in terms of the interaction of adjectival and verbal lexical representations in a modification constellation.

We will first single out those types of adverbs that relate to events, since only these can be expected to interact with a verb’s lexical-semantic representation. Adverb types which are clearly related to the propositional or pragmatic level remain outside the scope of the project. This concerns at least all types of “speaker-oriented” and “domain” adverbs and some of the “functional” adverbs in the classification in Maienborn & Schäfer (2012, p. 1402).

For establishing semantic classes of adverbial modifiers, one of the most important heuristics is their syntactic classification, which means that we need to take into account certain syntactic issues even though the project is aimed at modelling modification at a lexical-conceptual level. The syntactic classes are generally thought to map onto different semantic classes of modifiers. With respect to English, the most basic distinction traditionally recognised is between “VP-internal” and “VP-external” modifiers (Jackendoff, 1972). This is often thought to correlate with a semantic distinction between event-related and propositional modifiers. However, the syntactic generalisations that are relevant for us must be stated in terms of relative positions, not specific syntactic heads with fixed properties, for it has been argued that the German VP covers much more material of the clause than the English VP, including both subjects and auxiliaries (Haider, 2000, 2010; Sternefeld, 2006). Hence, most English “VP-external” adverbials occur within the German VP. Frey (2003) presents a summary of what we see as the standard account of German adverbial syntax. In this work, classes of modifiers are distinguished on the basis of their relative ordering and their ordering with respect to the positions of the verb’s arguments (Frey also argues that these generalisations carry over to English). Frey’s syntactic adverb classes are labelled in terms of semantic classes, and, in particular, lead to the recognition of “process-related adverbials” as opposed to so-called “event-internal” and “event-external” ones. Frey’s “event-internal” adjuncts are actually those that serve to localise the event as a whole, e.g. adverbials of time and place, while it is the “process” class that contains the manner adverbs, also including what Maienborn (2003) calls “event-internal locatives”. The hallmark of the process class is a syntactic position closer to the verb than those of the other adjuncts.

“Process” or “manner” adverbs like *slowly* in *He is working slowly* constitute a type of modifiers whose semantic event-relatedness is beyond doubt (but which raise other problems for us, see below under D2) – but only in manner-adverb uses. Adverbs like *quickly* are manner adverbs if they specify the speed of an

on-going event. But the same adverbs apply at a higher level in examples such as (1), where they express the duration of time elapsed from some previous reference point.

- (1) We quickly closed the door.

This is a first example of an alternation between a manner and a non-manner use of the same lexical item; this case involves a shift between manner and temporal meaning, and can be considered fairly well-understood already (especially in light of the work by Rawlins, 2013). However, a more problematic issue is the existence of adverb classes that cannot easily be grouped with either “propositional” or “event-related” modifiers. In Frey’s system, they are modifier classes that are expected to fall in with his “sentential adjuncts” or “event-internal adjuncts”, respectively, but for which additional restrictions have to be invoked that seem to originate from a special relation with the agent role of the event (or, rarely, other arguments). We refer to these classes as “agentive adverbs” (following Geuder, 2002) and “mental-attitude adverbs” (following Frey), respectively. These adverb types deserve attention in our project both with respect to alternations between manner and non-manner uses, and with respect to the non-manner variant as such.

(i) *Mental attitude adverbs*, like *reluctantly* or *intentionally*, appear to take scope over some part of the clause, namely the part that would describe the object of such an attitude. They are able to occur above VP in English and to precede negation. Nevertheless, Landman (2000) has argued that all this need not point to an analysis in terms of the intensional operators of Thomason & Stalnaker (1973), but can be handled via argument structures like ‘reluctantly (e,x,C)’, i.e. an event-related modifier that additionally predicates of an individual (the bearer of the attitude) and has a propositional object recovered from context. What remains unaccounted for, though, is the role of the e-variable here. Wyner (1998) and Eckardt (1998) use the event to retrieve the bearer of the attitude via semantic role information. Matsuoka (2013), however, shows that some of those adverbs may shift their orientation between agent or theme arguments depending on syntactic position, which makes them entirely different from manner adverbs. Buscher (2013), in turn, identifies different subgroups of mental-attitude adverbs in terms of different semantic mechanisms that serve to retrieve the relevant individual. Finally, Maienborn & Schäfer (2012, p. 1398) assume that *reluctantly*, while belonging to a distinct class of mental-attitude adverbs, may simultaneously shade into a manner semantics. – In sum, there is a consensus that these adverbs do involve the event variable, but there is no decisive account as to how event or individual predication and lexical meaning of the adverb work together in establishing their reference. Moreover, the relationship between the notions “event predication” and “manner modification” remains obscure.

(ii) *Agentive adverbs*, like *stupidly* in (2) below raise similar problems. They are usually assumed to be confined to positions above the VP in English. As a rule, agentive adverbs derive from adjectives denoting a disposition of agents and yield adjectival paraphrases of the form “it is [adj.] of x ...”, as in the example (to be read in a football context):

- (2) The defender stupidly passed back / It was stupid of the defender to pass back.

