

German *wie*-complements: Manners, methods and events in progress

Carla Umbach (Universität Köln / ZAS Berlin)

Stefan Hinterwimmer (Universität Köln)

Helmar Gust (Institut für Kognitionswissenschaft Osnabrück)

7. December 2019

substantially revised version - submitted

This research started in the Osnabrück OntoRef group: Peter Bosch, Louise McNally, Philip Miller, Graham Katz, Stefan Evert, Sarah Mieskes, Natasha Pracejus, Hibatulnaseer Nasir.

We are grateful to Louise McNally, Hana Filip, Ilse Zimmermann, Fabienne Martin, Werner Frey, Tom McFadden, Robin Cooper and Lukasz Jedrzejowski for grateful for repeated patient discussions during the development of this paper and incredibly helpful comments.

We would also like to thank the audiences of the event semantics meetings in Düsseldorf 2016 and Heidelberg 2018, the Sklarska workshop 2017, the Tbilisi conference in 2017 and the Riga Symposium of Cognition, Logic and Communication in 2018 for valuable feedback.

The first author acknowledges funding by the Deutsche Forschungsgemeinschaft, DFG UM 100/1-3

1 Introduction

German *wie* ('how' / 'like') is, first of all, a question word asking for manner or method. It occurs in many syntactic environments, most prominently in questions, as in (1). In this paper we focus on clausal complements introduced by *wie*, which give rise to two types of readings. First, there is a manner reading, as shown in (2). This reading allows for clarification questions with *wie*, to be answered by the manner (pure manner or method) in which the event was performed (answer 1, answer 2). Secondly, there is a reading which is not a manner reading but instead is close in meaning to bare infinitives and to *that*-clauses and is preferably translated into English by a progressive, see (3). This reading does not allow for *wie* clarification questions, but only for questions addressing the reason or way the event came about. We name it the *eventive reading of wie*-complements.

(1) *Wie* hat Berta ihre Tasche gepackt?
'How did Berta pack her bag?'

(2) Anna sah, *wie* Berta ihre Tasche packte. manner reading
'Anna saw how Berta packed her bag.'

clarification question: Und *WIE* hat sie ihre Tasche gepackt?
'And how did she do that?'

answer 1: Sehr hastig. (pure manner)
'Very hastily.'

answer 2: Zuerst die Turnschuhe, dann ein T-shirt, dann ein Buch (method)
und oben drauf einen Pulli.
'Running shoes first, then a T-shirt, then a book, and on top a sweater.'

- (3) Anna sah, *wie* Berta ihre Tasche packte. eventive reading
 'Anna saw Berta packing her bag.'
- clarification question : #Und *WIE* hat sie ihre Tasche gepackt?
 'And how did she do that?'
- clarification question : Was ist geschehen? / *Wie* ist das gekommen?
 'What happened?' / 'How come?'
- answer: Sie hat sich mit ihrer Schwester gestritten.
 'She had a fight with her sister.'

The semantics of *wie*-complements is puzzling for a number of reasons. First, there is the question of how the eventive reading comes about. Restrictions on embedding verbs make it obvious that eventive *wie*-complements denote neither questions nor propositions, since embedding under *fragen* and *wissen* ('ask', 'know') is blocked (see ex.16 below). According to the commonly agreed on intuition described in the literature, eventive *wie*-complements induce a process-perspective such that the event is presented as a scene or situation. This intuition is confirmed by the fact that nominal labels for eventive *wie* complements are nouns like *Vorgang*, *Szene* or *Begebenheit* ('process', 'scene', 'event') (see 6d below). We will thus assume that eventive *wie*-complements denote events in progress.

Manner *wie*-complements denote, first, questions or propositions. This is obvious in the case of *fragen*, *wissen* ('ask', 'know'). When embedded under perception verbs or report verbs like *sehen* and *erzählen* ('see', 'report'), manner *wie*-complements have to be analyzed as free relative clauses denoting DPs of type *manner*. Both variants require, however, an interpretation of the wh-word *wie*, and even though the semantics of questions and free relative clauses is in general well understood, there is no agreement about the denotation of manner questions and manner free relatives – are manners properties of events or should they be treated as basic ontological entities? Thus a semantic analysis has to answer the question what the meaning of the wh-word *wie* is — in addition to (or even before) addressing the interpretation of *wie*-complements.

The third and most puzzling issue is the word *wie* itself. There are a number of languages featuring a non-manner interpretation of manner wh-words, and it would clearly not be adequate to assume that there are two homonymous manner words in language after language. Focusing on German *wie*, an analysis is required explaining why *wie* is used to introduce events in progress in addition to manners of events. So the question from the perspective of German (as well as Russian and Polish though not English) is: Why use a manner word to express an event in progress?

The analysis presented in this paper includes four building blocks:

(A) Two base positions of *wie* in syntax;

we follow, on the one hand, Frey (2003) assuming a verb-adjacent base position of manner adverbs in German and, on the other hand, Legate's (2010) proposal of an in situ base position of English *how* in non-manner clauses. Manner *wie* is base-generated within the VP while eventive *wie* is base-generated in the left periphery of the clause. This entails that manner *wie* is a modifier of an event type while eventive *wie* is a modifier of an event token. This difference is at the core of the semantic analysis.

(B) The similarity interpretation of *wie*;

this interpretation has been suggested, e.g., for equative comparison constructions (*Anna tanzte wie Berta*. 'Anna danced like Berta did') where *wie* is said to express a similarity relation between, e.g. events. The notion of similarity is spelt out in multi-dimensional attribute spaces (Umbach & Gust 2014).

(C) The semantics of manner *wie*-complements;

we propose to consider manners – pure manners as well as methods – as similarity classes¹ of events of a given event type. Methods, in particular, are understood as similarity classes of sequences of subevents. When occurring as free relative clauses (embedded under, e.g., *sehen* 'see'), manner *wie*-complements denote manner similarity classes (instead of manner basic objects), and when occurring as interrogative clauses (embedded under, e.g., *fragen* 'ask') they denote propositions asserting that an event is in a particular manner similarity class.

(D) The semantics of eventive *wie*-complements;

we start from the observation that eventive *wie*-complements express events in progress, and from the idea that an event in progress is an initial sequence of subevents plus possible continuations of the respective type. We make use of the analysis of methods as similarity classes of sequences of subevents and provide a similarity-based characterization of events in progress which is close in spirit to Landman (1992) and Bonomi (1997). Bringing these two views together, eventive *wie*-complements are analyzed as methods, i.e. similarity classes of sequences of subevents, such that they share a given initial sequence (a *stage* in Landman's terms).

According to this analysis, the core difference between the manner and the eventive reading is the attachment point of the wh-word *wie*. In the case of the manner reading it is attached to the event type given by the verb and it generates classes of similar events of this type; in the case of the eventive reading it is attached to the event token made available by higher functional projections, and it generates classes of similar continuations of this event.

In Section 2, the data will be discussed. Section 3 presents the (rare) literature on German *wie*-complements and Legate's (2010) article on English *how* clauses. From there on, our paper is organized along the building blocks listed above: Section 4 presents the syntactic analysis (A). Section 5 presents the semantic analysis starting with a brief overview over the similarity framework (B), proceeding with the semantics of manner *wie*-complements (C) and eventive *wie*-complements (D).

Although non-manner uses of manner wh-words are found in a number of languages including Russian, Polish, French, Greek and Hebrew, and also in English, this paper focuses exclusively on German, since there seems to be considerable variation between languages. While in Russian and Polish non-manner uses of manner wh-words match semantically with the findings for German, English non-manner uses of *how* clearly differ in meaning. Cross-linguistic comparison requires substantial additional research, which has to be left for future work.

¹ Similarity classes are sets of similar items, cf. section 5.1. We use the term *similarity class* because it is established in the literature on similarity and conveys the idea of classification.

2 The data

When considering a sentence hosting a *wie*-complement in isolation the reading of the complement may not be obvious. The difference between the manner reading and the eventive reading of example (1) is manifest only when taking the different clarification questions into account. In this section, a number of characteristics will be reviewed distinguishing the two readings – accenting, continuations, nominal labels, adverb position and coordination. Then we will consider matrix verbs licensing the respective readings. It will show up in the end of this section that the difference between manner reading and eventive reading is subtle and sometimes even negligible.

Manner and eventive readings will be distinguished by subscripts (wie_M / wie_E). As for terminology, we will use the term *manner* in a broad sense covering *pure manner*, (4a), *instrument*, (4b), and *method* given either as a single more concrete event (4c), or as a sequence of subevents (4d). We will focus on the latter.

- (4)
- a. She danced frantically.
 - b. She opened the can with a knife.
 - c. She solved the problem by taking a loan.
 - d. She drove to Metz by first going to Dijon, then from Dijon to Nancy and finally from Nancy to Metz.

Consider the manner *wie* complement in (5). Accent on the wh-word is licit although not obligatory, cf. (a). The sentence is naturally continued by specifying a manner or method, cf. (b). Nominal paraphrases make use of the nouns *Art* or *Weise* ('manner', 'way'), cf. (c).

- (5)
- a. Anna sah, wie_M / WIE_M Berta ihre Tasche packte,
 - b. ... nämlich wild durcheinander /
... nämlich zuerst die Turnschuhe, dann ein paar Tshirts, und oben drauf einen Pullover.
'Anna saw how Berta packed her bag, ... namely messy /
... namely running shoes first, then some T-shirts and on top a sweater.'
 - c. Anna sah, auf welche Art / in welcher Weise Berta ihre Tasche packte.
'Anna saw the manner / the way in which Berta packed her bag.'

Eventive readings do not license accenting of the wh-word, (6a). Subsequent sentences preferably add another event (6b), while *namely*-specifications are blocked, (6c). Labels in paraphrases are nominals like *Szene*, *Situation*, *Vorgang* and *Begebenheit* ('scene', 'situation', 'process', 'event'), confirming the intuition that eventive *wie* complements emphasize a process, see (6d).

- (6)
- a. Anna sah, $wie_E / *WIE_E$ Berta ihre Tasche packte,
 - b. ... und das Haus durch die Hintertür verließ.
 - c. ... *nämlich wild durcheinander.
'Anna saw Berta packing her bag,
... and leaving the house by the backdoor. / ... *namely messy.'
 - d. Anna sah die Szene / die Situation / den Vorgang, *wie* Berta ihre Tasche packte.
'Anna saw the scene / situation / process when Berta was packing her bag.'

If *wie* is combined with a gradable adverb, it functions as a degree modifier and the adverb is fronted together with the *wh*-word. Degree readings of *wie*-complements allow accenting of the *wh*-word and subsequent degree specifications, see (7), as well as paraphrases make use of degree nominals like *Geschwindigkeit* 'speed', (8). In other respects they pattern with manner readings, which is why they will not be considered separately from the manner cases.

- (7) Anna sah, *wie*_M schnell / *WIE*_M schnell Berta ihre Tasche packte [... nämlich blitzartig].
'Anna saw how fast Berta packed her bag. [... namely in a flash.]'
- (8) Anna sah, in welcher Geschwindigkeit Berta ihre Tasche packte.
'Anna saw the speed in which Berta packed her bag.'

Even though degree readings will not be in focus in this paper, we will make use of the syntactic behavior of gradable adverbs as an additional feature distinguishing manner readings from eventive readings: If a gradable adverb in a *wie*-complement stays in situ, as in (9), the eventive reading is the only option, which is evidenced by the fact that accenting and *namely* continuations specifying manners are blocked, (10). Therefore, gradable adverbs provide a reliable test for disambiguation: If a gradable adverb can be inserted next to the verb, the reading must be eventive.² But if it is fronted together with the *wh*-word, the *wie*-complement has a degree reading, which we subsume under the notion of manner reading. We will come back to this issue in syntactic analysis in Section 4.

- (9) Anna sah, *wie*_E Berta schnell ihre Tasche packte. eventive reading
'Anna saw Berta quickly packing her bag'
- (10) Anna sah, **WIE*_E Berta schnell ihre Tasche packte, [*... nämlich blitzartig].
LIT: 'Anna saw HOW Berta quickly packed her bag, [namely in a flash.]'

Another test distinguishing manner and eventive readings is based on coordination (due to Zimmermann 1991). A manner *wie*-complement can be conjoined with a *wh*-interrogative of any type including *wie* itself, see (11). Note that licensing of the adverb *sorgfältig* 'carefully' subsequent to the *wh*-word indicates the manner reading of the first conjunct. In contrast, an eventive *wie*-complement can only be conjoined with other eventive ones, as in (12a). Coordination with a manner *wie* complement or another *wh*-interrogative appears much less coherent, see (12b).

