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54. Adverbs and adverbials

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Abstract

The article offers an overview of the heterogeneous set of lexical and semantic classes and subclasses of adverbs and adverbials with their characteristic inferential and distributional properties. Furthermore, it sketches major theoretical approaches that have been developed to account for adverbial semantics and introduces some current issues of debate concerning the proper combination of lexical, compositional, and conceptual semantics for adverbials.

1. Introduction: Towards a definition of adverbs and adverbials

Adverbs and adverbials are highly adaptive expressions. They arise in a variety of environments from which they take on certain characteristic features. This makes them a very

flexible means of natural language expression. Their semantics raises some intriguing puzzles for linguistic theory that have attracted much interest in current semantic research as documented, e.g., by the collections in Lang, Maienborn & Fabricius-Hansen (2003), Austin, Engelberg & Rauh (2004) or McNally & Kennedy (2008). The aim of this article is to provide an overview outlining the major semantic issues involving adverbs and adverbials and sketching some major theoretical approaches that have been developed to account for adverbial semantics, as well as current issues of debate.

The article is organized as follows: The introductory section provides a characterization of adverbs and adverbials that will serve as working base for the remainder of this article. Section 2 lays out a classification of adverbials based on semantic criteria and includes some remarks on the delineation of adverbials and secondary predicates. Section 3 discusses the syntax/semantics interface addressing the relationship between the position of adverbials and their interpretation. Section 4 presents three major formal semantic approaches that have been developed for adverbials: the operator approach most prominently advocated by Thomason & Stalnaker (1973), McConnell-Ginet's (1982) argument approach, and the nowadays widely assumed Davidsonian predicate approach. On this basis, section 5 discusses some challenges concerning the compositional semantics and the underlying ontology of adverbials that current theories address. The article ends with a short conclusion in section 6.

Clear-cut definitions of adverbs and adverbials are difficult to formulate. Since we define the word class *adverb* on the basis of the syntactic function *adverbial*, we will start with the latter. Not all aspects mentioned in this definition hold for all adverbials, but it covers most types of adverbials unambiguously treated as such in the literature.

1.1. Adverbials

The term “adverbial” refers to a specific syntactic function within a sentence and therefore contrasts with other syntactic functions, such as subject, object, and predicate. Adverbials are traditionally conceived of as being those elements that serve to specify further the circumstances of the verbal or sentential referent. They are restricted to a set of semantically limited usages, prototypically specifying time, place, or manner, cf. the italicized strings in (1).

- (1) a. Paul laughed *the whole day*.
 b. The children played *in the kindergarten*.
 c. Henriette dances *beautifully*.

The adverbials in (1) pass standard constituency tests: They can be elicited by questions, can be replaced by pronouns, and are movable. The type of *wh*-word used for elicitation varies with the semantics of the adverbial. Temporal adverbials like *the whole day* in (1) answer the question *When/For how long ... ?*, depending on whether they specify the time or length of the laughing. The prepositional phrase *in the kindergarten* in (1) is a locative adverbial, answering the question *Where ... ?* Finally, *beautifully* in (1) is a manner adverbial, answering the question *How ... ?*

As the sample sentences in (1) already show, the function of adverbials may be realized by different kinds of phrasal units, here noun/determiner phrases, prepositional phrases and adverb phrases. Other phrasal units frequently functioning as adverbials are

adjective phrases and clauses; for an overview cf. van der Auwera (1998), cf. also article 55 (Sæbø) *Adverbial clauses*.

The prototypical adverbial is optional and corresponds syntactically to an adjunct, acting semantically as a modifier. Examples for subcategorized adverbials are given in (2).

- (2) a. Norah treated James *(badly).
 b. John behaved *(admirably).
 c. New York lies *(on the Hudson river bank).

The sentences in (2) require the presence of the adverbials –note, though, that *John behaved* is acceptable due to a conventionalized reading of bare *behave* as *behave well* –, contrasting with verbs like *to dress* in (3), which is acceptable without an adverbial when pragmatically licensed as in (3b); cf. Ernst (1984) and Goldberg & Ackerman (2001).

- (3) a. Norah dresses #(stylishly).
 b. Norah dresses, but the natives prefer to go naked.

1.2. Adverbs

The term “adverb” refers to a specific word class or lexical category and therefore contrasts with other word classes, such as nouns, adjectives, verbs, or prepositions.

On the one hand, both adverbs and prepositions are uninflected, with adverbs differing from prepositions in having phrasal status. Reductionist approaches have therefore proposed to analyze at least some adverbs as intransitive, i.e. objectless, prepositions; e.g. Jackendoff (1972), Wunderlich (1984). While this might be a viable option for some adverb candidates such as *up*, *down*, *away*, there is some consensus that such reductionist attempts are only feasible within certain limits suggesting that a lexical category of adverbs is needed after all; cf. the discussion in Delfitto (2000: 16ff).

On the other hand, adverbs differ from nouns, adjectives, and verbs in that they often do not possess clear markers for category membership and can only be defined via their syntactic function of being prototypically used as adverbials. In English, both cases exist: There is a large class of deadjectival *-ly* adverbs that can be identified through their morphology as adverbs. On the other hand, words like *well* are identified as adverbs because they can only have an adverbial function.