Many such uses involve the affix *-weise* in German but have to be distinguished from the class of “evaluative adverbs” described in Geuder (2002, ch. 4) and (Bonami et al., 2004), which carry the same affix and are sometimes ambiguous with an agentive adverb, as in the case of German *dummerweise*. Agentive adverbs can take scope over negation and have scope effects that seem to derive from association with focus, in a way that is markedly different from manner adverbs. Moreover in paraphrases like the one shown above, they may combine with a *that*-clause (especially in German) or also with a transitive gerund. Hence, they are often seen as some kind of propositional modifier (e.g. Parsons, 1990, p. 64). However, there have also been proposals for an event-based analysis, like McConnell-Ginet (1982) and more recently Piñón (2010). The motivation for these proposals seems to be that agentive adverbs are seen as modifying “decisions” or other aspects of agentive causation, and that such components would find a separate place in representations of the syntax or the logical form of verb phrases. The tension between these two kinds of proposals has not been resolved, and a fully convincing analysis of these adverbs, which also explains their nonrestrictive character, has not been found so far, including, in our view, the recent treatment in Morzycki (2013), which takes up Ernst (2002). We believe that focusing on event descriptions, using frame theory, instead of individual e’s may prove to be a way out of the dilemma. Moreover, this will also allow us to capture the regular alternations with manner uses of the same adverb (as in *played stupidly*).

(D 2) The representation of manner modification

In Parsons’ (1990) influential treatise on event semantics, typical manner adverbs are analysed as predicates of events, hence on a par with intersective modifiers in the nominal domain:

- (3) a. *to work slowly* : [slow(e) & work(e)]
 b. *a slow car* : [slow(x) & car(x)]

The main purpose of such representations has always been to encode the logical properties of these modifiers such as scopelessness and droppability, not lexical analysis. It is also important to recall that Parsons (1990, pp. 64–67) does not claim this to be an analysis of “manner” adverbs in a strict sense, but merely speaks of “VP-modifiers”.

Hence, event predication alone is not able to clarify the content of “manner modification”, and the problem is directly rooted in the purely extensional approach that uses joint predication of the form ‘A(x) & B(x)’. Here we share a concern with the planned project C10 on adjectives. The intersective format does not show the “modification” relation as such, since it does not show any asymmetry of modifier and head. It is apparently taken for granted that such asymmetries would reside in the lexical meaning of a modifier and need not be represented in the logical form. One way of adding a lexical asymmetry would be to point out that the interpretation of an adjective may depend on the nominal or verbal head in terms of comparison classes and the like, never the other way round. As a related point, modifier meanings are typically gradable, i.e. involve a degree scale, while verbs and noun meanings are often “multidimensional” in some sense. With respect to adjectival modifiers, this view has classically been expressed by Kamp (1975, p. 147f.). However, there is a complication originating from the fact that degree modification of verbs is actually a frequent phenomenon, at least in German (Löbner, 2012; Fleischhauer, forthcoming), for example:

- (4) Er hat sehr geblutet / Er vermisst sie sehr
 He has “very” bled / He misses her “very”
 ‘He bled a lot’ / ‘He misses her a lot’

Since traditionally, degree and manner modification are seen as two different realms, involving two different sorts of variables, the intuitive semantic similarity of the two raises additional questions as to the definition of “manner”. In reaction to this, Anderson & Morzycki (to appear) propose a unified analysis of manner and degree modification (as well as nominal kind expressions). Their account builds on crosslinguistic similarities such as the observation that in German the same question pronoun and the same anaphoric proform are used for both reference to values on scales and manner expressions, as illustrated in (5a) and (5b):

- (5) a. Der Koffer ist 10 Kilo schwer / Wie schwer? / So schwer
 The suitcase is 10 kg heavy / How heavy? / So heavy
 ‘The suitcase weighs 10 kg / How heavy is it? / It’s that heavy’
 b. Horst schreibt sorgfältig / Wie schreibt er? / Er schreibt so
 Horst writes carefully / How writes he? / He writes so
 ‘Horst writes carefully / How does he write? / He writes like that’

These authors propose to model degrees as ‘state kinds’ and manners as ‘event kinds.’ Informally, (5a) is analysed as saying that the suitcase is in a weight-state which is further characterised as realising an instance of the plurality of all 10 kilo-states. Likewise, (5b) refers to an event in which Horst is writing and which realises an instance of the plurality of all diligent-events. While parallels such as the ones illustrated above are indeed suggestive of a unified analysis, the account of Anderson & Morzycki faces the problems of the ontological plausibility of degree state kinds and manner event kinds. Moreover, it lacks a finer-grained access to event components for an adequate treatment of the different targets of manner modification. Eventually, kinds are again constructed from sets of individuals and there is no qualitative representation of properties. It seems that just any set of individuals can be used to form a kind; however, in the absence of a criterion as to what would be a natural kind, no inferential reasoning in the interpretation of modifiers will be supported (which is problematic, as will become evident in connection with D3).

Another attempt at accommodating manner to standard logical-semantic frameworks takes “manners” as individuals in the ontology. Piñón (2007) points out that manners should be classified as concrete particulars, since (like events) they can be directly perceived:

- (6) Malika saw how Rebecca wrote, namely, illegibly / with her foot.