- (11) Hans erzählte, *wie*_M (sorgfältig) er sich auf das Examen vorbereitet hat, wer ihm geholfen hat und wo das Examen stattfand.
LIT: 'Hans explained how (carefully) he prepared for the exam, who helped him and where the exam took place.'
- (12) a. Hans erzählte, *wie*_E er sich schlecht auf das Examen vorbereitet hatte, (*wie*_E er) vor Aufregung stotterte und *wie*_E er schließlich knapp bestand.
- b. Hans erzählte, *wie*_E er sich schlecht auf das Examen vorbereitet hatte, (*wie*_E er) vor Aufregung stotterte, ??? wer ihn prüfte und ??? *wie*_M knapp er schließlich bestand.
LIT: 'Hans explained told how he had poorly prepared for the exam, (how he) he stuttered with excitement, who tested him and how narrowly he finally passed.'

² One might think that a manner interpretation of (9) should be possible, in the sense of Anna seeing the manner of Berta's quickly packing her bag. However, native speakers consistently rule out such a reading.

There are two types of complement clauses that are close in meaning but not equivalent to eventive readings of *wie*-complements, namely *dass* 'that' complements and bare infinitives, (13b,c). Eventive *wie*-complements differ from *dass*-complements, first, in entailing direct perception when embedded under perception verbs. While in (13 b) indirect evidence would be sufficient – Anna may, e.g., see cloth scattered across the room – (13 a) entails that Anna actually saw Berta. Direct perception is also found with bare infinitives – mere evidence, e.g. cloth scattered across the room, would not suffice.

Another feature relevant in perception is epistemic neutrality: does the agent know what he is seeing? Bare infinitives are epistemically neutral since (13 c) can be true even if Anna does not realize that Berta is packing her bag. In contrast, neither eventive *wie*-complements nor *dass*-complements are epistemically neutral, (13 a) and (b) entail that Anna recognizes Berta's activity as packing a bag. (For direct perception and epistemic neutrality see Barwise (1989), and also the footnote on *Scenes and other Situations* in section 3).

The most important feature in the present paper, however, is that eventive *wie*-complements, in contrast to *dass*-complements as well as bare infinitives emphasize the process of the described event and present it as 'ongoing' (see also section 3). This will be the starting point of the semantic analysis of eventive *wie*-complements in section 5.3.

- (13) a. Anna sah, *wie*_E Berta ihre Tasche packte.
'Anna saw Berta packing her bag.'
- b. Anna sah, dass Berta ihre Tasche packte.
'Anna saw that Berta packed her bag.'
- c. Anna sah Berta ihre Tasche packen.
'Anna saw Berta pack her bag.'

From the point of view of the matrix clause, *wie*-complements – manner as well as eventive ones – are verbal arguments which are required by the subcategorization frame of the matrix verb, see (14a). They must not to be confused with temporal *wie*-clauses, as in (14b), where the required argument is given by the nominal and the *wie* clause functions as an adjunct (like temporal *als*-clauses in (14c)).

- (14) a. Anna sah, *wie*_{M/E} Berta ihre Tasche packte. wie-complement
'Anna saw Berta packing her bag.'
- b. Anna sah Berta, *wie* sie gerade ihre Tasche packte. temporal wie-clause
- c. Anna sah Berta, als sie ihre Tasche packte. temporal als-clause
'Anna saw Berta when she packed her bag.'

Matrix verbs embedding manner readings of *wie*-complements include, on the one hand, interrogative and factive verbs and, on the other hand, perception verbs, cognitive verbs and report verbs, (15a,b). Verbs generally blocking *wh*-interrogatives, like *glauben*, *behaupten* ('believe', 'assert') also block manner readings of *wie*-complements, (15c). In Section 5.2 manner *wie*-complements embedded under interrogative and factive verbs will be analyzed as interrogative clauses denoting questions. When embedded under perception verbs, cognitive verbs and report verbs they will be analyzed as free relative clauses, i.e. DPs denoting manners (which, in turn, will be interpreted as similarity classes).³

³ It might be argued that perception verbs embed not only free relatives but also interrogatives. We skip this possibility here for reasons of simplicity.

- (15) a. Anna fragte / wusste / bedauerte, *wie_M* Berta ihre Tasche packte.
'Anna asked / knew / regretted how Berta had packed her bag.'
- b. Anna sah / erinnerte sich / erzählte, *wie_M* Berta ihre Tasche packte.
'Anna saw / remembered / reported how Berta had packed her bag.'
- c. *Anna glaubte / behauptete, *wie_M* Berta ihre Tasche packte.
'Anna believed / claimed how Berta packed her bag.'

Matrix verbs embedding eventive *wie*-complements are restricted to perception verbs, cognitive verbs and report verbs. Eventive complements are blocked under interrogative and factive verbs (and also under *believe* type verbs), see (16a, b, c) (please note that the *wie*-complements in (16) are unambiguously eventive due to adding a degree adverb in its base position).

- (16) a. Anna sah / erinnerte sich / erzählte, *wie_E* Berta ihre Tasche (schnell) packte.
'Anna saw / remembered / reported how Berta had packed her bag.'
- b. *Anna fragte / wusste / bedauerte, *wie_E* Berta ihre Tasche (schnell) packte.
'Anna asked / knew / regretted how Berta had packed her bag.'
- c. *Anna glaubte / behauptete, *wie_E* Berta ihre Tasche (schnell) packte.
'Anna believed / claimed how Berta packed her bag.'

In (17) verbs are listed which have been attested to embed eventive *wie*-complements in a corpus study (Mieskes et al. 2007), thereby disproving the widely held claim in the literature that eventive *wie*-complements can only be embedded by perception verbs (see Section 3).

(17) Verbs embedding eventive *wie*-complements

Perception verbs:	sehen, beobachten, hören, fühlen, (be)merken ⁴ , erleben 'see', 'observe', 'hear', 'feel', 'observe', 'experience'
Cognitive verbs:	sich erinnern, daran denken, vergessen, träumen, sich vorstellen 'remember', 'keep in mind', 'forget', 'dream', 'imagine'
Report verbs:	erzählen, berichten, schildern, beschreiben 'report', 'describe'

To conclude, the set of verbs embedding eventive *wie*-complements is a subset of that embedding manner complements, excluding interrogative and factive verbs.⁵ However, it is not always straightforward to decide for an individual example what the intended reading is, since the difference in meaning is sometimes subtle. In (18), naturally occurring examples are shown.⁶

⁴ *Riechen* 'smell' does not allow for eventive readings, possible due to the fact that you cannot smell a process (?? *Er roch wie das Gas (langsam) ausströmte.* 'He smelled the gas slowly stream out').

⁵ There is one type of verbs embedding eventive readings but not manner readings, namely *träumen* / *sich vorstellen* 'dream' / 'imagine':

(a) Er wachte vor Lachen auf, weil er geträumt hatte, *wie* er (laut) einen Witz erzählt.
'He woke up laughing because he dreamt that he told a joke.'

(example from ZAS Data base, gradable adverb inserted for disambiguation). Frank Sode (p.c.) attributes the fact that manner readings are blocked to the non-factive nature of *träumen*.

⁶ DEWAC1, Korpuslinguistik Humboldt University Berlin, and *Süddeutsche Zeitung*.

- (18) a. Von der Dachterrasse des Hotels kann man beobachten, *wie* die Sonne den Himmel über der Stadt rot färbt.
'From the roof terrace of the hotel you can watch the sun coloring the sky over the city red.'
- b. Die Architektin kann sich noch gut daran erinnern, *wie* sie damals in jede Ecke des Hauses gekrabbelt ist.
'The architect vividly remembers crawling into every corner of the house.'
- c. Der Eröffnungsfilm erzählt, *wie* zwei Jungen in die Stadt kommen.
'The opening film reports about two boys coming into the city.'
- d. Gefrorene Tropfen fallen – *Wie* Christa Wolf am Dienstag auf dem Dorotheenstädtischen Friedhof in Berlin zu Grabe getragen wurde. (Titelzeile)
'Frozen drops fall – How Christa Wolf was buried on Tuesday at the Dorotheenstädtischer Friedhof in Berlin.' (newspaper headline)
- e. [...] als sie miterlebte, *wie* Alec einen seiner Bodyguards tötete.'
'[...] when she witnessed Alec killing one of his body guards.'

The example in (18a) cannot have a manner reading since the manner is already given (*den Himmel rot färben* 'color the sky red').⁷ Similarly in (b) a manner reading is unlikely because the verb already specifies a particular manner of movement (*krabbeln*).⁸ In the example in (c) the prominent reading is again the eventive one since a film reports an event. But actually, if a film reports an event, it has to present a sequence of subevents and this sequence may already be considered as a manner (or method) of performing the event. Example (d) is a newspaper headline, so there is no matrix verb. The prominent reading would again be eventive though headlines do not in general block manner readings.⁹ Presumably, the news was the event of the funeral, not the way it was performed. But as in the case of the film, as soon as you report the event in terms of a sequence of subevents the difference between the two readings gets blurred.

Example (e) is deliberately presented without context and is as such ambiguous between a manner and an eventive reading of the *wie*-complement. Disambiguation is possible with the help of a gradable adverb, say *grausam* ('cruelly'). If the adverb is in its base position, the reading is presumably eventive.¹⁰ But if it is fronted together with the *wh*-word, it yields a degree reading, (which we subsume under the notion of manner), see (19a, b).

⁷ It may be objected that *rot* in *rot färben* is not a manner but instead a result. And it could be argued that there may be several ways in which the sky could be colored red and thus a manner reading of the complement would still be appropriate (Robin Cooper p.c.) But that would be ways in which the sun does it, not ways of being red.

⁸ Similarly, it may be objected that *krabbeln* 'crawl' could still allow for a manner reading since there might be different ways of crawling. Such a reading is not fully excluded. But as before in example (9) native speakers don't like it.

⁹ For example, *Wie man Dornröschen wach küsst*, 'How to kiss Sleeping Beauty awake', title of a Czechoslovak fairy tale film.

¹⁰ Again, there are of course different manners in which you can kill somebody cruelly. But adding one of these to (20b) is dispreferred. Robin Cooper pointed out that in English the position of the adverb is crucial. The sentence in (a) is clearly better than the one in (b).

(a) He figured out how Alex cruelly killed his body guard, namely with a kitchen knife.

(b) (?) He figured out how Alex killed his body guard cruelly, namely with a kitchen knife.

In German, the contrast between (a) and (b) cannot be achieved through different adverb positions. German doesn't allow for adverbs in postposition and, as a rule, the position directly preceding the verb corresponds (semantically) to English postposition.

- (19) a. ... *wie_E* Alec einen seiner Bodyguards grausam tötete.
'... Alec cruelly killing one of his body guards'
- b. ... *wie_M* grausam Alec einen seiner Bodyguards tötete
'... how cruelly Alec killed one of his bodyguards'

Applying the coordination test demonstrated in (12) is evidence again for the ambiguity of (18e). Without further context the *wie*-complement can be conjoined with other wh-clauses, yielding a manner reading, (20a), and it can be conjoined with other eventive readings yielding an eventive reading, (20b) (note that licensing/blocking of the adverb *grausam* 'cruelly' indicates the reading of the first conjunct.).

- (20) a. Sie erzählte, *wie_M* (grausam) Alec den Bodyguard tötete, wann das war, wer dabei war und *wie_M* er entkam.
LIT: 'She reported how (cruelly) Alec killed the bodyguard, when that happened, who was present and how he escaped.'
- b. Sie erzählte, *wie_E* (*grausam) Alec den Bodyguard (grausam) tötete, *wie_E* er dann die Waffe entsorgte und *wie_E* er schließlich entkam.
LIT: 'She reported how (cruelly) Alec (cruelly) killed the bodyguard, how he then got rid of the weapon and how he finally escaped.'

Summing up the data, the contrast between manner and eventive *wie*-complements is perfectly clear when embedded under interrogative and factive verbs because these verbs block the eventive reading. In the case of perception verbs, cognitive verbs and report verbs the difference is subtle. One can enforce an eventive reading with the help of an adverbs, and enforce a manner reading by conjunction with different wh-clauses or by accenting the wh-word. But without auxiliary measures the difference stays subtle and frequently even appears irrelevant. This is something to be reflected in the semantic analysis.

3 The literature

The literature on eventive *wie*-complements is rare. In the Duden grammar (2006) as well as the comprehensive IDS grammar (Zifonun et al. 1997) they are mentioned only in passing, claiming that they are restricted to perception verbs and stress the process character of the perception. Similarly, Bayer (1986) acknowledges that *wie*-complements may have a non-manner interpretation while excluding them from the scope of his analysis.