For English, any further attempt to give a positive definition of the word class “adverb” is wrought with difficulties. First of all, a subclass of English adverbs (and adverbs in other Germanic languages) can, besides serving as standard adverbials, be used to modify adjectives or other adverbs, cf., e.g., *extremely* in (4).

- (4) a. He drives extremely/too/very fast.
 b. an extremely/very awkward situation

This kind of usage is not restricted to traditional degree adverbs like *extremely*, *too*, and *very*. A fairly large class of adverbs can be used as modifiers of adjectives, cf. (5).

- (5) Joe is provocatively/disappointingly/grotesquely/remarkably stupid.

Notice that these adverbs are not parallel to the degree adverbs in (4). See Morzycki (2008) for a detailed discussion of this point; Rawlins (2008) discusses the pre-adjectival use of *illegally*.

A second difficulty concerns items like *tonight*, *tomorrow*, *yesterday* which are usually considered prototypical English adverbs. These items, besides being used adverbially, can also serve as subjects; cf. (6).

- (6) a. *Yesterday* was a beautiful day. [Adv as subject]
 b. Peter worked in his office *yesterday*. [Adv as adverbial]

This data is problematic insofar as we argued above that the adverbial function is the basis for the category “adverb”. If we continue to classify items like *yesterday* as adverbs, we have to accept that some adverbs can serve both as adverbials and as subjects. An elegant solution to this problem is given in Huddleston & Pullum (2002: 564ff), who analyze *yesterday* and similar items as pronouns. This analysis explains their distributional pattern, which they share with standard noun phrases, cf. (7).

- (7) a. *The whole year* was a study in failure and disillusion. [NP as subject]
 b. Peter worked in his office *the whole year*. [NP as adverbial]

A further characteristic of adverbs in English and German is the fact that they cannot occur as prenominal attributive modifiers of nouns, cf. (8) for English.

- (8) a. *the well runner
 b. *the extremely conditions

Adverbs are often classified according to their lexical semantics, cf. e.g. (9):

- (9) a. now, tomorrow, afterwards [temporal adverbs]
 b. here, elsewhere, inside [locative adverbs]
 c. often, seldom, frequently [frequency adverbs]

Finally, it should be noted that, cross-linguistically, the word class adverb is not frequent; cf. Sasse (1993).

2. Semantic classification of adverbials

Common classifications of adverbials are based on either semantic or syntactic criteria, or both. Here, we will give a classification based on semantic criteria alone and discuss the interaction of adverbial subclasses with syntax in section 3. Adverbials may be subdivided into three major groups: *predicational adverbials*, *participant-oriented adverbials*, and *functional adverbials* (these terms are adapted from Ernst 2002), which may be roughly characterized as following: Predicational adverbials assign a (gradable) property to the verbal or sentential referent they combine with. Participant-oriented adverbials introduce a new entity that takes part in the eventuality described by the verb. “Functional adverbials” is the cover term for the remaining adverbials, including

quantificational and discourse-related adverbials. Before embarking on a more detailed discussion of these semantic subclasses, we will briefly introduce the semantic notions of opacity and veridicality, which will turn out to be crucial devices in classifying adverbials.

Opacity

In extensional systems of logic, it is usually assumed that Leibniz' Law holds: Two co-referential expressions can be freely substituted for one another without changing the truth value of the original expression. Expressions for which this law does not hold are *oblique* or *referentially opaque*. As (10) shows, adverbials can give rise to opaque contexts:

- (10) a. Necessarily, Sam Peckinpah is Sam Peckinpah.
 b. Necessarily, Sam Peckinpah is the director of The Wild Bunch.

While (10a) is analytically true (in most systems of logic), (10b) is false. Adverbials can be characterized as to whether they create opaque contexts for all positions in a sentence, for just specific positions, or for no positions at all.

Veridicality

An adverbial is *veridical* (or *factive*), if a sentence containing the adverbial entails the sentence without the adverbial. It is *nonveridical*, if there is no such entailment. Some adverbials, e.g. functional adverbials like *never*, are *antiveridical*, that is, they entail that the sentence without the adverbial is not true; cf. Giannakidou (1999) and also Bonami, Godard & Kampers-Manhe (2004).

2.1. Predicational adverbials

Predicational adverbials can typically be characterized as supplying a gradable property on the verbal or sentential base. (By restricting predicational adverbials to those expressing gradable properties we exclude, e.g., form adjectives like *rectangular*, which do not appear in adverbial function.) In Germanic languages, predicational adverbials are typically realized by deadjectival adverbs. They appear in a wide variety of adverbial usages. Typically, a single predicational can have at least two different usages, the exact usage depending on its lexical semantics; cf. Ernst (1984, 2002). One example is given in (11).

- (11) a. Rudely, Claire greeted the queen.
 b. Claire greeted the queen rudely.

In (11a) it is judged as rude that Claire greeted the queen, regardless of how she greeted her; *rudely* serves as a subject-oriented adverbial here. In (11b), in contrast, what is qualified as rude is not the very fact of greeting the queen, but the specific way in which Claire greeted her; here *rudely* serves as a manner adverbial.