For Piñón, the reification of manners also serves to solve the puzzle of so-called “scope taking manner adverbs”, initially described by Parsons (1972). The notion seems contradictory in view of the standard neo-Davidsonian analysis, and, in our view, it indeed remains to be determined whether they should be classified as manner adverbs in the full sense. Examples are:

- (7) a. Bob painstakingly wrote illegibly
b. Ann carefully spoke softly

The problem is seen in the fact that (7a) does not seem to entail “Bob wrote painstakingly”, hence *painstakingly* is said to have a scope effect. In sentence-final position, the effect disappears. Hence, the question arises whether we might be dealing with another alternation of the same lexical item occurring in different adverbial uses (adding to our list of types of the first section). Piñón (2007) proposes that manner individuals are the output of a function that applies to event descriptions; describing scopal uses of manner adverbs is now possible if such a manner-function applies to a complex event description that is formed in the syntax:

- (8) *Rebecca painstakingly write-illegibly* →
 $\lambda e.\text{agent}(\text{Rebecca})(e) \wedge \text{write}(e) \wedge \text{illegible}(\text{form}(\lambda e'.\text{write}(e'))(e)) \wedge$
 $\text{painstaking}(\text{effort}(\lambda e'.\text{write}(e') \wedge \text{illegible}(\text{form}(\lambda e''.\text{write}(e''))(e')))(e)$

Here, “form(-manner)” is interpolated as a function that maps a description ($\lambda e' \dots$) of an event (e) onto a manner individual (m). It is this individual that the modifier is actually predicated of (which is hidden in the notation of the formula above: the value of “form(...)” will be some m). So, while Parsons (1990) would write a modifying adverb as e.g. “illegible(e)”, Piñón would take it essentially to be “illegible(m)”. Again, this is an approach which uses a conceptually unexplained predication of a fairly abstract entity. In introducing manner functions like “effort”, Piñón’s approach is more explicit than others. In this way, on the other hand, we get a second set of items whose application has to be justified: “effort” is defined for “writing”, “painstaking” is defined for “effort”, etc. The system that should emerge from this is not specified yet, and moreover, it seems to be based again on set-theoretic representations.

(D 3) The promise of the frame model

In the preceding, we have pointed out that standard accounts of modification rely on extensions and operations that restrict extensions. The frame model first developed by Barsalou (1992) and elaborated in earlier research of the present CRC and its predecessor projects (e.g. Petersen, 2007; Löbner, 2011) opens up an alternative, in that predicate meanings are fanned out into a recursive attribute-value structure. Instead of sets of individuals, modifiers can therefore restrict attributes and their values. A first sketch of how a frame model could be used for modelling manner modification is found in Geuder (2006). This work argues that the potential of verbs to undergo manner modification can be traced back to the conceptual complexity of the network of attributes that represents their lexical meaning. The most complex case discussed there is the verb *glänzen* (‘gleam’), which can be paraphrased as LIGHT EMISSION BY REFLECTION AT A SURFACE. This allows an account of an example brought up by Maienborn (2004) *Die Perlen glänzen feucht* (‘The pearls are gleaming wet(ly)’), in which the modifier *feucht* (‘wet’) is not in itself a “predicate of events” but is able to modify the event frame via a special mechanism from Barsalou’s model that he calls correlations. The idea is that a modifier of a verb of light emission can only be linked to the verb meaning if it is able to modify an attribute that concerns light emission. This is now possible because the pattern of light reflection at a surface is known to be correlated with properties of the surface: the radiance of the light emitted from the surface has characteristic properties if the surface is wet, and therefore *wet*, if applied in its underlying lexical meaning to the SURFACE attribute, is able to indirectly modulate the radiance of the light. Hence, the modifier meaning is the result of a specific construal of a lexical meaning of a different sort. The proposed mechanism explains why modification in this example depends on the inference that it is the surface of the object that is wet, excluding other possible construals of *wet*.

In this way, a theory of manner modification is taking shape that can be dissociated from predication of event individuals in the logical form. Instead of depending on ontological sorts of the variable that a modifier may target, manner modification can be modelled as a process that restricts the values in one or more attributes of a frame.

Work done by Petersen and Gamerschlag in other projects during the previous phase of the CRC has started to advance frame theory so as to enhance its ability to deal with adverbial modification: Previous work in A01 has been devoted to modelling the dynamicity of events and has resulted in a mathematically viable representation of event frames. Moreover, Gamerschlag, Geuder & Petersen (2014) have proposed a frame account of both activity (or “manner”) verbs and degree achievements like *erwärmen* (‘warm’) (and

of equivalent combinations of functional noun and intensional verb like *die Temperatur steigt* ‘the temperature is rising’). The work by Thomas Gamerschlag in project B02, e.g. Fleischhauer & Gamerschlag (2014), provides important groundwork in that it has studied the role of scalarity in the context of fairly simple verb meanings, thus providing a laboratory case for dealing with specific verb types and their modification potential. Gamerschlag & Petersen (2013); Petersen & Gamerschlag (2014) have developed frame analyses of perception and posture verbs, which both involve the composition of a verb frame with the frame of another predicate (adjective or local preposition). Likewise, these works also feature proposals for the representation of path PPs and their interaction with verb meaning, thus coming close to certain cases of adverbial modification.