There are four articles focusing on eventive *wie*-complements, namely Clement (1971), Vater (1975), and Falkenberg (1989). They consider only perception verbs, and they unanimously agree that eventive *wie*-complements, in contrast to *dass* 'that' complements, emphasize the process of the described event and block stative verbs. Falkenberg in fact argues that eventive *wie*-complements are analogous to English progressives (which will be confirmed in Section 5.3).¹¹

¹¹ For those missing reference to Barwise's seminal paper on *Scenes and other Situations* (Barwise 1989): In the beginning of our work on eventive *wie*-complements, Barwise's paper played a major role. It soon became obvious, however, that, different from what was suggested in the literature, eventive *wie*-complements are not restricted to perception verbs, and that a number of features attributed to *wie*-complements in the literature

The fourth article on *wie*-complements is by Zimmermann (1991). She points out that eventive *wie* – subordinating conjunction *wie* in her terminology – not only occurs with perception verbs but also with report verbs. She assumes that manner *wie* and eventive *wie* are different words since the former has the status of a syntactic phrase whereas the latter is – in her analysis – a mere conjunction. Semantically, she argues that eventive *wie* differs from *dass* in expressing that the event in question is a process and is equipped with an additional covert property: "*daß* charakterisiert den bezeichneten Sachverhalt nüchtern als existierend, *wie* tut die Anspielung auf Eigenschaften des betreffenden Vorgangs hinzu." ('*dass* soberly characterizes the stated facts as existing, *wie* adds the allusion to particular properties of the process').

Though rejecting a relation between manner and eventive *wie*, Zimmermann suggests an analysis such that eventive *wie* is closely related to the temporal conjunction *wie*, as in (21 b), which expresses simultaneity between the events in matrix and subordinated clause. The relation to eventive *wie*-complements is established by a linguistically covert event running simultaneously with the complement clause event, which is described by the covert property mentioned above. The question of what the nature of the covert event should be is easily resolved when taking into account that eventive *wie*-complements are imperfective (as we do in our analysis): it is just the sequence of subevents emphasized by imperfectivity (see section 5.3). So Zimmermann's analysis does not capture the connection between manner and eventive *wie*, but it does capture the connection between eventive *wie* and temporal *wie* in a way that can straightforwardly be implemented in a modern aspectual semantics framework (e.g. Demirdache & Uribe-Etxebarria 2004). However, this has to be left for future work.

- (21) a. Hans hörte, *wie* das Kind weinte.
 b. Hans hörte das Kind, *wie* es weinte.
 'Hans heard the child (when) crying.'

One of the basic premises of this paper is that the word *wie* is the same in manner as well as eventive *wie*-complements. Against that it could be objected that there may be two homophonous *wie* words and the search for their semantic relation is a futile exercise – maybe the formal equivalence of manner and eventive *wie* is just a German mishap. This thought is refuted by Legate's (2010) paper on English *how* showing that in colloquial English there are *how* complement clauses which clearly have no manner (or degree) meaning, as in (22).

- (22) They told me how the tooth fairy doesn't really exist. = (1) in Legate (2010)

According to Huddleston and Pullum (2002), non-manner *how*-complements are equivalent to *that*-complements, and *how* in these contexts has to be reanalyzed as a declarative subordinator. Legate does not follow Huddleston & Pullum and instead argues that *how*-clauses as in (22) differ syntactically from *that*-clauses in behaving like DPs instead of CPs and are thus free relative clauses instead of interrogatives. But in contrast to regular free relatives there is no evidence for movement, so *how* must be base generated in its surface position. This is accounted for in the syntactic structure in Fig.1 (= 27

are in fact features of visual perception (e.g. simultaneity of the event expressed in the matrix verb and the embedded event, see Vater 1975). Moreover, characteristics like epistemic vs. non-epistemic seeing and veridicality are helpful in distinguishing naked infinitives from *that*-clauses but not in distinguishing manner from eventive *wie*-complements. Our problem seems not to be rooted in perception reports but instead in the expression of manner in language.

in Legate 2010) where *how* is in the specifier of CP position without being moved from a position lower in the clause.

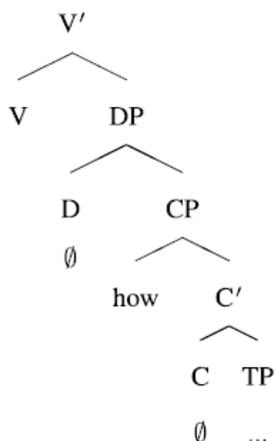


Figure 1 (27 in Legate 2010).

Legate's proposal is discussed in detail in Nye's dissertation in (2013). Nye agrees with Legate in that non-manner *how* is base generated above TP. She argues, however, that it occupies the head rather than the specifier position. Moreover, she argues that a non-manner *how* complement has a clausal instead of a nominal status. However, her arguments are not compelling. We will not go into details here since syntax is not in focus in this paper.

What is more important is the wide range of examples Nye adds to those presented by Legate, all in all leading to the conclusion that English non-manner *how* complements differ substantially from German eventive *wie*-complements. First, they appear informal in register, whereas German eventive *wie*-complements are unmarked with respect to register. Secondly, they allow for a number of embedding matrix verbs the German equivalents of which cannot embed eventive *wie*-complements, e.g., *promise*, *forgive*, *find out* (see Legate's list of examples on p. 129). Even more important, these examples are evidence that non-manner *how*-clauses license negation and stative content, as in (22) above (which can by no means be translated into German by using a *wie*-complement), and unlike German eventive *wie*, English non-manner *how* does not induce a process perspective (actually, none of Legate's examples is a progressive).¹² Moreover, following Legate, English non-manner *how*-clauses can be paraphrased by *the way that* which is surprising for a non-manner meaning.¹³

In concluding her paper, Legate poses the question of "why the manner wh-phrase is used in this construction instead of any other wh-phrases in English." (p.131), claiming that this is no coincidence since other languages, e.g., French, Greek and Hebrew, also make use of (the equivalents of) *how*-

¹²While German eventive *wie*-complements do not entail completion (see Section 5.3.1), English non-manner *how*-complements do if not combined with a progressive (Stephanie Solt / Robin Cooper, p.c.):

- (a) I saw you cross the street.
- (b) I saw you crossing the street [but after I looked away, I heard the car hit you].
- (c) I saw how you crossed the street to avoid meeting Fred, who was walking towards you.
- (d) I saw how you crossed the street, #but after I looked away, I heard the car hit you.
- (e) I saw how you were crossing the street, but after I looked away, I heard the car hit you.

In (a), (c) and (d) the crossing event has to be completed.

¹³ However, the *manner* meaning of the expression *way* in the paraphrase seems bleached, Stephanie Solt (p.c.).

clauses without referring to manner.¹⁴ Legate's question will be the starting point of the analysis in our paper. We will adopt her syntactic proposal focusing, however, on semantics. And it is important to keep in mind that the semantic analysis is geared towards German *wie*-complements.

4 The syntactic analysis: Two base positions of *wie*

The analysis of *wie*-complements requires, just like that of complements in general, considering internal aspects as well as restrictions imposed by the matrix verb. Taking the internal perspective, the primary issue is the base position of the *wh*-word, which will be argued to be different for manner and eventive readings of *wie*-complements. From the external perspective, the difference between interrogative complements and free relative clauses must be accounted for.

Recall that we use the term *manner* in a broad sense covering *pure manner*, *instrument* and *method*.¹⁵ *Pure manner* is typically given by an adverb, *instrument* is typically given by a prepositional phrase, and *method* is typically given by *indem*-clauses (Behrens & Fabricius-Hansen 2002), see (23 a-d). It is important to note that a method may consist of a single more concrete instance of the verbal predicate, but it may also include a sequence of subevents, cf. (c) and (d). All of these manner variants can be asked for by '*wie*' and may thus be targeted by manner *wie* complements.

- (23) a. Sie tanzte wild.
'She danced frantically.'
- b. Sie öffnete die Dose mit einem Messer.
'She opened the can with a knife.'
- c. Sie löste das Problem indem sie einen Kredit aufnahm.
'She solved the problem by taking a loan.'
- d. Sie fuhr nach Metz, indem sie erst nach Dijon, dann von Dijon nach Nancy und schließlich von Nancy nach Metz fuhr.
'She drove to Metz by first going to Dijon, then from Dijon to Nancy and finally from Nancy to Metz.'

We follow the standard account of adverbial modifiers in German (Frey 2003, Maienborn 2003, Schäfer 2013) in assuming that the base position of manner modifiers is adjacent to the verb, which is evidenced by clarification questions, cf. (24c). Since *wie* is a *wh*-word it is moved to the front of the clause, or, in terms of syntactic structure, to the specifier of CP. This view is generally accepted.

¹⁴The list of languages with analogous non-manner uses of manner *wh*-words is even longer though there may be essential semantic differences. Languages to be included are, e.g., Polish and Russian, and Kambaata, an East Cushitic language, Yvonne Treis, (p.c.)

(a) Anna widziała, jak Berta pakowała swoją torbę. (Polish)

This sentence has two paraphrases: *Anna saw the way how Berta packed her bag.* / *Anna saw the event of Berta packing her bag.* Lukasz Jedrzejowski, who provided the example, added that in the non-manner version, even though the verb may be perfective, there is the impression of a process.

¹⁵Schäfer (2013) provides a more fine-grained classification of manner adverbs distinguishing between (his) *pure manner*, *agent-oriented manner*, *method-oriented manner* and *degree*. For the purpose of our paper the simpler classification is sufficient.

- (24) a. (Anna sah/fragte), *wie*_M Berta tanzte.
'Anna saw/asked how Berta danced.'
- b. [*wie*_i Berta tanzte t_i]
- c. Berta hat *WIE* getanzt?
LIT: 'Berta danced HOW?'

If *wie* is combined with a gradable adverb, it acts as a degree modifier and the adverb is fronted together with the *wh*-word. We follow Schäfer (2013) in assuming that the degree phrase *wie schnell* has been moved from the original manner position adjacent to the verb, (25a). This entails that in (25a) the manner position is occupied, even though by a trace. Therefore, if a gradable adjective overtly occurs in the manner base position, as in (25b), the *wh*-word in front cannot result from movement out of the manner base position. This explains why the *wie*-complement in (25b) does not have a manner reading: If the manner position is overtly occupied, *wie* cannot represent manner – *wie*-complements with a gradable adjective adjacent to the verb must be eventive. Thus adding gradable adverbs provides a reliable way to decide between the two readings.¹⁶

- (25) a. Anna sah, [*wie schnell*]_i Berta die Möhren t_i putzte.
'Anna saw how quickly Berta prepared the carrots.'
- b. Anna sah, *wie*_E Berta die Möhren schnell putzte.
'Anna saw Berta quickly preparing the carrots.'

Saebo (2015) considers English *how* questions distinguishing between *manner* (in our terms: *pure manner*) and *method*, taking up an observation by Jaworski (2009) that *how* questions can be interpreted in different ways. Answering the question in (26) by (a) indicates manner, while (b) and (c) indicate a method/instrument interpretation.

- (26) How did Judith kill Holofernes? [Jaworski 2009, p. 134]
- a. With a mixture of revulsion and determination.
- b. With a mixture of seduction and cunning.
- c. With a mixture of bile and snake venom.

Saebo argues that manners are adjuncts providing restrictions of verbal predicates while methods are arguments of abstract verbal predicates implementing the action. He postulates that there are in general two types of verbal predicates, abstract ones equipped with an argument slot for an implementing method, and concrete ones without such a slot. This account makes strong predictions – abstract predicates should always occur with a method specification, and *by*-gerunds combine only with abstract predicates – and it has to resort to coercion when *by*-gerunds are chained. In view of these problems we will adhere to the mundane idea that manners, including methods, are adjuncts.¹⁷

¹⁶ In footnote 7, 8, and 10 cases were discussed in which this test is not fully reliable. Similarly, one reviewer wonders whether *wie* can be manner if the adverb has a demonstrative. This is possible if *wie* refers, e.g., to an instrument, that is, manner-instrument is added to pure manner:

Nun verstand Anna, *wie* Berta die Möhren so schnell putzen konnte, nämlich mit einer Wurzelbürste.
'Now Anna understood how Berta could clean the carrots so fast, namely with a root brush.'

Note that *wie* in this example is equivalent to *warum* 'why', which is presumably due to the matrix verb *verstehen* 'understand' – another future topic.

¹⁷ The idea of abstract predicates goes back to the notion of 'criterion predicates' discussed by Kearns (2003) and Saebo (2008).

From the perspective of the matrix clause, the primary issue is the type of the embedded clause – are *wie*-complements interrogatives or free relative clauses? As shown in Section 2, *wie*-complements may be embedded by verbs like *fragen* and *wissen* ('ask', 'know') which gives them the status of interrogative clauses., see (27a). Interrogative *wie*-complements can only have manner readings: (27b) is ungrammatical., because the gradable adverbs in the manner base position blocks a manner interpretation. When embedded under perception verbs, cognitive verbs and report verbs, we consider *wie*-complements as free relative clauses (e.g. Caponigro 2004, Hinterwimmer 2013), that is, they have the status of DPs.¹⁸ Free relative *wie*-complements may then have either a manner or an eventive reading, (27c).