The most basic division in providing a further semantic subclassification for predicational adverbials is that between *sentence adverbials* and *verb-related adverbials* (sometimes also termed “higher” and “lower” adverbials). Sentence adverbials have

a hierarchically high attachment site; they stand in a relation to or combine with the overall proposition expressed by the rest of the sentence without the adverbial (= the sentential base). Verb-related adverbials have a lower attachment site within the VP and are more closely connected to the verbal referent.

Some sort of distinction between sentence adverbials vs. verb-related adverbials along the lines sketched above can be found in almost any semantic classification of adverbials, although details and further subdivisions may differ to some extent. The subdivision developed in the following draws on previous classifications, especially by Bartsch (1972/1976), Jackendoff (1972), Bellert (1977), Ernst (1984, 2002), and Parsons (1990). Each subclass will first be introduced on intuitive grounds and, if available, by some characteristic paraphrases that are indicative of their underlying semantics. Afterwards, each subclass will be characterized in terms of opacity, veridicality and further semantic and inferential properties. (For a critical discussion of paraphrases, cf. e.g. Jackendoff (1972: 52) and Ernst (1984), for a very elaborate system of paraphrases, cf. Bartsch (1972).)

2.1.1. Sentence adverbials

Sentence adverbials can be further subdivided into subject-oriented adverbials, speaker-oriented adverbials and domain adverbials.

Subject-oriented adverbials

The term goes back to Jackendoff's (1972) "subject-oriented adverbs". Subject-oriented adverbials assign a specific property to the agent, based on the action as described by the proposition expressed by the sentential base, cf. (12).

(12) Peter arrogantly/idiotically put his love letters on the net.

In (12), the speaker judges Peter to be arrogant/idiotic, basing his judgement on Peter's action of putting his love letters on the net. Sentences containing subject-oriented adverbials allow paraphrases analogous to the one given in (13) for sentence (12).

(13) It was arrogant/idiotic of Peter to put his love letters on the net.

Subject-oriented adverbials are veridical and they have scope over negation: (14a) entails (14b).

- (14) a. Peter arrogantly did not answer my phone call.
 b. Peter did not answer my phone call.

Finally, subject-oriented adverbials appear to be anomalous in questions, cf. (15).

(15) ?Did Peter arrogantly not answer my phone call?

Bellert (1977) relates this behavior to the general observation that we cannot ask a question and assert a proposition in one and the same sentence. As Wyner (1994: 28ff) and Geuder (2000: 165ff) point out, subject-oriented adverbials do not create opaque contexts.

Speaker-oriented adverbials

Speaker-oriented adverbials provide a commentary by the speaker on the proposition expressed by the sentential base. They allow further subdivision into *speech-act adverbials*, *epistemic adverbials*, and *evaluative adverbials*.

Speech-act adverbials characterize the speaker's attitude towards the content (16a) or the form (16b) of what s/he is saying; cf. Mittwoch (1977).

- (16) a. Honestly/frankly, I have no idea what you're talking about.
 b. Briefly/roughly, Peter did not manage to convince her.

In declaratives, speech-act adverbials allow the addition of the participle *speaking* without change in meaning, i.e. *Honestly speaking*, ... Furthermore, they can appear in explicit performative utterances, e.g. *I sincerely apologize*.

Epistemic adverbials express the speaker's expectation with regard to the truth of the sentential base; cf. (17a). They can be paraphrased according to the pattern given in (17b). (Note that *maybe* is special in that it is not gradable, but shares the general characteristics of the other predicational used here.)

- (17) a. Maybe/probably/surely Mary is still alive.
 b. It is maybe/probably/surely true that Mary is still alive.

Epistemic adverbials are often referred to as "epistemic modals", contrasting with alethic and deontic modals; cf., e.g., Parsons (1990: 62f) on epistemic vs. alethic modals and Bonami, Godard & Kampers-Manhe (2004) on epistemic vs. alethic and deontic interpretations of modals. An example for an alethic modal is the usage of *necessarily* in, e.g., *Two and two is necessarily four*; deontic modals refer to rule or law based knowledge as, e.g., *In the USA, the president is necessarily the commander in chief*; cf. article 58 (Hacquard) *Modality*. Epistemic adverbials cannot be directly negated (18a) nor do they have negative counterparts (18b), and they are nonveridical (18c).

- (18) a. *Matthew is not probably dead.
 b. *Matthew is improbably dead.
 c. Matthew is probably dead. \nrightarrow Matthew is dead.

All three types of modals create opaque contexts for both subject and complement positions, cf. the pattern for *necessarily* in (19) and (20).

- (19) a. Necessarily, nine is an odd number.
 b. The number of planets is nine.
 c. \nrightarrow Necessarily, the number of planets is an odd number.

- (20) a. Necessarily, nine is an odd number.
 b. Nine is a lucky number.
 c. \nrightarrow Necessarily, nine is a lucky number.

Evaluative adverbials express the opinion of the speaker with regard to the state of affairs expressed by the rest of the sentence, cf. (21).

(21) Fortunately/surprisingly, Peter is back in Australia.

Paraphrases for evaluative adverbials follow the pattern of (23) for sentence (22).

(22) Fortunately/unfortunately, Peter is back in Australia.

(23) It is fortunate/unfortunate that Peter is back in Australia.

As the above example illustrates, evaluatives often come with negative counterparts, although they usually cannot be negated analytically, cf. (24).

- (24) a. Peter is fortunately back in Australia.
 b. *Peter is not fortunately back in Australia.