3.3.2 Project-related publications

- Gamerschlag, T. & W. Petersen. 2013. Analyzing stative dimensional verbs in frames. In A. Stefanowitsch & S. Niemeier (eds.), *Yearbook of the German Cognitive Linguistics Association 1*: 3–23. Berlin: Mouton de Gruyter.
- Gamerschlag, T., W. Geuder & W. Petersen. 2014. Glück auf, der Steiger kommt: A frame account of extensional and intensional steigen. In D. Gerland et al. (eds.), *Meaning and Grammar of Nouns and Verbs*, 115–144. Düsseldorf: Düsseldorf University Press.
- Geuder, W. 2002. *Oriented Adverbs. Issues in the Lexical Semantics of Event Modifiers*. Doctoral dissertation, Universität Tübingen. <<https://publikationen.uni-tuebingen.de/xmlui/handle/10900/46179>>
- Geuder, W. 2004. Depictives and transparent adverbs. In J. Austin, S. Engelberg & G. Rauh (eds.), *Adverbials. The Interplay between Meaning, Context and Syntactic Structure*, 131–166. Amsterdam: Benjamins.
- Geuder, W. 2006. Manner modification of states. In C. Ebert & C. Endriss (eds.), *Proceedings of Sinn und Bedeutung 10*, 111–124. Berlin: ZAS
- Geuder, W. 2012. Building event representations: A long path to go. *Theoretical Linguistics* 38: 205–209.
- Löbner, S. 1989. German schon – erst – noch: an integrated analysis. *Linguistics & Philosophy* 12: 167–212.
- Löbner, S. 2012. Sub-compositionality. In W. Hinzen, E. Machery, M. Werning (eds.), *The Oxford Handbook of Compositionality*, 220–241. Oxford: Oxford University Press.
- Petersen, W. 2007. Representation of concepts as frames. In: J. Skilters, F. Toccafondi and G. Stemberger (eds.), *Complex Cognition and Qualitative Science*, 151–170. University of Latvia.
- Petersen, W. & T. Gamerschlag 2014. Why chocolate eggs can taste old but not oval: A frame-theoretic analysis of inferential evidentials. In T. Gamerschlag et al. (eds.), *Frames and Concept Types: Applications in Language, Cognition and Philosophy (= Studies in Linguistics and Philosophy 94)*, 199–220. Dordrecht: Springer.

3.4 Research Plan

3.4.1 Research questions, aims and hypotheses

A key problem that emerges from the literature survey is that the monolithic event-semantic representation of manner adverbs as “predicates of events” is insufficient as a representation of lexical meaning and as the basis of a theory of modification – already on the grounds that it does not allow a delimitation of the “manner” class. In response to this, our leading idea is that a theory of modification needs a decomposition of head and modifier meanings into sub-properties, i.e. the attributes in a frame. From this perspective, adverbial modification is seen as the interaction of the information contained in the two attribute-value structures of head and modifier, by means of unification rules that operate on the frame representation so as to truly ‘modify’ it, i.e. alter it. What the field of adverbial semantics gains from this approach is a model that allows one to express fine-grained distinctions between modifier functions and, it is hoped, derive explanations for fine points of modification which go beyond usual semantic type distinctions, such as compatibility restrictions between verbs and modifiers. Conversely, frame theory gains guiding principles that allow one to detect the attributes that have to be posited in the representation of verbs. It is obvious that adverbial modifiers display meanings that are richer than what can be derived from usual considerations on “event structure” and “argument structure”, which otherwise enjoy most attention in work of verb semantics. To take an example, our preliminary research suggests that modifiers of the type *carefully* and its German counterparts *vorsichtig* / *sorgfältig* involve especially complex attribute constellations. Thus, *sorgfältig* seems to make reference to the degree of perfection of a result in combination with choices of an agent between different ways of proceeding with an action, and attributes of the action itself along with their causal efficacy. The modifier depends both on the agentivity of the verb (hence, *Die Türe schloss sich sorgfältig* ‘The door

closed carefully' is odd), and on particular kinds of result (*die Türe sorgfältig schließen*, 'to close the door carefully/thoroughly', is fine, whereas *die Türe sorgfältig öffnen*, 'open the door thoroughly', is odd). The challenge coming from such modifiers is to explain their functioning via the interplay of simple, well-defined attributes in both the modifier meaning itself and in the verb meaning. The example of *sorgfältig* indicates that attributes surrounding the agent role of an event and attributes describing the stage structure of an event, and their interactions, may play pivotal roles in the emerging theory.