- (27) a. Anna fragte / wusste / bedauerte, *wie*_M Berta ihre Tasche packte.
'Anna asked / knew / regretted how Berta packed her bag.'
- b. *Anna fragte, *wie*_M Berta schnell ihre Tasche packte.
'Anna asked how Berta quickly packed her bag.'
- c. Anna sah / erinnerte sich / erzählte, *wie*_M / *wie*_E Berta ihre Tasche packte.
'Anna saw / remembered / reported how Berta packed her bag.'

We thus follow Legate (2010) in assuming that eventive *wie*-complements are free relative clauses and denote DPs. Nye (2013), in contrast, argues for a clausal status presenting contexts which appear to be restricted to clausal complements. We won't go into the English data here, it suffices to see that none of the embedding verbs of eventive *wie*-complements exclusively selects for clauses.

The other syntactic issue with eventive *wie*-complements is the position of the *wh*-word. Since it does not express manner, the *wh*-word cannot be base-generated in the manner position adjacent to the verb. We follow Legate again in assuming that *wie* in eventive readings is base-generated in its surface position, i.e. in the left periphery. Legate suggests that non-manner *how* is generated as a specifier of CP, that is, in the same position as manner *how* after movement. The other option would be the head of CP position where complementizers are located. Nye presents tests that speak, in her opinion, for non-manner *how* to be in head position. That would, however, require reanalysis of the *wh*-word as a complementizer.

In the previous version of this paper we in fact argued for eventive *wie* to be in head position because we wanted the core semantic difference between manner *wie* and eventive *wie* – modification of the

¹⁸ In earlier versions of this paper we contemplated the idea that manner *wie*-complements are interrogatives while eventive *wie*-complements are free relative clauses. Manner *wie*-complements embedded under perception, cognitive, report verbs would then be interpreted as answers to the question what the subject saw/ remembered/ reported. Evidence for this interrogatives would be multiple questions, see (a).

- (a) Anna sah, *wie* und wo Berta ihre Tasche packte.
'Anna saw how and where Berta packed her bag.'

There are, however, manner cases that do not allow an interrogative interpretation. The complement in (b) has clearly a manner reading, but nevertheless Anna is not pleased by true answers to the question of how Berta solved the problem, but instead by her way of problem solving.

- (b) Es freut Anna, *wie* Berta das Problem gelöst hat.
'Anna is pleased by (the way) how Berta solved the problem.'

We then considered to postulate that manner *wie*-complements embedded under perception, cognitive and report verbs may be either interrogative clauses or free relative clause. However, in order to avoid further complications, we decided for the solution given above.

event type vs. modification of the event token – be reflected in the syntactic structure. In the present version we revise our analysis in favor of the specifier position for three reasons:

First, the semantic difference between type and token modifier is already given by the presence or absence of the trace in the manner position adjacent to the verb. From a compositional point of view what is relevant is not the final position but the base position – the trace in the case of manner *wie* suffices to trigger event type modification. Secondly, if eventive *wie* would be reanalyzed as a complementizer (in head position) it should be equivalent in meaning to *dass* 'that'. There is however a clear difference given by direct perception and imperfectivity, see the discussion of (13) in section 2.

Thirdly, we neglected data from Bavarian German showing that the head position may in fact be inhabited by the complementizer *dass* 'that', in the manner as well as the eventive reading: ... *wie dass die Mari mit dem Toni tanzen tut*. (LIT: 'how that the Mari with the Toni dancing does.'). Even if such data are somewhat shaky – is there really an eventive reading? – it seems premature to exclude the cooccurrence of eventive *wie* and *dass*.

For these reasons we join Legate's specifier of CP analysis. We think, however, that this might not be the last word in terms of syntactic structure. The imperfective nature of eventive *wie*-complements strongly suggests an analysis that shows their proximity to temporal *wie*-clauses which differ from the former only in being adjuncts instead of arguments, see the examples in (14) (and also Zimmermann's account in section 3). From this point of view, eventive *wie* might as well be the specifier of an aspect phrase in the sense of Demirdache & Uribe-Etxebarria (2004) indicating a WITHIN relation between reference time and event time.¹⁹

Summing up, we will assume the syntactic structures shown (greatly simplified) below. The one in (28) is that of interrogative (manner) *wie*-complements. (29) and (30) represent free relative clauses. The manner free relative and the eventive one are near identical: In both structures *wie* is in the specifier of CP position. The only difference is that in the manner structure there is a trace of *wie* in the manner base position next to the verb. This difference will be the starting point for the semantic analysis in the next section.

(28) manner interrogative

- a. (Anna fragte,) *wie*_M Berta die Tasche packte.
- b. [_{CP} *wie*_{M_i} [_C Q [_{VP} Berta die-Tasche-packen t_i]]]

(29) manner free relative

- a. (Anna sah) *wie*_M Berta die Tasche packte.
- b. [_{DP} ∅ [_{CP} *wie*_{M_i} [_C ∅ [_{VP} Berta die-Tasche-packen t_i]]]]]

(30) eventive free relative²⁰

- a. (Anna sah) *wie*_E Berta die Tasche packte.
- b. [_{DP} ∅ [_{CP} *wie*_E [_C ∅ [_{VP} Berta die-Tasche-packen]]]]

¹⁹ Note, by the way, that there are no temporal counterparts for English non-manner *how*-complements.

²⁰ We subsume these structures under the notion of free relatives even if they are no relative clauses in the strict sense because there is no gap abstracted over.

5 The semantic analysis: similarity of events and of stages

The semantic analysis of *wie* complements – manner as well as eventive – is based on the idea that the wh-word *wie* denotes similarity, as it does in, e.g., in equative constructions. Manners in general are understood as classes of similar events.²¹ Eventive *wie_M* is analyzed as a special case, namely as indicating methods, i.e. classes of similar sequences of subevents, which share a given initial sequence, or *stage* in terms of Landman (1992).

In section 5.1 we will briefly introduce the similarity framework our analysis is based on. Technical details will be reduced to a minimum. Then, in 5.2 a semantic analysis of manner *wie*-complements will be proposed that makes use of manners considered as similarity classes instead of basic entities. Section 5.3 is about the semantics of eventive *wie*-complements. The core point is the idea of capturing their imperfective nature as particular methods.

5.1 The similarity framework

In Umbach (2016), a generalized account of German equatives is proposed including scalar as well as non-scalar occurrences, cf. (31). The core of this account is the idea that equatives express similarity, that is, indistinguishability with respect to a given set of dimensions, and that this is the contribution of the standard marker *wie*. Thus the standard marker *wie* is not semantically empty (as assumed in standard degree semantics) but denotes a similarity relation: In (a), Anna's height is said to be similar to Berta's height; in (b) Anna's speed at running is similar to Berta's speed; in (c) Anna's table is similar to Berta's table; finally in (d) Anna's way of dancing is similar to Berta's.

- (31) a. Anna ist so groß wie Berta.
'Anna is as tall as Berta.'
- b. Anna ist so schnell gerannt wie Berta.
'Anna ran as fast as Berta.'
- c. Anna hat so einen Tisch wie Berta.
'Anna has a table like Berta's.'
- d. Anna tanzte so wie Berta.
'Anna danced like Berta.'

We will assume that the wh-word in *wie*-complements has the same meaning as the standard marker *wie* in equatives, viz. similarity. It has to be kept in mind, however, that similarity in our framework is implemented as indistinguishability with respect to a given set of features and should not be confused with the meaning of the English word *similar*, (see Umbach & Gust in print).

The similarity analysis of equatives is akin to the kind analysis suggested in Anderson & Morzycki (2015). In the nominal and the verbal case, cf. (31c,d) (but not in the degree cases) features licit in

²¹ Recall that similarity classes are sets of similar items - we use the term *similarity class* because it is established in the literature on similarity and conveys the idea of classification.

equative comparison are restricted to "in virtue of" properties²² (see König & Umbach 2018). In the verbal case, these features correspond to what is called "event-internal modifiers" of manner verbs which affect the make-up of manner, cf. Schäfer (2013). Thus the similarity analysis can be considered as an extension of the kind analysis (for experimental evidence see Umbach & Stolterfoht in prep).

The outlines of the similarity analysis of equatives is such that the *wh*-word *wie* heading the standard clause is interpreted as a similarity relation which is 3-place: $SIM(x, y, \mathcal{F})$. Variables x and y represent items to be compared (individuals or events) and \mathcal{F} is a contextual parameter called *representation* including, among other things, the relevant dimensions of comparison.

Consider the verbal equative in (31d): *wie* is interpreted by similarity, and the *wie* clause is interpreted as a free relative clause. i.e. a DP denoting a set m' of events similar to Berta's dancing with respect to the parameters in \mathcal{F} , cf. (32a,b).²³ Coming back to *wie*-complements: the analysis of the manner reading will have the same interpretation as the *wie*-clause in the verbal equative, namely that in (32b).

- (32) a. $[[wie]] = \lambda e.\lambda e'. SIM(e, e', \mathcal{F})$
 b. $[[[_{DP} \emptyset [_{CP} wie_{M_i} [_{C'} \emptyset [_{VP} Berta\ tanzen\ t_i]]]]]]$
 $= \lambda e''. \iota m'. dance(e'') \ \& \ ag(e'', berta) \ \& \ m' = \{e' \mid sim(e', e'', \mathcal{F})\}$

The technical key points of the similarity framework are this: Similarity is spelt out with the help of three components which are combined in a *representation* \mathcal{F} :

- Multi-dimensional attribute spaces, which are defined by 1-n dimensions of arbitrary scale types (metric, ordinal and nominal) – note that scales in degree semantics can be seen as 1-dimensional spaces with a metric scale level.
- Generalized measure functions, which map individuals and events to points in attribute spaces; they can be seen as generalized versions of adjectival measure functions (cf. Kennedy 1999): While adjectival measure functions map individuals to degrees on a single ratio type dimension,

²² In Greenberg (2002) distributional differences between certain types of generic sentences are explained by referring to "in virtue of" properties. For example, a dog is four-legged in virtue of being a dog, even though an accidentally three-legged dog still counts as a dog.

²³ The combination of the *wie*-clause with the matrix clause is shown below. It is assumed in the generalized account of equatives that the pronominal element *so* denote similarity, as does *wie*, but in addition has an anaphoric or deictic capacity represented as *target*. So the parameter part of the equative is interpreted as in (32d). The free variables *target* and m are introduced by *so* asserting that Anna's dancing is in the set of events m that are similar to *target*. The *wie*-clause is combined with the matrix clause by identifying m and m' , which is achieved by unification (\oplus), (32 e). Unification is here simply identification of arguments: the free variable *target* is instantiated by the token event e'' (Berta's dancing), and the parameters \mathcal{F} and \mathcal{F}' must be identical for unification to be successful. This derivation accounts for the correlative status of *so* in equatives.

- (32) c. $[[wie\ Berta\ getanzt\ hat]]$
 $= \lambda e'' \iota m'. dance(e'') \ \& \ ag(e'', berta) \ \& \ m' = \{e' \mid sim(e', e'', \mathcal{F})\}$
 d. $[[Anna\ hat\ so\ getanzt]]$
 $= \exists e. dance(e) \ \& \ ag(e, anna) \ \& \ m = \{e' \mid sim(e', target, \mathcal{F})\} \ \& \ dance(e') \ \& \ e \in m$
 e. $[[Anna\ hat\ so\ getanzt\ wie\ Berta\ getanzt\ hat]]$
 $= \exists e. \exists e''. dance(e) \ \& \ ag(e, anna) \ \& \ e \in m \ \& \ dance(e'') \ \& \ ag(e'', berta). \ \& \ e'' \in m$
 $\ \& \ m = \{e' \mid sim(e', target, \mathcal{F})\} \ \& \ dance(e') \ \oplus \ \{e' \mid sim(e', e'', \mathcal{F}') \ \& \ dance(e')\}$
 $= \exists e. \exists e''. dance(e) \ \& \ ag(e, anna) \ \& \ e \in m \ \& \ dance(e'') \ \& \ ag(e'', berta). \ \& \ e'' \in m$
 $\ \& \ m = \{e' \mid sim(e', e'', \mathcal{F}') \ \& \ dance(e')\}$

generalized measure functions map individuals to vectors with multiple dimensions of arbitrary scale types (including ordinal and nominal scales).

- Classifiers, which are predicates on points in attribute spaces; they regulate granularity by providing a "grid" such that points within a cell cannot be distinguished.