They are veridical, and usually they cannot occur in hypothetical contexts, cf. (25). (See Bellert (1977: 344f) for an explanation of why these two properties cooccur.)

(25) If firemen had (*unfortunately) not been available, my grandpa would maybe/
 *fortunately have extinguished the fire himself.

Evaluatives are also anomalous in questions, cf. (26).

(26) *Is Peter fortunately back in Australia?

Because of the last two features, evaluative adverbials have recently been linked to positive polarity items; cf. Nilsen (2004) and Ernst (2007, 2009). With regard to opaque contexts, evaluatives behave similarly to subject-oriented adverbials, cf. Bonami, Godard & Kampers-Manhe (2004).

Domain adverbials

Domain adverbials restrict the domain in which the proposition expressed by the rest of the sentence is claimed to hold true; cf. Bellert (1977), McConnell-Ginet (1982), Bartsch (1987), Ernst (2004).

- (27) a. Emotionally Zardock is cold as ice.
 b. Politically he is as good as dead.
 c. Botanically, a tomato is a fruit.

Thus, (27a) says that the proposition expressed by *Zardock is cold as ice* is true when the viewpoint on this proposition is restricted to the domain of emotions, but remains neutral wrt. Zardock's body temperature.

Domain adverbials do not appear to be veridical, cf. the pattern in (28).

- (28) Deixis-wise, this sentence is intriguing.
 → This sentence is intriguing.

The entailment failure in (28) is of a different nature than that with epistemic adverbials, though. When dropping the domain adverbial, the sentence will still be evaluated from a certain viewpoint. In this case the domain will be restricted to some default or contextually salient value. That is, domain adverbials support an inferential pattern along the lines of (28'). It is only because we cannot be sure that omitting the domain adverbial will keep the implicitly involved domain constant that the inferential pattern in (28) does not go through.

- (28') Deixis-wise, this sentence is intriguing.
 → Wrt. some domain, this sentence is intriguing.

2.1.2. Verb-related adverbials

Verb-related adverbials have a lower attachment site within the VP and are more closely connected to the verbal referent. Usually, at least mental-attitude adverbials, manner adverbials, and degree adverbials are distinguished.

Mental-attitude adverbials

Mental-attitude adverbials describe the attitude of the agent with regard to the activity described by the verbal predicate, cf. (29).

- (29) Claire reluctantly/gladly went to school.

The adverbial *reluctantly* in (29) does not primarily describe the manner of going to school, but Claire's attitude towards going to school. It is only secondarily that this attitude might also have an impact on Claire's manner of going to school. Mental-attitude adverbials can take scope over sentence negation, cf. (30).

- (30) Martha gladly did not go to school.

However, in this case the agent does not have a certain attitude wrt. a negated proposition but wrt. the *omission* of a certain action, which is in turn an action. For instance, in (30) Martha is glad about staying at home.

The mental-attitude adverbials in the above examples do not create opaque contexts. This is not a general property of mental-attitude adverbials, though. The mental-attitude adverbial *intentionally*, for example, creates opaque contexts for the complement position but not for the subject position; cf. (31), a classic example from Thomason & Stalnaker (1973).

- (31) Oedipus intentionally married Jocasta.
 a. Oedipus is the son of Laius. → The son of Laius intentionally married Jocasta.
 b. Jocasta is Oedipus' mother. ↗ Oedipus intentionally married his mother.

Bonami, Godard & Kampers-Manhe (2004) label *intentionally* and similar items, like *by chance*, "adverbs of attitude towards a state of affairs".

Manner adverbials

Manner adverbials are used to specify the manner in which an eventuality or an action unfolds; prototypical examples are given in (32).

(32) Klogman defended himself skillfully/intelligently/hectically.

Manner adverbials cannot take scope over sentence negation, cf. (33).

(33) Frankie does not run fast. \neq Frankie does not run and he does so fast.

There is a straightforward semantic explanation for this behavior: Sentence negation tells us that there is no eventuality of V-ing. Consequently there is no target available for a potential manner modifier. Apparent counterexamples such as (34) are based on event coercion. They require the interpolation of an event that can be plausibly associated with the negated proposition; cf. articles 25 (de Swart) *Mismatches and coercion* and 34 (Maienborn) *Event semantics*.

(34) Klogman skillfully didn't answer the question.

On a manner reading of *skillfully* in (34), what is skillful is some activity of Klogman which allows him to uphold the state of not-answering the question, that is, he skillfully dodged the question; cf. (Schäfer 2005: 161).

We will return to a more detailed discussion of manner adverbials in section 5.2.

Degree adverbials

Degree adverbials indicate the extent or intensity to which somebody does something; cf. (35).

(35) Lochnan loves her very much/deeply.

Similarly to manner adverbials, degree adverbials cannot take scope over sentence negation:

(36) Frankie does not love her very much. \neq Frankie does not love her and he does so very much.

Besides these three major subtypes there are further instances of verb-related adverbials with a low attachment site such as the verb-related counterparts of domain adverbials, the so-called *method-oriented adverbials* (cf. Schäfer 2005), which describe certain means or methods of doing something, cf. (37).

- (37) a. United States destroyed Switzerland economically.
 b. The scientist classified the plants genetically.
 c. They analyzed the data linguistically.