Q 1 How the topic of modification interacts with the representation of verbs

Central to frame theory is the notion of functional concepts. It can be noted that the literature has touched on such functional concepts here and there, but not in terms of a systematic theory. Most notably, Piñón (2007, 2010) uses them in his "manner functions", which, however, still seem impressionistic in that they appear as isolated postulates in the analysis of specific adverbs. The proposed project, in contrast, will be able to integrate such ideas in a coherent approach to verb meaning, based on first results on the modelling of events in a frame theory from project A01. Hence, the theory of adverbial modification naturally leads to an account of the conceptual structures in verb meaning. In this connection, we will also be able to address problems in verb classification, notably those that revolve around notions like "manner verb" (cf. Levin & Rappaport Hovav, 2013). The question of whether verbs can be classified in terms of attributes that predominantly characterise their lexical meaning leads to the question of superordinate "domains" that may serve to structure frames; we borrow this notion of domain from Gärdenfors (2014, pp. 21ff.) (without subscribing to the geometrical model in which it appears), where it is introduced as a specific set of meaning dimensions (or attributes). Domains are characterised by being linearly independent from each other, while within a domain, property values are more strongly interdependent. Gärdenfors (2014) posits the existence of separate "result" and "force" domains (with "result" domains yielding scalar verbs), besides others that belong to the intentional realm, and more. Again, a systematics of verb meanings in terms of domains is still missing, but we hypothesise that it should be a key notion in establishing anchors for modification.

Q 2 How frame theory allows a definition of "manner" and other adverb types

A possible definition of "manner modification" that emerges from the frame model is that these will be modifiers with a subsecutive effect on feature sets in certain attributes, as opposed to other types of predications which, for instance, could simply situate the individual event in time and space, relate it to other events, or make other sorts of "non-restrictive" statements about an event. As an example for the relevance of this issue, consider the difference between (9a) and (9b):

- (9) a. He absent-mindedly forgot his keys (= out of absentmindedness)
 b. ?He forgot his keys absent-mindedly (= in an absentminded manner)

If it is possible for events "to be absent-minded" (as the neo-Davidsonian parlance goes), one has to wonder why events of forgetting should not be the prime examples for this. While both variants above may depend on the event variable in some way, manner adverbs are apparently special in that they must be "restrictive", not just be "predicates of events". We hypothesise that this restrictiveness has to derive from their ability to restrict the values of some attribute in the verb meaning; an explanation could not be based on the inspection of a logical form alone.

The relevant attributes will often turn out to be property scales, expressed by the adverbial use of scalar adjectives like "loudly", "brightly" or "quickly". However, as pointed out above, many adverb types that have been found difficult to classify may refer to agentive traits of the meaning representation, and hence the interaction and delimitation of manner attributes as opposed (perhaps) to agentive / intentional features will be an important area of work. This also requires an extension of the frame approach so as to capture scope phenomena, i.e. for adverbs describing attitudes like *reluctantly* and for (potentially) scope-taking manner adverbs like certain uses of *carefully*. Likewise, it is important to capture adverbial alternations like the one in (9a/b) above, since this phenomenon indicates the existence of different construals for the same conceptual core (whether or not the two uses of the adverb involve a distinction of lexical senses). Hence, the explanation of the distinctions that give rise to the different adverb classes remains on the agenda also in the context of frame theory. By and large, there must be both "restrictive" and "non-restrictive" ways in which an adjectival lexeme may bear on an event frame.

Q 3 Questions of reference and ontology

While frame theory presents itself as an alternative to the classic extensional perspective on modification, the achievements of that theory need not be given up in the present context. We assume that principles can be formulated for a mapping of attribute values to extensions. Roughly, it can be postulated that with its array of values, each attribute represents a partition of the predicate's extension, since the values will have to be

mutually exclusive for each individual. From this perspective, the proposed project also ties in with the issue of clarifying the balance between qualitative description and reference that has been identified as a general desideratum for a further development of frame theory in the next phase of the CRC. A related question concerns the ontological status of the attributes themselves (hence, what are “manners”?), especially in light of their apparent similarity with degrees.

3.4.2 Work packages

WP 1 Data collection and pre-analysis

Using standard (tree) pattern matching procedures, different German corpora will be searched for constructions of adverbial modification. We will first stick to existing, manually annotated tree corpora like Tübingen Treebank (Tübingen University), NEGRA (Saarland University), or TIGER (Stuttgart University) as automatic adverbial attachment is very error prone in German. The collected data will be of high quality but probably not extensive enough to serve as empirical database for the conceptual investigation in the later WPs. Therefore we plan to gain additional data by searching larger automatically parsed or even unparsed corpora for particular patterns in which adverbials often occur. By this method we will not be able to identify all adverbials in a text but we will extend our collection of adverb uses.

A database will be built containing the modifier-modifiee-context triples plus additional annotations like whether the modification is one- or multidimensional, which dimension is involved and what type of event is modified. The annotations will be incomplete and preliminary, their aim is to allow for quicker reference to examples of different adverbial modification types in the later WPs. It is planned to make the list of modifier-modifiee-context triples publicly available (but not the preliminary annotations).

WP 2 Modifier types

This work package contains steps towards resolving fundamental questions of the frame representation such as the ontological status of “manners”, and questions of application that involve building blocks for the treatment of more complex cases in WP 3.