Similarity of individuals or events is defined by indistinguishability with respect to a representation \mathcal{F} (including dimensions, measure functions and classifiers) such that two individuals or events are similar if and only if the points they are mapped to are indistinguishable (for details see Umbach & Gust 2014 and Gust & Umbach to appear). Similarity defined this way is an equivalence relation.²⁴

Let us take the verb *dance* as an example. We focus on tango and assume, for the sake of the example, that relevant dimensions of comparison are LEVEL, STYLE, FIGURES, DECORATION (with scale types ordinal, nominal, ordinal, metric). Then a dancing event is "measured" by the function in (33), that is, level, style, figures, and the number of decorations are taken into account. Now suppose that Berta's dancing is high level Milongero style, includes Ochos and Ganchos and five decorations. So it is mapped to $\langle \text{high level, Milongero, \{Ochos, Ganchos\}, 5 \rangle}$. Suppose, moreover, that granularity imposed by classifiers is such that advanced level and high level are not distinguished, as for figures, it doesn't play a role if there are only Ochos or also Ganchos and the number of decorations has to be greater than three. A classifier to this end would be the one in (34). Let us call it *STYLISH**. Accordingly, the similarity class of dancing events similar to Berta's dancing – *dancing like Berta does* – includes all events mapped to points within the range of *STYLISH**.

$$(33) \quad \mu_{\text{dance}} : D \rightarrow \text{LEVEL} \times \text{STYLE} \times \text{FIGURES} \times \text{DECORATION}$$

$$\text{where } \mu_{\text{dance}}(x) = \langle \mu_{\text{LEVEL}}(e), \mu_{\text{STYLE}}(e), \mu_{\text{FIGURES}}(e), \mu_{\text{DECORATION}}(e) \rangle$$

$$\text{and } \begin{array}{ll} \text{LEVEL:} & \text{BEGINNER} < \text{ADVANCED} < \text{HIGH LEVEL} < \text{PROFESSIONAL} \\ \text{STYLE:} & \{\text{MILONGERO, VILLA URQUIZA, TANGO DE SALON, CANYENQUE}\} \\ \text{FIGURES:} & \wp\{\text{OCHOS, GANCHOS, BOLEOS, VOLCADAS, COLGATAS}\} \\ \text{DECORATION:} & \mathbb{N} \end{array}$$

$$(34) \quad \text{STYLISH}^*(v)$$

$$\text{iff } \begin{array}{l} \text{LEVEL}(v): \text{ADVANCED} \vee \text{LEVEL}(v): \text{HIGH LEVEL} \ \& \ \text{STYLE}(v): \text{MILONGERO} \ \& \ \text{FIGURE}(v): \{\text{OCHOS}\} \\ \text{or } \text{FIGURE}(v): \{\text{OCHOS, GANCHOS}\} \ \& \ \text{DECORATION}(v) : \geq 3 \end{array}$$

$$(\text{where } v \text{ is a vector in } \text{LEVEL} \times \text{STYLE} \times \text{FIGURES} \times \text{DECORATION})$$

Similarity classes of events represent manners. In the example above Berta's manner of dancing would be described as "*high level Milogero style including Ochos and Ganchos and five decorations*" which is pure manner. Manner in the sense of *instrument* requires an instrument dimension (for example, {HAMMER, KNIFE, POISON, GUN} in the case of *killing*). Manner in the sense of methods specifying sequences of subevents (which is, what we are interested in in this paper) require a dimension where values are strings of basic events. Such strings represent sequences of performing an event of a certain type. String indices may be interpreted as time course. (For a string-based view of events see Fernando 2015). We define:

²⁴ Tversky's (1977) arguments against similarity being an equivalence relation are shown to be untenable in Umbach & Gust (to appear).

- A method measure function $\mu_{\text{seq}}: E \rightarrow S$ takes events to strings of names of basic events.
- Strings are partially ordered by a relation *initial-part-of* such that for strings α and β , $\alpha \leq_{\text{init}} \beta$ iff $\text{length}(\alpha) \leq \text{length}(\beta)$ and $\alpha_i = \beta_i$ for index i from 1 to $\text{length}(\alpha)$.
- The *initial-part-of* relation on strings in attribute spaces is reflected by an *initial-sequence-of* relation on events, $e \leq f$ iff $\mu_{\text{seq}}(e) \leq_{\text{init}} \mu_{\text{seq}}(f)$.²⁵ (Initial sequences correspond to *stages* in Landman 1992).

In the case of *pack-a-bag* possible sequences of subevents could be those in (35). Whether two events corresponding to the strings in (a) and (b) count as similar is – as in the case of Tango dancing – a matter of classifiers. If classifiers are such that the strings cannot be distinguished, the events count as similar (ignoring other dimensions of the events for the sake of exposition).²⁶

- (35) a. [RUNNING-SHOES-IN, 3-PAIRS-OF-SOCKS-IN, HARRY-POTTER-IN, 2-TSHIRTS-IN, SWEATER-IN]
 b. [RUNNING-SHOES-IN, 4-PAIRS-OF-SOCKS-IN, HARRY-POTTER-IN, 2-TSHIRTS-IN, DOWN-JACKET-IN]

In concluding, it is important to note that the notion of similarity in this framework is qualitative (property-based) unlike that in Gärdenfors' (2000) conceptual spaces which is quantitative (distance-based). Even more importantly, unlike Gärdenfors' conceptual spaces, multi-dimensional attribute spaces in our framework are integrated into referential semantics by means of generalized measure functions. These functions map referents (individuals or events) to points in attribute spaces, just like measure functions in degree semantics map individuals to degrees. Similarity in this system is a relation between referents which is defined by means of indistinguishability of corresponding points in attribute spaces.

5.2 Manner *wie* complements

One building block of the analysis of *wie*-complements in this paper is the interpretation of manner readings, manner interrogative clauses as well as manner free relative clauses (cf. section 4). There is a long-standing dispute in the literature about how to understand the notion of manner. We will briefly go into this issue before presenting our semantic analysis of manner *wie*-complements.

5.2.1 Are manners basic ontological entities?

A comprehensive overview over the conceptions of the notion of manner in semantics is given in Pinon (2008). Do they denote properties of events, or are manners basic ontological entities? Do they exist

²⁵ It is an interesting open question how tight this reflection has to be in terms of temporal development (Louise McNally, p.c.)

²⁶ A classifier making sure that 3-4 pairs of socks and a sweater or a down jacket were packed into the bag would be of the form $\exists s_i$ in $s_i = 3\text{-PAIRS-OF-SOCKS-IN}$ or $s_i = 4\text{-PAIRS-OF-SOCKS-IN}$ & $\exists s_j$ in $s_j = \text{SWEATER-IN}$ or $s_j = \text{DOWN-JACKET-IN}$.

Recall that *3-PAIRS-OF-SOCKS-IN* and *4-PAIRS-OF-SOCKS-IN* as well as *SWEATER-IN* and *DOWN-JACKET-IN* are names of basic events.

independently of a specific event? How are they related to an event? Is there a single manner of an event or are there multiple ones corresponding to different aspects? For the various positions see the references in Pinon (2008) and see Schäfer (2013) and Alexeyenko (2015).

The common way of talking about manner in the current literature is such that manners are basic entities and there is a manner function from events to manners. Adverbs are then interpreted as predicates on manner entities. An example along the lines of Schäfer (2013) is shown in (37). In (b) an unspecific function MANNER is used, in (c) the manner function is specified for a particular type of event, which is alternative considered by Schäfer.

- (37) a. Annette danced stylishly.
 b. $\exists e. \text{dance}(e) \text{ agent}(e, \text{anna}) \ \& \ \exists m. \text{MANNER}(e, m) \ \& \ \text{stylish}(m)$
 c. $\exists e. \text{dance}(e) \text{ agent}(e, \text{anna}) \ \& \ \exists m. \text{M-DANCE}(e, m) \ \& \ \text{stylish}(m)$

The representation in (37c) is surprisingly close to the idea of multi-dimensional attribute spaces presented in the preceding section. If you think of the manner function as a generalized measure function and the manner variable m as ranging over points in attribute spaces, (37 b) corresponds to (38):

- (38) $\exists e. \text{dance}(e) \text{ agent}(e, \text{anna}) \ \& \ \exists m. \mu_{\text{dance}}(e) = m \ \& \ \text{STYLISH}^*(m)$
 (where m is a point in LEVEL×STYLE×FIGURES×DECORATION)

In our framework points in attribute spaces differ from referential entities like individuals and events in being mere auxiliaries facilitating classification of individuals and events with respect to certain attributes.²⁷ They are dependent on the individuals or events they are attributes of. Their ontological status is analogous to that of degrees in degree semantics and should be decided in the same way – if you accept degrees, you should accept other auxiliary entities, too.

The interpretation of *wie*-complements raises the question of the domain the *wh*-word *wie* ranges over. Since points in attribute spaces are not on par with individuals and events, we prefer thinking of *wie* as ranging over sets of events mapped by a particular manner measuring function onto a particular point in an attribute space. If you allow for some granularity such that closely adjacent points are indistinguishable such sets are similarity classes: sets of all events for which the measure function yields indistinguishable values, cf. (39).

- (39) $m = \{e' \mid \text{sim}(e', e, \mathcal{F})\}$ where \mathcal{F} includes generalized measure functions and classifiers providing granularity, (cf. 5.1)

This view may at first sight appear unnecessarily complex – why talk about similarity classes instead of basic manner entities? – but it has three significant advantages. First, we get a little closer to the internal make-up of manners. The similarity framework does, of course, not tell you which measure functions are relevant for a particular manner. But it allows for predictions that can be empirically

²⁷ The basic idea of our framework is to have a referential semantics where predicates talk about entities in the world, and a representational layer where classifiers talk about auxiliary items like degrees, numbers, symbols etc., and vectors thereof. Entities of the world are related to auxiliary items by processes of measurement or feature extraction or perception etc.

tested (see Umbach & Stolterfoht in prep). Second, analyzing the *wh*-word *wie* in complements as expressing similarity allows to establish links to other uses of *wie*, e.g., its use in equatives – is there a common core between manner *wie*-complements and *wie*-clauses in verbal equatives as in (32)?

Third, and most important in this paper: The similarity analysis of manner reveals what manner and eventive *wie*-complements have in common and provides an answer to the question we started out from: Why use a manner question word to express an event in progress?

One argument raised against the similarity approach is about perception. Seeing how Anna dances should not be analyzed such that it entails seeing all similar events. We assume that perceiving a manner in form of a similarity class like (39) entails perceiving the 'seed' of this set (variable *e* in 39). The other elements of the class are indistinguishable from the 'seed' event with respect to certain features of comparison, but they are not indistinguishable per se. So they will not be simultaneously perceived. What you see when seeing how Anna dances is, first, Anna dancing – this is why *wie*-complements are factive – and second that her dancing has attributes with respect to which her dancing is indistinguishable from other dancing events. Compared to the basic-manner view according to which what is seen is a manner object, the similarity view retains the link between event and manner which is an acknowledge problem for the basic manner analysis, cf. Alexeyenko 2015, p.161).²⁸

5.2.2 Manner *wie*-complements interpreted by similarity

We saw in Section 2 that manner *wie*-complements occur, on the one hand, embedded under perception verbs, cognitive verbs and report verbs and, on the other hand, under interrogative and factive verbs, cf. (15a,b). In Section 3, the former were analyzed as free relative clauses and the latter as interrogative clauses, with *wie* being base generated in the manner position adjacent to the verb in both cases, cf. (40b), (41b). Before going into the similarity analysis of manner *wie*-complements, let us see what the interpretation would look like if we consider manners as basic entities related to the event by a MANNER relation. The free relative interpretation is shown in (40), the interrogative one in (41).

Manner as basic entity

(40) manner free relative clause

- a. (Anna sah) *wie*_M Berta die Tasche packte.
- b. [_{DP} ∅ [_{CP} *wie*_{M_i} [_C ∅ [_{VP} Berta die-Tasche-packen t_i]]]]
- c. λe. ιm. MANNER(e, m) & bag-pack(e) & ag(e, berta)

(41) manner interrogative clause

- a. (Anna fragte,) *wie*_M Berta die Tasche packte.
- b. [_{CP} *wie*_{M_i} [_C Q [_{VP} Berta die-Tasche-packen t_i]]]
- c. λp. ∃e. ∃m. p ↔ MANNER(e, m) & bag-pack(e) & ag(e, berta)

The reason why we think that the analyses above are unsatisfactory have been laid out in the previous section. Most importantly, analyses making use of basic manner entities cannot – as far as we can see

²⁸And it avoids the highly ideological debate on whether basic manner objects can be perceived as such.

– be extended to account for eventive *wie*.²⁹ Using manner particulars would thus predict that the manner reading and the eventive reading of *wie*-complements are unrelated, which would be a poor result.

We propose the similarity-based analyses in (42) and (43). It is important to note that they do not deviate from standard semantic assumptions on the interpretation of free relatives and interrogative clauses. They are just more detailed and spell out the making of manner objects which would otherwise be primitive units.

In (42) the interpretation of a manner free relative clause is shown. As in the case of equatives (section 4), *wie* denotes a similarity relation: $\lambda e'. \lambda e. \text{SIM}(e', e, \mathcal{F})$.³⁰ Combining it with the verb yields (c). The free relative clause is type-shifted from $\langle e, t \rangle$ to $\langle e \rangle$ by *iota*,³¹ cf. (e). We assume that the event variable is bound by existential closure only after adding the matrix clause, cf. (f).