Some verb-related predicational adverbials may deviate from the standard behavior of predicational in non-trivial ways. Thus, *halfway* in (38) is neither veridical nor gradable.

(38) The door is halfway closed. \nrightarrow The door is closed.

2.2. Participant-oriented adverbials

Participant-oriented adverbials—or *circumstantials*, as they are also called—are predominantly realized through prepositional phrases. They introduce a new participant that takes part in the eventuality described by the verb. On a Neo-Davidsonian view, they are linked to the verb's eventuality argument through a thematic role just like standard agent or patient arguments; cf. articles 18 (Davis) *Thematic roles* and 34 (Maienborn) *Event semantics*. Sentence (39a), e.g., has two participant-oriented adverbials *in the garage* and *with a knife*, which specify the place and the instrument role of the event. A standard Neo-Davidsonian logical form is given in (39b); cf. section 4.3. for details.

- (39) a. Peter opened the box with a knife in the garage.
 b. $\exists e$ [OPEN (e) & AGENT (e, peter) & PATIENT (e, the box) & LOCATION (e, the garage) & INSTR (e, a knife)]

Just as predicational, participant-oriented adverbials can have different uses. Following the terminology in Maienborn (2001), we distinguish between *event-related adverbials*, which restrict the verb's eventuality argument, and *frame adverbials*, which set a frame for the overall proposition; cf. the different meaning contributions of the locative, temporal, and instrumental phrase in (40) vs. (41):

- (40) a. We met Jürgen Klinsmann in the USA.
 b. The Queen visited Jamestown in 1957.
 c. Siri examined the diamond with a loupe.
- (41) a. In the USA, resigned military officials are not frowned upon.
 b. In 1957, moral integrity still had some value.
 c. With a loupe, small fissures of a diamond become visible.

We will discuss the different uses of participant-related adverbials in more detail in section 5.1.

2.3. Functional adverbials

Ernst's (2002) last class, the so-called "functional adverbials" comprise a rather heterogeneous set of adverbials including adverbial quantifiers as in (42a) as well as discourse-anaphoric adverbials such as (42b).

- (42) a. They often/never/usually carried out his orders.
 b. They therefore/thus/notwithstanding became congenial companions.

We won't discuss these adverbials any further here but refer the reader to articles 43 (Keenan) *Quantifiers* and 76 (Zimmermann) *Discourse particles*.

2.4. Adverbials and secondary predicates

Having laid out a semantic classification for adverbials we want to close this overview with some remarks on the delineation of adverbials on the one hand and resultative and depictive secondary predicates on the other hand; cf. also article 56 (Rothstein) *Secondary predicates*.

Both resultatives and depictives introduce a secondary predicate into the sentence that in a sense “lives on” the primary verbal predicate. This secondary predicate holds of one of the verb’s arguments. That is, unlike verb-related adverbials, secondary predicates do not qualify the verbal referent but one of its arguments. More specifically, depictives, as in (43), express a secondary property of the subject or the object referent that holds at least for the temporal duration of the verbal referent; cf. Rothstein’s (2003) notion of *time-participant-connectedness*.

(43) Peter eats meat nude/raw.

Whenever a psychological adjective, i.e., an adjective denoting a particular state of mind, is used, the distinction between mental-attitude adverbials and subject depictives is blurred, especially in languages which do not use use different morphological forms to differentiate between the adverbial use and the adjectival use as secondary predicate, cf. the German example in (44).

(44) Gudrun ist traurig nach Hause gegangen.
 Gudrun has sad/sadly to home gone
 ‘Gudrun went home sad/sadly.’

Geuder (2000) attempts to tease these different usages apart and contains a detailed discussion of the English data. Himmelmann & Schulze-Berndt (2005) take a wide range of typological data into account, showing that across languages there is considerable variation in how depictives are encoded.

As for resultatives, they introduce a secondary predicate into the sentence that holds true of one of the verb’s arguments as a result of the event expressed by the main predicate; cf. e.g. (45), which expresses that the tulips became flat as a result of the gardener watering them.

(45) The gardener watered the tulips flat.

There is a vast literature on resultatives; cf. the references in article 56 (Rothstein) *Secondary predicates*. One particular topic of interest relating to adverbials are manner-resultative ambiguities such as the one in (46); *elegantly* may have a manner reading as in (46a) as well as a resultative reading as in (46b); cf., e.g., the discussion in Eckardt (1998, 2003), Geuder (2000), Dölling (2003). (Note that the resultative interpretation of (46) involves a so-called “implicit resultative” (Schäfer 2005): Rather than predicating over one of the verb’s overtly expressed arguments the secondary predicate holds for an implicit argument, viz. Judith’s dress.)

(46) Judith dresses elegantly.
 a. The way in which Judith dresses is elegant.
 b. Judith dresses, so that as a result, her dress is elegant.

The manner and the resultative reading in (46) are conceptually easily distinguishable, because there isn't any connection between the way one dresses and the result of dressing. Yet, such a clear-cut distinction between manner and resultative readings is not always possible; cf. the sentences in (47).

- (47) a. Arndt fixed the chair perfectly.
 b. Sarah grows roses marvelously.