WP 2.1 Degree modification

Degree and manner modification share the property that they often do not allow for a straightforward and simple composition with the co-occurring verb. As shown by Fleischhauer (forthcoming) and Löbner (2012) for the degree gradation of verbs by German *sehr* ‘very much, a lot’, the scalar attribute addressed by degree gradation differs drastically depending on the semantic verb type modified. Moreover, the relevant attribute is often not part of the semantic core of the verb but rather of a peripheral status. In this work package, we tackle the question of the viability of a unified frame account which structurally reflects the similarities and differences between the two types of modification.

WP 2.2 One-dimensional modification

The first set of manner modifiers to be analysed at this stage comprises adjectival lexemes from domains that can be directly identified as simple attributes that are active in the event frame. These simple cases will usually involve scales (as with *slowly*, *loudly* and the like). These case studies will be used to formulate and refine a theory of manner modification as frame alteration, as test cases for the modelling of dynamicity (addressed in A01), and to assess the need for an inferential component which deals with cases in which the meaning of a modifier requires an extension of the frame with attributes that are not lexically prespecified. (For example, how do verbs with underspecified subevent structures like *play* interact with modifiers like *quickly*, *silently* and the like?) Central in this line of research will be the attempt at a unified analysis for event-internal and event-external uses of *quickly* (*work quickly*, *finish quickly*, *react quickly*, *open the door quickly*) (cf. Frey & Pittner, 1998; Rawlins, 2013). For capturing the uses of *schnell* that do not relate to internal speed of a process, we build on the notion of faster or less fast developments proposed in Löbner (1989). Intermediate cases such as *arrive quickly* can be modeled as relating to the verb-internal situation frame (work on situation structure currently in progress).

WP 2.3 Agent-related modification

We will address the delimitation between manner modifiers and non-manner adverbs that make reference to agency (like many mental-attitude adverbs and agentive adverbs). The latter type of adverbs requires the integration of agent-orientation into the frame model in a way that allows for the special behaviour of different types of adverbs that are loosely event-related. This work package is needed as the groundwork for WP 3.3.

WP 3 Complex issues of event modification in frames

Work package no. 3 represents the advanced stage of the project, in which we will develop analyses for

cases of modification that involve more complex interactions between attributes, building on the work on the elementary cases.

WP 3.1 Semantic classification in terms of modifiability

Each type of adverb determines a group of verbs which can co-occur with this particular type. Consequently, the exploration of different adverb types will also lead us to a semantic classification of verbs in terms of the modifiability by different adverb types. As part of the overall investigation of manner modification, we will sort out verb types in terms of the recurring bundles of verb frame attributes that are activated by modifying adverbs and assess the role of complementarity principles (in the sense of Levin & Rappaport Hovav 2013, Gärdenfors 2014) in lexical representation and modification.

WP 3.2 Interaction of attributes in modification

Building on our work on simple (scalar) adjectives in WP 2.2, we proceed to modifiers that possess, and modify, complex attribute structures. Such complex constellations may involve manners-cum-results, or decision paths over a whole course of events (e.g. with *carefully*). The special challenges they present for modelling in terms of frames are due to the interaction of complex systems of attributes with the dynamicity of the frame.

WP 3.3 Adverbial alternations and adverbs with scope

We will investigate the interplay between event reference and scope (e.g. mental-attitude adverbs; agentive adverbs, “scope-taking manner adverbs”). In close cooperation with A01 we will elaborate the representation of scope in a frame model. Furthermore, we set out to resolve the differences between non-restrictive reference to events and restrictive modification and their different frame composition procedures. Most importantly, the frame model offers a way to represent the conceptual unity of manner and agentive modification by adverbs of the type *stupidly* (pointed out in Geuder 2002 and Ernst 2002, but not yet modelled in a model-theoretic approach).

WP 4 Overarching research with C10

WP 4.1 Joint investigation of adverbial verb modification and adjectival modification of deverbal nouns

For selected adverbs from the one-dimensional and the agent-related classes, we will investigate which combinations of Adv + V correspond to A + deverbal N, and which readings of the deverbal N. For example, *schnell* ‘quickly’ with *fahr-* corresponds to *schnell* + N with deverbal N that denotes the process, the agent, the vehicle, or the road (*schnelle Fahrt*, *schneller Fahrer*, *schnelles Fahrzeug*, *schnelle Fahrstrecke*). We will investigate more carefully, based on corpus-linguistic data, which adverbs ‘carry over’ in this sense to which readings of deverbal nouns. We expect this study to throw light on the semantic mechanisms involved in the modification of deverbal nouns, as well as on sub-types of adverbial classification.

WP 4.2 Comparing the behaviour of frame structures in the modification of verbs and nouns

We will compile and compare the results on the semantic mechanism of V modification and N modification obtained in the projects B09 and C10 in order to identify general characteristics of, and restrictions on, modification. In particular, we aim at deriving a sound theoretical model explaining the intuition of the principal asymmetry between modifier and head.