Comparing (42 f) to (40c), the only difference is the specification of the variable *m* representing the manner Anna is seeing as being a similarity class of events. But then, Anna cannot see how the event is performed without seeing the event itself. So the manner-as-basic as well as the similarity analysis have to presuppose that seeing a manner entails seeing the event it is a manner of. In the similarity analysis this is fairly easy to accept since the relevant event is not detached from the manner – it's the seed of the similarity class.

Manner as similarity class

(42) manner free relative clause

- a. (Anna sah) $[_{DP} \emptyset [_{CP} \text{wie}_{M_i} [_{C'} \emptyset [_{VP} \text{Berta die-Tasche-packen } t_i]]]]$
- b. $[[\text{wie}]] = \lambda e. \lambda e'. \text{SIM}(e, e', \mathcal{F})$
- c. $[[[_{VP} \text{Berta die-Tasche-packen } \text{wie}_{M_i}]]]$
 $= \lambda e \lambda m. \text{bag-pack}(e) \ \& \ \text{ag}(e, \text{berta}) \ \& \ m = \{e' \mid \text{sim}(e', e, \mathcal{F})\}$
- d. $[[[_{CP} \text{wie}_{M_i} [_{C'} \emptyset [_{VP} \text{Berta die-Tasche-packen } t_i]]]]]$
 $= \lambda e. \lambda m. \text{bag-pack}(e) \ \& \ \text{ag}(e, \text{berta}) \ \& \ m = \{e' \mid \text{sim}(e', e, \mathcal{F})\}$
- e. $[[[_{DP} \emptyset [_{CP} \text{wie}_{M_i} [_{C'} \emptyset [_{VP} \text{Berta die-Tasche-packen } t_i]]]]]]]$
 $= \lambda e. \iota m. \text{bag-pack}(e) \ \& \ \text{ag}(e, \text{berta}) \ \& \ m = \{e' \mid \text{sim}(e', e, \mathcal{F})\}$
- f. $[[\text{Anna sah } [_{DP} \emptyset [_{CP} \text{wie}_{M_i} [_{C'} \emptyset [_{VP} \text{Berta die-Tasche-packen } t_i]]]]]]]$
 $= \exists e'. \exists e. \text{see}(e') \ \& \ \text{ag}(e', \text{anna}) \ \& \ \text{th}(e', \iota m. \text{bag-pack}(e) \ \& \ \text{ag}(e, \text{berta}) \ \& \ m = \{e'' \mid \text{sim}(e'', e, \mathcal{F})\})$

In (43) the interpretation of a manner interrogative clause is shown. We make use of a simplified Karttunen-style analysis such that embedded interrogatives denote questions and questions are sets of (true) propositions (Karttunen (1977)). We neglect the details of question semantics and instead

²⁹ Alexeyenko (2015) considers a type shift from manner to event in order to account for eventive *wie*-complements, which he then discards because the relevant event is already present in the manner interpretation, p.161/162.

³⁰ Recall that the parameter \mathcal{F} includes the relevant features of comparison and is given by the context.

³¹ cf. Caponigro (2004). Note, however, that manner *wie* complements are closer to kinds than to maximal individuals. So the *nominalizer* shift might be more adequate, see also Hinterwimmer(2013) for kind-denoting free relatives. In the present paper we stay with *iota* to keep things simple.

focus on the role of manners. From the point of view of manners as basic entities, propositions vary over the domain of manners in the same way they vary over the domain of persons in (44). If manners are viewed as similarity classes, the domain is required to consist of similarity classes. Similarity classes of a given event vary with respect to representations \mathcal{F} . So the domain has to be the set of similarity classes of some event varying in \mathcal{F} -- in prose, the set of manners in which an event of the given event type can be performed. Such a domain is defined by $M(e) = \{m \mid \exists \mathcal{F}. m = \{e' \mid \text{sim}(e', e, \mathcal{F})\}\}$.³²

(43) manner interrogative clause – manner-as-similarity-class

a. (Anna fragte) [_{CP} *wie*_{M_i} [_{C'} Q [_{VP} Berta die-Tasche-packen *t_i*]]]

b. [[[_{VP} Berta die-Tasche-packen *wie*_{M_i}]]]
= $\lambda e \lambda m. \text{bag-pack}(e) \ \& \ \text{ag}(e, \text{berta}) \ \& \ m = \{e' \mid \text{sim}(e', e, \mathcal{F})\}$

c. [[[_{CP} *wie*_{M_i} [_{C'} Q [_{VP} Berta die-Tasche-packen *t_i*]]]]]
= $\lambda m. \exists e. \text{bag-pack}(e) \ \& \ \text{ag}(e, \text{berta}) \ \& \ m = \{e' \mid \text{sim}(e', e, \mathcal{F})\}$

d. [[[_{CP} *wie*_{M_i} [_{C'} Q [_{VP} Berta die-Tasche-packen *t_i*]]]]]
= $\lambda p. \exists e \exists m. p \leftrightarrow m \in M(e) \ \& \ \text{bag-pack}(e) \ \& \ \text{ag}(e, \text{berta})$

where $M(e) = \{m \mid \exists \mathcal{F}. m = \{e' \mid \text{sim}(e', e, \mathcal{F})\}\}$

(44) [[who Peter loves]]

= $\lambda p. \exists e. \exists x. p \leftrightarrow \text{person}(x) \ \& \ \text{love}(e) \ \& \ \text{ag}(e, \text{peter}) \ \& \ \text{theme}(e, x)$

We started this section explaining the notion of manner by similarity of events. Similarity classes of events are akin to event kinds in sharing "in virtue of" properties (see footnote in 5.1), Umbach & Stolterfoht (in prep). This suggests that the reification of the free relative clause might in fact result in kinds rather than (maximal) plural individuals. We did not pursue this path because it would go beyond the scope of this article. But if you wonder what sort of an individual a similarity class might be, think of it as an event-kind.³³

5.3 The meaning of eventive *wie*-complements

The core issue in this paper is the semantics of eventive *wie*-complements, and the main motivation for the additional effort of explaining manners by similarity is that in this way the connection between manner and eventive *wie* complements becomes visible. The most important observation on eventive *wie*-complements is that they have a process-like character. So our hypothesis is that eventive *wie*-

³² One reviewer suggested to rephrase (43d) such that e and \mathcal{F} are existentially quantified over while dismissing the explicit mention of the domain $M(e)$. This is simpler and in fact equivalent. But since we want to make the domain explicit, we leave (43d) as it is and add the rephrase here:

(43e) [[[_{INT}[_{CP} *wie*_{M_i} [_{C'} Q [_{VP} Berta die-Tasche-packen *t_i*]]]]]
= $\lambda p. \exists e \exists \mathcal{F}. (p \leftrightarrow \{e' \mid \text{sim}(e', e, \mathcal{F})\} \ \& \ \text{bag-pack}(e) \ \& \ \text{ag}(e, \text{berta}))$

³³ Also, if you wonder how something more complex than a variable may move in a syntactic tree, consider the similarity class as a kind.

complements are imperfective denoting events in progress. Starting from the commonly accepted idea that events in progress are associated with a set of possible continuations, we will suggest an analysis such that events in progress correspond to similarity classes built from an initial event sequence – a sequence that is observed – plus possible natural continuations. According to this analysis, events in progress constitute a very particular sort of manner similarity classes, particular in three respects: First, these classes represent methods, that is, sequences of subevents of an event of the given type. Second, the sequences are similar to a natural course of events of the relevant type. Third, all sequences share a common initial sequence, or stage, that has already been realized.

We will first provide evidence that eventive *wie*-complements do in fact denote events in progress, then discuss basic characteristics of imperfectivity and how they were accounted for in Landman (1992) and Bonomi (1997), and finally suggest a semantics for eventive *wie*-complements.

5.3.1 Eventive *wie*-complements denote events in progress

The characterization of eventive *wie*-complements in the literature is mostly negative: They don't express a manner of performing an event, they cannot be used as embedded questions and, syntactically, the *wh*-word has not been moved. Moreover, they are not equivalent to *dass* ('that') complements, since they cannot be embedded under *glauben* ('believe') and, unlike *dass*-complements, they entail direct perception when embedded under perception verbs – *Anna sah wie_E Berta ihre Tasche packte*. ('Anna saw how Berta packed her bag.') entails that Anna actually saw Berta packing her bag – mere evidence, e.g. cloth scattered across the room, would not suffice.

The only positive characterization found in the literature is the commonly agreed on intuition that *wie_E*-complements induce a process perspective – they describe a process or scene. From this observation, Falkenberg (1989) draws the conclusion that eventive *wie*-complements are imperfective, analogous to English progressives.³⁴ He shows that they allow for the so-called *imperfective paradox* – (45a) does not entail that the crossing of the river event was completed while (45b) does, thus continuing the sentences by *sie kam aber nicht auf der anderen Seite an*. ('but she did not reach the other side.') would be consistent in the case of (45a) but not in the case of (45b). Falkenberg furthermore points out that eventive *wie*-complements may contain "*dabei sein*" constructions ('be in the process of doing s.th.') as in (46a) and also the *Rheinische Verlaufsform*, which is a substandard German progressive, (46b).

- (45) a. Anna sah, *wie_E* Berta den Fluss überquerte.
 b. Anna sah, *dass* Berta den Fluss überquerte.
 LIT: 'Anna saw how Berta was crossing / that Berta crossed the river.'

- (46) a. Anna sah, *wie* Berta dabei war, den Fluss zu überqueren.
 b. Anna sah, *wie* Berta den Fluss am überqueren war.
 LIT: 'Anna saw how Berta was crossing the river.'

We follow Falkenberg in assuming that *wie_E*-complements are imperfective in the sense of viewpoint aspect: the situation is presented from the inside, as an ongoing event. In English, clauses are marked as imperfective is by using the progressive (for details see Deo to appear). In German, imperfectivity is

³⁴ Note that a simple tense in German is indeterminate between a progressive and non-progressive meaning.

mostly unmarked. Possible markers are particles like *gerade* 'just' and "*dabei sein*" constructions, and also the (substandard) *Rheinische Verlaufsform*. Eventive *wie*-complements are compatible with these markers, cf. (46). Moreover, if eventive *wie*-complements induce imperfectivity, they should conform to the well-known constraints on lexical aspect, i.e. they should license activities and accomplishments but not states and achievements.

States are in fact excluded in *wie_E*-complements, see (47a) (= 21 in Vater 1975). This is independent of whether they express stage level or individual level predicates (47a, b). Position verbs like *stand*, *sit*, *lie*, though clearly stative, may in rare contexts occur in English progressives, (48) (= 10a in Deo to appear). In *wie_E*-complements, position verbs are hardly acceptable, (49a). The sentences improve, however, when adding an activity conjunct, (49b, c). This effect is reminiscent of the pseudo-coordination form of progressives in Norwegian in which a position verb is combined with an activity.³⁵ Without going into details, we will consider this effect as support for the claim that *wie_E*-complements reject statives.

- (47) a. *Ich sah, *wie_E* Hans krank war.
'I saw Hans being sick.'
- b. *Anna hörte/erzählte *wie_E* Berta *Die Glocke* von Schiller auswendig konnte.
'Anna heard/reported Berta knowing Schillers poem *Die Glocke* by heart.'
- (48) The socks are lying under the bed.
- (49) a. ?? Anna sah, *wie_E* Berta in der Küche saß.
LIT: 'Anna saw how Berta sat in the kitchen.'
- b. Anna sah, *wie_E* Berta in der Küche saß und heulte.
LIT: 'Anna saw how Berta sat in the kitchen and cried.'
- c. Dann stürmten sie raus und sahen, *wie_E* Ganon am Boden lag und sich wand *wie* ein Wurm.³⁶
LIT: 'Then they rushed outside and saw how Ganon lay on the ground and squirmed like a worm.'

Contrary to expectation, achievements are not excluded in *wie_E*-complements. But if they occur in *wie_E*-complements they have either an accomplishment-like reading with an additional preparatory phase or they have a "slow-motion" reading, see (50 a, b). The two readings have been observed by Rothstein (2004) for English achievement verbs occurring in the progressive.³⁷

³⁵ See Tonne (2006); her example (1a) is '*Bama satt og leste*.' (lit: the children sat and read) which means that the children were reading. The position verb is prototypical for the activity but is not entailed (sit in the kitchen and cry; stand and talk on the telephone etc.), Atle Groenn p.c.