The manner of fixing a chair or growing roses can only be qualified as perfect or marvelous if the result is of a comparably high quality and vice versa. If the result of, e.g., Arndt's fixing the chair is perfect, then the way he did it must have been perfect, too. So, manner and resultative readings cannot be completely disentangled in these cases; cf. Quirk et al.'s (1985: 560) notion of *blends*.

2.5. Summary

The following Fig. 54.1 provides an overview of the adverbial subclasses that were introduced in this section.

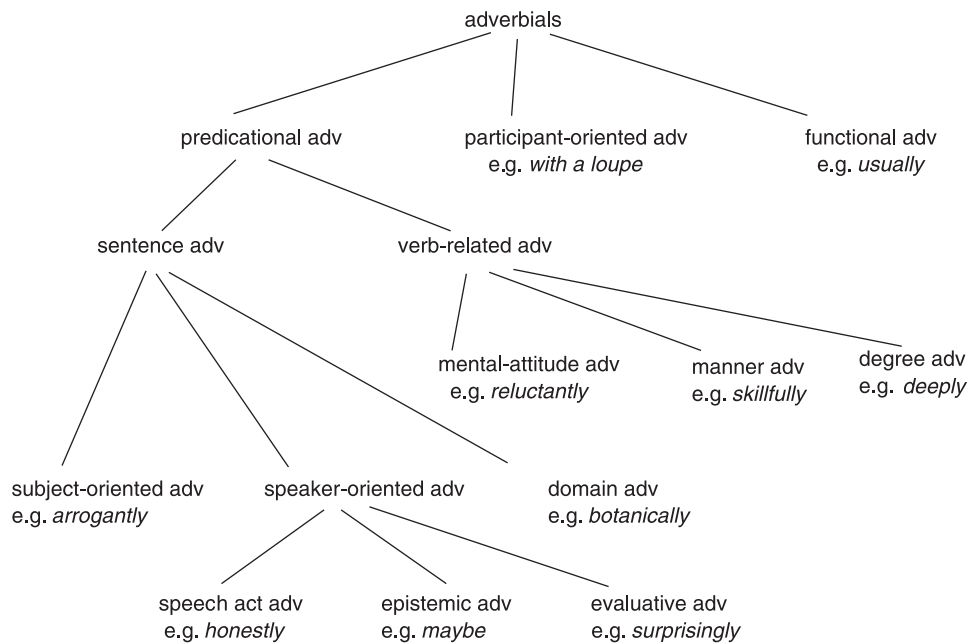


Fig. 54.1: Semantic classification of adverbials

3. Adverbials at the syntax/semantics interface

The semantic interpretation of an adverbial correlates to some degree with its syntactic position. Jackendoff (1972) was the first to discuss this point in some detail; he distinguished three basic positions for adverbials in English: initial position, final position

without an intervening pause, and auxiliary position (i.e. between the subject and the main verb). For illustration, consider English *-ly* adverbs. Some *-ly* adverbs can occur in all three positions. But English also has *-ly* adverbs which can occur only in the initial and aux positions along with *-ly* adverbs that occur only in the aux and final positions; cf. (48).

- (48) a. (Frequently) Horatio has (frequently) lost his mind (frequently).
 b. (Evidently/probably) Horatio (evidently/probably) lost his mind
 *(evidently/probably).
 c. *(Completely/easily) Stanly (completely/easily) ate his wheaties
 (completely/easily).

Jackendoff argues that the different distributional patterns can also be distinguished on semantic grounds, e.g. the adverbials showing the pattern in (48b) are speaker- or subject-oriented, whereas manner adverbials show the pattern in (48c).

In the last decade, the correlation between syntactic position and semantic interpretation of adverbials has received considerable attention. Two main strands of thought can be distinguished: an entirely syntax-driven one (represented by Cinque 1999), and one based on semantic scope (represented by Ernst 1998, 1999, 2002 and Haider 1998, 2000).

Cinque (1999) has made an influential proposal to explain the order of adverb(ial)s in purely syntactic terms, by assuming a universal hierarchy of functional heads that encodes the hierarchy of adverbials. Adverbials are integrated as specifiers, each one having a designated specifier position; cf. Alexiadou (1997) and Laenzlinger (1998) for similar proposals and see also Alexiadou (2004a, b) for a recent overview. (Note that Cinque (1999: 28ff) excludes participant-oriented adverbials—“circumstantials” in his terms—from his adverb hierarchy because he considers them to lack a rigid ordering, suggesting that they should be treated completely separately. Alexiadou (1997) and Laenzlinger (1998) conceive of the universal adverb hierarchy as also including specifier positions for circumstantials.)

Cinque’s purely syntactic account has been criticized by, e.g., Ernst (1998, 1999, 2002) and Haider (1998, 2000) for leading to an unnecessary proliferation of functional heads which duplicate underlying semantically motivated distinctions; see also Shaer (2003). Ernst and Haider argue instead that the ordering restrictions on adverbials have no genuine syntactic sources but can be derived from independent semantic properties. According to this view, the syntax does not specify explicit attachment sites for (non-subcategorized) adverbials but allows them to be adjoined wherever this is not explicitly forbidden. The distribution of adverbials is accounted for by an interface condition mapping syntactic c-command domains onto semantic domains. Haider (1998, 2000) distinguishes three semantic domains: PROPOSITION > EVENT > PROCESS/STATE. Ernst (1998, 2002) assumes a richer hierarchy: SPEECH ACT > FACT > PROPOSITION > EVENT > SPECIFIED EVENT. Once the mapping procedure reaches a higher semantic domain, modifiers that address the lower domain are ruled out.