Schedule

2015/2	2016/1	2016/2	2017/1	2017/2	2018/1	2018/2	2019/1
WP 1							
	WP 2.1						
	WP 2.2						
	WP 2.3						
	WP 3						
	WP 4.1						
						WP 4.2	

3.5 Role within the Collaborative Research Centre

Project A01 (Petersen): B09 and A01 form two complementary branches of an investigation into the potential of frame theory for the modelling of event concepts, among other things. Whereas A01 takes a theory-driven approach and investigates formal means of extending the capacity of the framework, especially with respect to modelling the dynamicity of events, B09 takes a data-driven approach, with the goal of

determining from the semantics of modification what shape the theory should take. Therefore, B09 provides valuable test cases for the theory developed by A01.

Project C10 (Löbner, Petersen): Next to the connection with A01, these two projects are most closely related. Having two projects on modification, one on adverb-verb and one on adjective-noun modification, is in no way redundant, but rather creates a wealth of synergies. The two projects jointly address two basic fields of composition by analysing the direct semantic interaction of the basic parts of speech A and V and A and N. The contrast is of particular interest, because we expect the compositional mechanisms involved to be of a more general nature, while the fundamental difference between verb frames and noun frames lends itself to radically different modes and dimensions of modification.

Project A02 (Kallmeyer): A02 is a predominantly syntactic project which investigates, among other things, depictives and mental attitude adverbs, asking e.g. how predication over a distance is syntactically constrained. From B09's predominantly semantic perspective, both of these adjunct types can be described as combining reference to individuals and events to varying degrees, and hence they constitute test cases for our theory that seeks to delineate manner modifiers against other adjunct types. In this way, the two projects take complementary perspectives on a set of data they have in common. Also, from a more general perspective, A02 explores syntactic frameworks that provide extended domains of composition, while B09 rather leans toward presupposing a framework with local rules, due to its interest in using syntactic classifications of modifiers as a heuristic for semantic classification. Consequently, both projects will profit strongly from exchanging views and analyses, and will entertain relatively close connections.

Project B01 (Van Valin): B01 investigates the meaning and linking of complex event expressions which result from the combination of two verbs in clause linkage, serial verb constructions and causatives among others. Since often one of the verbs modifies the other, both B01 and B09 will be concerned with the integration of the meaning of a modifying element (verb or adverb) into the meaning of the modified verb. Consequently, each of the two projects can build on the insights gained by the other project with respect to verb modification and its representation by frames. A particular case of interest is that of complex verbs in which one of the verbs explicates a modifying manner of motion, a type attested e.g. for Japanese compound verbs. In this regard, a promising aspect of collaboration between B01 and B09 consists in an analysis of how manner-denoting component verbs interact with co-occurring manner adverbs.

Project C09 (Filip): C09 explores the notion of countability in the verbal domain. Countability of verbs is related to types of modification. For example, *schnell* 'quickly' receives different analyses for its 'mass' uses relating to speed and its 'count' uses relating to the time within which an event takes place. Thus, types of modification are indicative of the countability feature of the verb, and conversely, the countability feature may serve to distinguish types of modification.

Bibliography

- Anderson, C. & M. Morzycki. to appear. Degrees as Kinds. *Natural Language and Linguistic Theory*. <https://www.msu.edu/~morzycki/work/papers/anderson-morzycki.pdf>.
- Barsalou, L. 1992. Frames, concepts, and conceptual fields. In A. Lehrer & E. F. Kittay (eds.), *Frames, Fields, and Contrasts: New Essays in Semantic and Lexical Organization*, 21–74. Hillsdale NJ: Lawrence Erlbaum Associates.
- Bonami, O., D. Godard & B. Kampers-Manhe. 2004. Adverb classification. In F. Corblin & H. de Swart (eds.), *Handbook of French Semantics*, 143–184. Stanford: CSLI.
- Buscher, F. 2013. Im Spannungsfeld von Semantik und Pragmatik: Zur Bedeutungskonstitution von Einstellungsadverbialen. *Zeitschrift für Sprachwissenschaft* 32. 135–179.
- Eckardt, R. 1998. *Events, Adverbs, and Other Things*. Tübingen: Niemeyer.
- Ernst, T. 2002. *The Syntax of Adjuncts*. Cambridge: Cambridge University Press.
- Fleischhauer, J. forthcoming. *Degree Gradation of Verbs*: University of Düsseldorf dissertation.
- Fleischhauer, J. & T. Gamerschlag. 2014. We're going through changes: How change of state verbs and arguments combine in scale composition. *Lingua* 141. 30–47.
- Frey, W. 2003. Syntactic conditions on adjunct classes. In E. Lang, C. Maienborn & C. Fabricius-Hansen (eds.), *Modifying adjuncts*, 163–209. Berlin: Mouton de Gruyter.
- Frey, W. & K. Pittner. 1998. Zur Positionierung der Adverbiale im deutschen Mittelfeld. *Linguistische Berichte* 176. 489–534.
- Gamerschlag, T., W. Geuder & W. Petersen. 2014. Glück auf, der Steiger kommt: A frame account of extensional and intensional 'steigen'. In D. Gerand, C. Horn, A. Latrouite & A. Ortman (eds.), *Meaning and Grammar of Nouns and Verbs*, 115–144. Düsseldorf: Düsseldorf University Press.
- Gamerschlag, T. & W. Petersen. 2013. Analyzing stative dimensional verbs in frames. In A. Stefanowitsch & S. Niemeier (eds.), *Yearbook of the German Cognitive Linguistics Association*, vol. 1, 3–23. Berlin: Mouton de Gruyter.
- Gärdenfors, P. 2014. *The Geometry of Meaning*. Cambridge MA: MIT Press.