³⁶ From the term paper 'Event-Lesart in *wie*-Komplementen mit Zustandsverben' by Chiara Aigner and Judith Linden, winter semester 2016, university of Cologne. The authors did a corpus search on position verbs in eventive *wie*-complements (in DEWAC, HU Berlin). They found few genuine *wie_E*-complements but a number of temporal *wie*-clauses of the form in (a)

(a) Plötzlich sieht der den Teufel, *wie* er auf seinem Thron sitzt und vor Kälte bibbert.

LIT: 'Suddenly he sees the devil how he is sitting on his jittering from cold.'

³⁷ In Rothstein (2004) progressive achievements are distinguished between accomplishment-like readings available for many but not all achievement verbs and "slow-motion" readings which are always available. The former add a short preparatory phase to the instantaneous event expressed by the achievement, while the latter make the instantaneous event appear as being stretched over time. Rothstein furthermore observes that the former pattern with accomplishments is not entailing the completed event thereby licensing the imperfective paradox, while the latter pattern with activities since they do entail the completed event and

- (50) a. Anna sah/erzählte, *wie* Berta ihren alten Schulfreund *wiedererkannte*.
LIT: 'Anna saw/reported how Berta recognized her old schoolmate.'
- b. Anna sah/erzählte, *wie* Berta das andere Ufer erreichte.
LIT: 'Anna saw/reported how Berta reached the other side of the river.'

5.3.2 Events in progress construed as particular methods

The semantics of imperfective sentences, and in particular the English progressive, has been discussed at length in the literature; see, e.g., Dowty (1979), Landman (1992), Bonomi (1997), Portner (1998) and, recently, Fiorin and Delfitto (2017) and Varasdi (2017); for an overview see Deo (to appear).

The basic idea is that imperfectivity indicates viewing an event "from the inside" or as "ongoing". Accordingly, the reference time is included in the event time (see Deo to appear). In (51 a) the reference time is that of the matrix event; imperfectivity of *wie_E*-complements would predict that Anna did not necessarily watch all of Berta's bag-packing. This is what we find, see (51 b)

- (51) a. Anna sah, *wie_E* Berta ihre Tasche packte.
'Anna saw Berta packing her bag.'
- b. Anna sah drei Minuten lang zu, *wie_E* Berta ihre Tasche packte. Das Packen dauerte insgesamt drei Stunden.
'Anna watched Berta packing her bag for three minutes. The bag-packing took three hours.'

The 'ongoing' characteristics entails that the event segment denoted by the imperfective sentence is continued. When Anna sees Berta packing her bag she will assume that Berta continues even if she is no longer watching. She will not expect Berta to stop as soon as she left the room. This type of expectation is subsumed under the notion of inertia in cognitive science. Moreover, if the speaker describes Berta's activity as being of the type bag-packing, expected continuations are of the same type. Or, from Anna's point of view, if she classified Berta's activity as being of the type bag-packing she will expect its continuation to be of the type bag-packing, too.³⁸ So if you ask Anna: *what is Berta doing there?* she would answer: *Berta ist am Koffer packen. / Berta is packing her bag.* even though she doesn't see more than Berta rummaging around in her belongings

The discussion in the literature centers on the question of which requirements have to be met by continuations of the event in order for the imperfective sentence to be true. Which interruptions would falsify the truth of *Berta is packing her bag*? Intuitively, the sentence is true even if the bag-packing stops due to an earth quake. But it is not true if the process stops because Berta realizes that there is nothing available to put in the bag (maybe because she is in the garden). This is the question

block the imperfective paradox, see (a) and (b) below (= 8b, p.39 and 48a, p. 57, Rothstein 2004). She therefore suggests an interpretation such that in the case of accomplishment-like readings the progressive triggers a type shifting operation resulting in an accomplishment being derived from the achievement, and in the case of slow-motion readings the progressive triggers a type shift resulting in an activity.

(a) The plane was landing when it exploded in midair (so it didn't land).

(b) #Mary is spotting her arch enemy at the party but she hasn't yet spotted her.

³⁸ Recall that *wie_E*-complements are not epistemically neutral in the sense of Barwise, that is, (51 a) entails that Anna thinks Berta is packing her bag.

behind the famous *imperfective paradox*.³⁹ It led to the idea of *inertia worlds* which are worlds identical to the actual world up to reference time and from there on everything takes a natural course – nothing unexpected happens. Based on the idea of inertia worlds Dowty (1979) proposed: *Mary is building* a house is true in a world *w* at an interval *i* iff in every inertia world *u* for *w* at *i* this interval *i* is a subinterval of a larger interval where *Mary build a house* is true.

There were a number of problems with possible interruptions and questions of naturalness which led to the event based account in Landman (1992). It makes use of *stages of events* and *continuation branches*. Stages are "parts of an event which are big enough and share enough with the event to be called a less developed version of the event" (Landman 1992, 23). Continuations match with stages: If an event *e* is a stage of an event *f*, then *f* is a continuation of *e*. Continuation branches are described by Landman as follows: "We follow the actual continuation of our event *e* in our world until it stops. Then we perform a thought experiment: How would *e* have continued if it hadn't stopped?"⁴⁰ The implementation makes use of closest (i.e. most similar, Lewis 1973) worlds such that in the case of an interruption in the actual world the continuation of the event in the closest worlds is considered, up to the next interruption, and this is repeated as long as switching to another world is still reasonable.

So continuation branches are possible continuations of a given event stage (this is why Varasdi 2017 classifies Landman's account as a possibility-based theory of the progressive). The stage is realized in the actual world – it is an event token, for example the stage of Berta's bag-packing that Anna observed. But we don't yet know how it will develop from then on because reference time is within event time. Due to cognitive inertia we take only natural continuations of the type of bag-packing into account and we judge the progressive to be true if we can think of a possible and also natural continuation of the token stage. This is why *Mary was crossing the street* is true even if she was hit by a truck, and *Mary was swimming across the Atlantic* is not true even if she made the first 500 meters.

While in Landman's account possibility is encoded with the help of possible worlds, the account suggested in Bonomi (1997) is extensional making use of *stereotypical frames* and *natural courses of events*.

"The idea is that our perception of an event involves a bunch of possible developments of that event. My going to the blackboard and taking a piece of chalk can be considered as part of a number of alternative events, as putting the room in order, writing some instructions, proving a theorem, and so on."⁴¹

³⁹ The imperfective paradox points to the observation that for activities but not for accomplishments the entailment from (a) to (b) holds, see the concise presentation in Varasdi (2017).

(1) a. Mary was pushing a cart. b. Mary pushed a cart.
(2) a. Mary was crossing the street. b. Mary crossed the street.

If (2a) is interrupted by some unforeseen accident, it is still true because normally Mary would reach the other side of street. This is different in *Mary was crossing the Atlantic (by swimming)*. This sentence is false even if Mary after holding on for 500m is carried to the other side by magic forces since that would not count as a natural continuation (Surprisingly, Landman claims that the sentence is true).

⁴⁰ cont. "... But we only do so if the thought experiment is reasonable on the basis of what is internal to *e*; if the thought experiment brings us to a world where *e* continues further than is reasonable on the basis of *e* itself, we don't perform it." (Landman 1992, 26)

⁴¹ cont. "[...] Since the same event *e* can be 'embedded' into several possible continuations, the context is a determining factor in selecting the relevant ones. If *e* is considered in connection with a given set of concomitant facts, then its possible extensions are events of a certain type. But if another set of concomitant facts is selected

The notion of natural courses of events is implemented in Bonomi (1997) with the help of stereotypical frames which are functions from events and contexts yielding sets of natural courses of events. Truth conditions for the progressive are defined such that an event *e* is an *event in progress of type V* iff there is a stereotypical frame such that each natural course of events licensed by this frame contains an event which is of type *V* and includes the event in progress. A sentence in the progressive is true in Bonomi's system if the actual course of events is contained in the natural courses of events selected by the relevant stereotypical frame.

"... *Leo is going to Metz* is true iff there is an event whose characteristics, with respect to the some features of the world and a given stereotypical constraint, force the perception of *e* as *part* of a process of Leo's going to Metz, [...] there can still be different chains of events leading to an event of Leo's getting to Metz. He might take a toll road or a freeway, stop at X rather than Y, and so on. This is why we have to refer to a plurality of courses of events, even though the type of the event which is going on is already definite." (Bonomi 1997, p. 193/194)

From Bonomi's analysis to the similarity analysis of eventive *wie* complements it's just a few steps. The basic idea of our interpretation of eventive *wie* complements rests on three observations:

- First, sets of courses of events correspond to **methods** – sets of sequences of subevents performing an event of a certain type, e.g., *bag-packing*;
- second, the stage of the event realized within reference time – the stage of Berta's bag-packing observed by Anna – is a **token** corresponding to an initial sequence of a bag-packing sequence;
- third, even though the initial stage has various continuations, namely all the sequences it is initial of, the truth of the sentence should be confined to **natural** sequences only – the stage of Berta's activity is truly described by *wie Berta ihren Koffer packt* if there are natural continuations of this stage which are of the type *bag-packing*.

The role of *wie* in eventive *wie*-complements is to create a similarity class of this form. Note that this class is a hybrid: while a run-of-the-mill method is a class of courses of events (and combines intersectively with the event type given by the verbal predicate), the method induced by eventive *wie* depends on a given token and includes all courses of events this token is a stage of. From the point of view of type theory (Martin-Löf 1984, Cooper in prep.) this is a dependent type.

As argued in section 4, the interpretation of eventive *wie*-complements is based on a free relative clause which is such that the *wh*-word *wie* is base-generated in Spec CP (instead of being moved from a verb adjacent position). As in the case of manner *wie*-complements, *wie* denotes a similarity relation. Different from manner *wie*-complements, the similarity class is not an intersective modifier of the event type but instead a constraint attached to an event token (which is available only above VP, Carlson 2003) : There have to be natural continuations of the relevant type.

In (52) the interpretation of eventive *wie*-complements is shown. The VP is interpreted such that there is some rummaging around of Berta's that is classified by the speaker (as well as Anna) as being a stage of bag-packing, and due to cognitive inertia the speaker (as well as Anna) assume that Berta's rummaging around will develop into a natural bag-packing event.

as the relevant background, then the type of the global event which is considered in progress will be different." (Bonomi 1997, 174)

Note that imperfectivity arises already at this point, by the assumption that the activity given at reference time is only part of a fully developed event. This is expressed by the *initial-sequence-of* relation – e is a stage of a bag-pack event f , $e \leq f$.⁴² In (high) German there is no morphological difference between simple tense und progressive, but in the Rheinland dialect the VP in (52b) can be expressed in a progressive form: *Berta ist am Tasche packen*.

As in the case of manner *wie*-complements, similarity provides is a constraint, but due the high position of *wie* it does not affect the event type *tasche-packen* but instead the stage of Berta's rummaging around, that is, it is a constraint on variable e in (52 d). In (52e) the free relative clause is type-shifted from $\langle e, t \rangle$ to $\langle e \rangle$ by *iota* yielding an event which is the theme of the seeing event in the matrix clause in (52 f).⁴³

(52) eventive *wie*-complement

- a. (Anna sah) [_{DP} \emptyset [_{CP} *wie*_E [_C \emptyset [_{VP} Berta die-Tasche-packen]]]]
- b. [[[_{VP} Berta die-Tasche-packen]]]
= $\lambda e. \text{ag}(e, \text{berta}) \ \& \ \exists f. e \leq f \ \& \ \text{bag-pack}(f) \ \& \ \text{natural}(f)$
- c. [[*wie*]] = $\lambda e. \lambda e'. \text{SIM}(e, e', \mathcal{F})$
- d. [[[_{CP} *wie*_E [_C \emptyset [_{VP} Berta die-Tasche-packen]]]]]
= $\lambda e. \text{ag}(e, \text{berta}) \ \& \ \exists f. \text{bag-pack}(f) \ \& \ \text{natural}(f) \ \& \ \exists m. m = \{f' \mid \text{sim}(f', f, \mathcal{F})\} \ \& \ \forall f'. f' \in m \rightarrow e \leq f'$
- e. [[[_{DP} \emptyset [_{CP} \emptyset [_C *wie*_E [_{VP} Berta die-Tasche-packen]]]]]]]
= $\lambda e. \text{ag}(e, \text{berta}) \ \& \ \exists f. \text{bag-pack}(f) \ \& \ \text{natural}(f) \ \& \ \exists m. m = \{f' \mid \text{sim}(f', f, \mathcal{F})\} \ \& \ \forall f'. f' \in m \rightarrow e \leq f'$
- f. [[Anna sah [_{DP} \emptyset [_{CP} *wie*_E [_C \emptyset [_{VP} Berta die-Tasche-packen]]]]]]]
= $\exists e'. \text{see}(e') \ \& \ \text{ag}(e', \text{anna}) \ \& \ \text{th}(e', \lambda e. \text{ag}(e, \text{berta}) \ \& \ \exists f. \text{bag-pack}(f) \ \& \ \text{natural}(f) \ \& \ \exists m. m = \{f' \mid \text{sim}(f', f, \mathcal{F})\} \ \& \ \forall f'. f' \in m \rightarrow e \leq f')$

Comparing the interpretation of eventive *wie*-complements in (52) to that of manner *wie*-complements in (42), the difference in meaning is inherently connected to the difference in syntax. We follow Carlson (2003) assuming that the lexical projection of a major phrase contains only type information while token information is made available only in higher functional projections. In the manner reading of *wie*-complements the *wh*-word is base-generated below VP and thus has access to the event type. The similarity class functions as an intersective modifier, and this is what we expect from a manner modifier.