The difference between the two approaches can be seen when looking at the sentence pair in (49).

- (49) a. Marie probably cleverly found a good solution.
 b. *Marie cleverly probably found a good solution.

On Cinque's account the ordering in (49a) is syntactically well-formed because this reflects the assumed order of the relevant functional heads, whereas (49b) does not. Ernst and Haider, on the other hand, argue that (49a) is fine, because *cleverly* selects for EVENTS first, and *probably*, which requires an object of the higher semantic domain PROPOSITION, is applied afterwards. When *probably* is applied first, as in (49b), the result is of type PROPOSITION, which does not fit with *cleverly* anymore. Thus, on Ernst's and Haider's account (49b) is semantically ill-formed.

While Ernst's and Haider's outline of a semantic explanation of the distributional facts can be considered a promising alternative to Cinque's hard-wired syntactic codification, many of its details remain to be worked out. For instance, as Frey (2003: 201ff) points out, in Haider's approach ordering restrictions are only assumed to hold between adverbials. The placement of adverbials is not expected to be sensitive to the position of arguments. Yet, as Frey (2003) shows, adverbials are not only ordered with respect to each other but also with respect to the arguments of the verb. Furthermore, Frey (2003) argues that on Ernst's and Haider's account adverbials shouldn't be able to move around but only appear in base-generated positions, otherwise they would be uninterpretable. This doesn't fit with the facts either in a scrambling language like German or in English; cf. the discussion in Frey (2003) and see also the argumentation in Maienborn (2001) for different base positions for locative adverbials.

With these observations in mind, Frey (2003) develops a compromise between a rigid syntactic solution and a semantic scope approach by assuming five broader classes of adverbials, each of which is assigned a syntactic base region defined by characteristic structural requirements. Adverbials are freely base generated within the limits of their characteristic region and they are allowed to move. (50) lists Frey's five adverbial classes and their syntactic positioning restrictions wrt. each other and wrt. the verb's arguments in terms of c-command ('>'); cf. Frey (2003: 202f).

(50) *Adverbial classes and base positions according to Frey (2003):*

sentence adverbials > frame and domain adverbials > event-external adverbials (e.g. causals) > highest ranked argument > event-internal adverbials (e.g. locatives, instrumentals) > (internal arguments) > process-related adverbials (e.g. manner) > verb

Frey's proposal has been taken up, further elaborated and/or challenged by numerous authors; cf. e.g. the articles in Lang, Maienborn & Fabricius-Hansen (2003).

A last complication at the syntax/semantics interface that should be mentioned here involves parenthetical adverbials, that is, adverbials that are prosodically marked as standing outside the regular syntactic structure. In English and German, these occurrences of adverbials appear with so-called comma-intonation, reflecting the corresponding use of commata in writing. When adverbials are not integrated into a sentence, they can appear in many more positions than when they are integrated, cf. (51a) vs. (51b).

(51) a. Peter obviously never came back home.

b. (Obviously,) Peter (, obviously,) never came back home (, obviously).

How these parentheticals are treated syntactically is not entirely clear. Their semantic contribution often corresponds to at least one of the regular, integrated, usages, and

there tend to be preferences for a particular use specific to a given parenthetical position; see Bonami, Godard & Kampers-Manhe (2004), Haegeman, Shaer & Frey (2009) for more discussion and Shaer (2003, 2009) for a semantic analysis based on Haegeman's (1991/2009) orphans-approach.

4. Theoretical approaches

The foremost problem in dealing with adverbials in formal semantics is that there is no natural place for them in the standard functor/argument set up. Neither do (non-subcategorized) adverbials behave syntactically or semantically as "passive" arguments, that are required by other categories and assigned to fixed positions, nor are they "active" functors, opening up specific argument requirements and assigning structural positions. We have to accept that standard formal semantics was not invented with adverbials in mind. This makes them a particularly challenging subject for formal semantic accounts.

This section discusses three classical formal semantic treatments of adverbials, all of which propose different ways of accounting for and reconciling the semantics of adverbials with some basic functor/argument account. These are (a) the operator approach most prominently advocated by Thomason & Stalnaker (1973), (b) McConnell-Ginet's (1982) argument approach, and (c) the predicate approach, whose breakthrough came with the spread of Davidsonian event semantics (Davidson 1967). (The order here does not so much reflect the original publication history but rather the order of influence on the linguistic community.)

4.1. The operator approach

The most influential text on adverbials as operators is Thomason & Stalnaker (1973), but cf. also Montague (1970), Clark (1970), Parsons (1972), Cresswell (1973), and Kamp (1975). Within this framework, adverbials are analyzed as endotypical functors. That is, they are functors that, when applied to some argument of a certain logical type, yield a result of the same type. This accounts for the typical iterability of adverbials: Since they do not change the logical type of their environment they may be iterated.

Within this framework, Thomason & Stalnaker (1973) strive to account for the differences between adverbials like *slowly* and *intentionally* on the one hand and *necessarily* on the other hand. They analyze the former as predicate modifiers and the latter as a sentence modifier. One important difference between the two types of modifiers lies in their behavior with regard to opaque contexts. The epistemic adverbial *necessarily* gives rise to opaque contexts everywhere in a sentence, whereas *intentionally* only creates opaque contexts for the object position; see section 2.1.1.