- Geuder, W. 2002. *Oriented Adverbs. Issues in the Lexical Semantics of Event Modifiers*: Universität Tübingen dissertation. <https://publikationen.uni-tuebingen.de/xmlui/handle/10900/46179>.
- Geuder, W. 2006. Manner modification of states. In C. Ebert & C. Endriss (eds.), *Proceedings of Sinn und Bedeutung 10*, 111–124. Berlin: ZAS. <http://www.semanticsarchive.net/Archive/WNhMGJiY/sub10proc.pdf>.
- Haider, H. 2000. Adverb placement: Convergence of structure and licensing. *Theoretical Linguistics* 26. 95–134.
- Haider, H. 2010. *The Syntax of German*. Cambridge: CUP.
- Jackendoff, R. 1972. *Semantic Interpretation in Generative Grammar*. Cambridge MA: MIT Press.
- Kamp, J. . H. 1975. Two theories about adjectives. In E. Keenan (ed.), *Formal Semantics for Natural Language*, 123–155. Cambridge: Cambridge University Press.
- Landman, F. 2000. *Events and Plurality. The Jerusalem Lectures*. Dordrecht: Kluwer.
- Levin, B. & M. Rappaport Hovav. 2013. Lexicalized meaning and manner/result complementarity. In B. Arsenijević, B. Gehrke & R. Marín (eds.), *Studies in the Composition and Decomposition of Event Predicates*, 49–70. Berlin: Springer.
- Löbner, S. 1989. German schon – erst – noch: an integrated analysis. *Linguistics and Philosophy* 12. 167–212.
- Löbner, S. 2011. Functional Concepts and Frames. http://semanticsarchive.net/Archive/jl1NGEwO/Loebner_Functional_Concepts_and_Frames.pdf.
- Löbner, S. 2012. Sub-compositionality. In W. Hinzen, E. Machery & M. Werning (eds.), *The Oxford Handbook of Compositionality*, 220–241. Oxford: Oxford University Press.
- Maienborn, C. 2004. On Davidsonian and Kimian states. In I. Comorowski & K. von Heusinger (eds.), *Existence: Semantics and Syntax*, 107–130. Berlin: Springer.
- Maienborn, C. & M. Schäfer. 2012. Adverbs and adverbials. In C. Maienborn, K. von Heusinger & P. Portner (eds.), *Semantics: An International Handbook of Natural Language Meaning*, 1389–1420. Berlin: Walter de Gruyter.
- Matsuoka, M. 2013. On the notion of subject for subject-oriented adverbs. *Language* 89. 586–618.
- McConnell-Ginet, S. 1982. Adverbs and logical form. *Language* 58. 144–184.
- Morzycki, M. 2013. Modification. Book manuscript for Cambridge University Press. https://www.msu.edu/~morzycki/work/papers/modification_book.pdf.
- Parsons, T. 1972. Some problems concerning the logic of grammatical modifiers. In D. Davidson & G. Harman (eds.), *Semantics of Natural Language*, 127–141. Dordrecht: Reidel.
- Parsons, T. 1990. *Events in the Semantics of English*. Cambridge MA: MIT Press.
- Petersen, W. 2007. Representation of Concepts as frames. In J. Skilters, F. Toccafondi & G. Stemberger (eds.), *Complex Cognition and Qualitative Science*, 151–170. University of Latvia.
- Petersen, W. & T. Gamerschlag. 2014. Why chocolate eggs can taste old but not oval: A frame-theoretic analysis of inferential evidentials. In T. Gamerschlag, D. Gerland, R. Osswald & W. Petersen (eds.), *Frames and Concept Types. Applications in Language and Philosophy*, 199–220. Dordrecht: Springer.
- Piñón, C. 2007. Manner adverbs and manners. Talk presented at the 7th Ereignissemantik-Konferenz, Schloss Hohentübingen. http://pinon.sdfcu.org/work/pinon_mam_ho.pdf.
- Piñón, C. 2010. What to do with agent-oriented adverbs. Talk presented at the 7th workshop on inferential mechanisms and their linguistic manifestation, Göttingen. <http://pinon.sdfcu.org/covers/wdaoa.html>.
- Rawlins, K. 2013. On adverbs of (space and) time. In B. Arsenijević, B. Gehrke & R. Marín (eds.), *Studies in the Decomposition and Composition of Event Predicates*, 153–193. Berlin: Springer.
- Sternefeld, W. 2006. *Syntax. Eine merkmalsbasierte generative Beschreibung des Deutschen*. Tübingen: Stauffenburg. 2 vols.
- Thomason, R. & R. Stalnaker. 1973. A semantic theory of adverbs. *Linguistic Inquiry* 4. 195–220.
- Wyner, A. 1998. Subject-oriented adverbs are thematically dependent. In S. Rothstein (ed.), *Events in Grammar*, 333–348. Dordrecht: Kluwer.