⁴² Two remarks: We assume that agents stay constant during the development of an event . Second, the definition of initial-sequence in section 5.1 does not exclude degenerate cases covering the overall sequence. We leave this issue open since the data are not fully clear.

⁴³ If you object that the variable m in (52 d, e, f) is superfluous: yes, it is. It is syntactic sugar meant to visualize the idea of the method.

In contrast, in the eventive reading the *wh*-word is base-generated above VP and has no access to the event type. The similarity class provides a constraint on the event token which is the stage of Berta's rummaging around, by postulating natural continuations.

The modal impact of imperfectivity is encoded in the similarity analysis by the type-token distinction. While the stage referred to by a progressive sentence is a token, the set of continuations is a type constituted by possible continuations – only one of them will be realized (if at all). From this point of view our analysis draws on possibilities even if not possible worlds.

Finally, one might think that German *wie* in eventive complements is a progressive operator analogous to progressive morphology in English. However, on our analysis *wie_E* requires a stage in order to build the dependent similarity class, and it is the notion of the stage indicating that the event is 'ongoing', that is, reference time is within event time. In Deo (to appear) two roles of grammatical devices (obligatory or optional) are distinguished in signaling the presence of imperfectivity: Either they induce imperfectivity or they merely presuppose imperfectivity. In our analysis *wie_E* takes the latter role.⁴⁴ But since in German simple tenses are ambiguous between a perfective and an imperfective reading *wie_E* has the non-vacuous role of indicating an imperfective interpretation.

6 Conclusion

The main issue in this paper is the semantics of eventive *wie*-complements and the differences to manner *wie*-complements. This includes a number of questions the most puzzling of which is: Why use a manner word to express an event in progress?

The answer is given in this paper in two steps. First, we argued that the *wh*-word *wie* should not be considered as ranging over basic manner objects, but instead be interpreted as expressing similarity. Similarity classes of events can be seen as representing manners – classes of events sharing particular features.

This view offers a chance to glimpse into the internal makeup of manners. More importantly, it reveals the common core of the two types of *wie*-complements: They both involve similarity classes. But while in the case of manner complements the similarity class restricts the event type, in the case of eventive complements it just adds information about an event token, namely the stage of the event in progress. The former is unsurprising: restrict an event type is what we expect manner to do. The latter requires thinking of imperfectivity in terms of sets of similar natural continuations of the stage of the event in progress.

The idea of natural continuations reflects the cognitive principle of inertia which is commonly accepted as the core of the meaning of the progressive. In the similarity account natural continuations are provided as a similarity class of sequences of subevents sharing the same initial sequence. From this perspective the question of why use a manner word to express an event in progress can be answered as follows: The *wh*-word *wie* expresses similarity, and both the manner reading and the eventive reading of *wie*-complements are based on similarity classes.

The similarity analysis explains why *wie*-complements have a manner as well as an eventive reading without postulating two homophonous versions of the *wh*-word. It also accounts for the different syntactic characteristics the *wh*-word – being moved from a base position adjacent to the verb as opposed to being base-generated above VP. It also accounts for the finding that all matrix verbs that license free relative manner readings also license eventive readings: The form of similarity class in

⁴⁴ which has early on been predicted by Sebastian Bücking (p.c.).

eventive readings is just a very special case of a general manner similarity class. This may finally explain why it is sometimes hard to distinguish the two readings.

The similarity analysis opens the door for future work on a uniform interpretation of the *wh*-word *wie* across syntactic constructions, including equative comparison, temporal *wie*-clauses, *wie* appositions and also overt *wie*-questions. The most exciting puzzle for future work, however, is this: Non-manner uses of manner *wh*-words are found in a broad variety of European and non-European languages, but their meaning seems vary across languages. Is there nevertheless a systematic relation between manner *wh*-words and non-manner uses thereof?

References

- Alexeyenko, Sascha (2015) The Syntax and Semantics of Manner Modification: Adjectives and Adverbs. Dissertation, University of Osnabrück.
- Anderson, C. & Morzycki, M. (2015) Degrees as Kinds. *Natural Language and Linguistic Theory* 33-3, 791-821.
- Barwise, Jon (1989) Scenes and other situations. In Jon Barwise: *The Situation in Logic*, CSLI Lecture Notes 17.
- Bayer, Josef (1986) The role of event expression in grammar. *Studies in Language* 10-1, 1-52.
- Behrens, Bergljot & Cathrine Fabricius-Hansen (2002) Connectives in contrast: A discourse semantic study of Elaboration based on corpus research. In Hilde Hasselgård, Stig Johansson, Bergljot Behrens, Cathrine Fabricius-Hansen (eds.) *Information structure in a Cross-Linguistic perspective*. Rodopi, Amsterdam/new York, 45-61.
- Bonomi, Andrea (1997) The Progressive and the Structure of Events. *Journal of Semantics* 14: 173-205.
- Caponigro, Ivano 2004. The Semantic Contribution of WH-Words and Type Shifts: Evidence from Free Relatives Crosslinguistically, in R. B. Young (ed.), *Proceedings of SALT XIV*. CLC Publications, Cornell University, Ithaca.
- Carlson, G. (2003). Interpretive Asymmetries in Major Phrases. In A-M. DiSciullo (ed.) *Asymmetry in Linguistic Theory*. Benjamins. 299-311.
- Clement, Danielle (1971) Satzeinbettungen nach Verben der Sinneswahrnehmung. In D. Wunderlich (ed.) *Probleme und Fortschritte der Transformationsgrammatik*, München, Hueber, 245-265.
- Cooper, Robin (in prep) Type theory and language. From perception to linguistic communication.
- Demirdache, Hamida & Myriam Uribe-Etxebarria (2004) The Syntax of Time Adverbs. In J. Lecarme, J. Gueron (eds.) *The Syntax of Time*. MIT Press
- Deo, Ashwini (in press) Imperfectivity. commissioned article for Matthewson, L., C. Meier, H. Rullmann and T. E. Zimmermann (eds.) *Companion to Semantics*, New York: Wiley Blackwell.
- Dowty, D. (1979), *Word Meaning and Montague Grammar*, Reidel, Dordrecht.
- Duden Grammatik (2006). Dudenverlag Mannheim
- Falkenberg, Gabriel (1989) Einige Bemerkungen zu perzeptiven Verben. In G. Falkenberg (ed.), *Wissen, Wahrnehmen, Glauben*. Niemeyer, Tübingen, 27-45.
- Fiorin, Gaetano & Denis Delfitto (2017) A Perspective-Based Account of the Imperfective Paradox. In J. Blochowiak, C. Grisot, S. Durrleman, C. Laenzlinger (eds.) *Formal Models in the Study of Language*, Springer.
- Frey, Werner (2003) Syntactic conditions on adjunct classes. In Ewald Lang, Claudia Maienborn & Cathrine Fabricius-Hansen (eds.) *Modifying Adjuncts*. Berlin: Mouton de Gruyter, 163-209.
- Gärdenfors, Peter (2000) *Conceptual Spaces*. Cambridge MA: MIT Press.

- Gust, H. & C. Umbach (2015) Making use of similarity in referential semantics. In Christiansen, Stojanovic, Papadopoulos (eds.) *Proceedings of Context 2015*, LNCS Springer.
- Hinterwimmer, Stefan (2013) Free Relatives as Kind-Denoting Terms. In C. Beyssade, F. Del Prete and A. Mari (eds.) *Genericity*, Oxford: Oxford University Press, 140-156.
- Huddleston, Rodney & Geoffrey Pullum (2002) *The Cambridge Grammar of the English Language*. Cambridge University Press.
- Jaworski, W. (2009). The logic of how-questions. *Synthese*, 166, 133–155.
- Karttunen, Lauri 1977. Syntax and semantics of questions. *Linguistics & Philosophy* 1, 3–44.
- Kearns, K. (2003). Durative achievements and individual-level predicates on events. *Linguistics and Philosophy*, 26, 595–635.
- König, E. & C. Umbach (2018) Demonstratives of Manner, of Quality and of Degree: A Neglected Subclass. In M. Coniglio, E. Schlachter & T. Veenstra (eds.). *Demonstratives: syntax, semantics and typology*. Berlin, de Gruyter Mouton.
- Kratschmer, Regina Alexandra (2013) The winner takes it all. The interplay of evidentiality, factivity and event type: The German conjunction *wie* 'how' following verbs of perception. *Sprache und Sprachen* 45, 32-54.
- Landman, Fred (1992) The Progressive. *Natural Language Semantics* 1, 1-32.
- Landman, M. & M. Morzycki (2003) Event-Kinds and the Representation of Manner. In N. M. Antrim, G. Goodall, M. Schulte-Nafeh, V. Samiiian (eds.) *Proceedings of the Western Conference in Linguistics (WECOL) 2002*, vol. 11. California State University, Fresno.
- Legate, Julie Anne (2010) On how *how* is used instead of *that*. *Natural Language & Linguist Theory* 28: 121–134.
- Lewis, David (1973). *Counterfactuals*. Oxford: Blackwell Publishers and Cambridge, MA: Harvard University Press.
- Maienborn, Claudia (2003). Event-internal adverbials: Semantic underspecification and conceptual interpretation. In: E. Lang, C. Maienborn & C. Fabricius-Hansen (eds.). *Modifying Adjuncts*. Berlin: de Gruyter, 475–509.
- Martin-Löf, Per (1984) *Intuitionistic Type Theory*, Bibliopolis, Naples
- Moltmann, Friederike (2007) Events, Tropes and Truthmaking. *Philosophical Studies* 134, 363-403.
- Mieskes, Sarah; Pracejus, Natasha; Nasir, Hibatulnaseer (2007) 'Wie'-Komplemente. Termpaper seminar "Reference to Facts & Events". University of Osnabrück, summer semester 2007.
- Nye, Rachel (2013) *How complement clauses distribute: complementiser-'how' and the case against clause-type*. Dissertation, Universiteit Gent.
- Piñón, Christopher (2008) From properties to manners: a historical line of thought about manner adverbs. *Studies van de Belgische Kring voor Linguïstiek – Travaux du Cercle Belge de Linguistique – Papers of the Linguistic Society of Belgium*, volume 3.
- Portner P (1998) The progressive in modal semantics. *Language* 74:760 -787
- Rothstein, Susan (2004) *Structuring Events: a study in the semantics of lexical aspect*. Blackwell.
- Sæbø, K. J. (2008). The structure of criterion predicates. In J. Dölling, T. Heyde-Zybatow, & M. Schäfer (eds.) *Event structures in linguistic form and interpretation*. Berlin: Mouton de Gruyter, 127–147.
- Sæbø, K.J. (2016) "How" questions and the manner–method distinction. *Synthese* 193(10), 3169–3194.
- Schäfer, Martin (2013). *Positions and interpretations. German adverbial adjectives at the syntax-semantics interface*. Berlin: De Gruyter Mouton.
- Siekman, Jörg (1990) Unification Theory. In C. Kirchner (ed.) *Unification*. Academic Press.
- Tonne, Igebjorg (2006) Elucidating Progressives in Norwegian. In Torgrim Solstad, Atle Gronn, Dag Haug (eds.) *A Festschrift for Kjell Johan Sæbo*. Oslo.
- Tversky, Amos (1977) Features of similarity. *Psychological Review* 84:327–352.

- Umbach, Carla (2016) The meaning of German *wie* in equative comparison. Project description of the DFG project 'Similarity II', UM 100 / 1-3 (see www.carla-umbach.de)
- Umbach, Carla & Helmar Gust. 2014. Similarity Demonstratives. *Lingua* 149, 74-93
- Umbach, Carla & Helmar Gust (in press) Grading Similarity.
- Umbach, Carla & Britta Stolterfoht (in prep.) Ad-hoc kind formation by similarity.
- Vater, Heinz (1975) *Wie*-Sätze. In K. Braunmüller & W. Kürschner (eds.) *Grammatik. Akten des 10. Linguistischen Kolloquiums 2*, Tübingen, 209-222.
- Varasdi, K. (2017) Worlds, Events, and Inertia. *Journal of Logic, Language and Information*, 26(3), 303–332. <https://doi.org/10.1007/S10849-017-9253-3>
- Zifonun, G., L. Hoffmann & B. Strecker (1997) *Grammatik der deutschen Sprache*. De Gruyter, Berlin.