Thomason & Stalnaker (1973) account for this difference by analyzing sentence modifiers as functions from sentence intensions to sentence intensions, that is, *necessarily* is of type $\langle\langle s,t \rangle, \langle s,t \rangle\rangle$, and sentence (52a) can be represented as (52b), where the caret is used to indicate the intension.

- (52) a. Necessarily, nine is odd.
 b. NECESSARILY \wedge [ODD (nine)]

Under this analysis the opaqueness effects are accounted for straightforwardly, because sentence modifiers apply to sentence intensions.

In contrast, predicate modifiers map the intensions of one-place predicates into intensions of one-place predicates. The restriction to one-place predicates means that, in the case of transitive verbs, predicate modifiers are applied after the direct object has combined with the verb, but before the verb combines with the subject, cf. (53).

- (53) a. Oedipus intentionally married Jocasta.
 b. INTENTIONALLY \wedge [λx [MARRY (x, jocasta)]](oedipus)

This account correctly predicts that opacity arises with regard to the object position but not with regard to the subject position. (Note that λ -conversion into an intension is not possible here.) The opacity pattern exhibited by *intentionally* is thus elegantly accounted for. Other adverbs like, e.g., *slowly* are treated in a similar way as *intentionally*, although here we do not find parallel opacity effects, cf. (54).

- (54) a. Renate slowly repaired the broken toy.
 b. Renate is the director of the German Department.
 → The director of the German Department slowly repaired the broken toy.
 c. The broken toy is my puppet. → Renate slowly repaired my puppet.

No theory-internal explanation is available for these patterns. Note, however, that *slowly* cannot operate on predicate extensions, either, because this would lead to yet other unwanted consequences; cf. e.g. McConnell-Ginet (1982: 162f): Given a scenario with co-extensional dancers and singers, that is, all individuals who are singing are also dancing and vice versa, there would be no way of distinguishing, say, the slow dancers from the slow singers (due to Leibniz' Law).

One of the major motivations for the operator approach, besides accounting for the opacity effects, was a proper treatment of scope effects. A classical problem concerning the scope of adverbials is illustrated by the sentence in (55) taken from Parsons (1972).

- (55) John painstakingly wrote illegibly.

Parsons (1972: 131) argues that the correct interpretation of (55) requires that "the illegibility of the writing was at least one of the things John was taking pains to do". That is, *painstakingly* clearly has scope over *illegibly*. In the operator approach, this is predicted, because in the course of forming the complex predicate, the syntactically higher adverbial is applied last, yielding (56).

- (56) PAINSTAKINGLY [ILLEGIBLY \wedge [λx [WRITE (x)]]](john)

The second classical scope problem is discussed by Thomason & Stalnaker (1973) and concerns the different readings available for (56a/b).

- (57) a. Sam carefully sliced all the bagels.
 b. Sam sliced all the bagels carefully.

While the exact reading differences for (57a/b) are somewhat subtle (cf. the discussion in Eckardt 1998: 8f), they become more obvious if *carefully* is replaced, e.g., with *quickly*,

where *quickly sliced all the bagels* is preferably interpreted as meaning that the overall time it took Sam to slice all the bagels was short, while *sliced all the bagels quickly* does not tell us anything about the overall amount of time, but only gives the time span for each individual slicing. Thomason & Stalnaker formalize this difference by having the quantifier within the complex predicate for (57a), but letting it have widest scope for (57b), see the formalizations in (58), where x is taken to range over bagels.

- (58) a. $CAREFULLY \wedge [\lambda y \forall x [SLICE(y, x)]](sam)$
 b. $\forall x [CAREFULLY \wedge [\lambda y SLICE(y, x)]](sam)$

The operator approach is usually also chosen to treat non-intersective adjectives in attributive modification as, e.g., *former* in *the former alcoholic*.

4.2. The argument approach

An alternative to the operator approach is presented in McConnell-Ginet (1982). McConnell-Ginet's article discusses sentence adverbials as well as verb-related adverbials (her *Ad-Verbs*). Here, we will only focus on the latter. As mentioned above, McConnell-Ginet shows that an extensional operator approach will not work for adverbs like *slowly*. Furthermore, she argues that an intensional solution lacks psychological plausibility and therefore isn't adequate, either. Her own account draws on the observation that some manner adverbials are obligatory in a similar way as direct objects; see the discussion of the sample sentences (2) in section 1.1. McConnell-Ginet goes on to argue that verb-related adverbials in general should be treated as arguments of the verb. According to this view, verbs have a latent potential of being further specified wrt. certain dimensions. What adverbials do is activate this potential and fill in a corresponding value. For instance, the verb *to run* has a latent argument slot for speed, which may be activated and filled in by an adverbial such as *quickly*. A simplified representation of (59a) along these lines is given in (59b).

- (59) a. Fritz runs quickly.
 b. $RUN(fritz, quickly)$

In order to derive this representation, McConnell-Ginet introduces the operation of *verb-augmentation*, by which additional argument slots can be made available whenever needed. Treating adverbials as arguments is particularly appealing in the case of non-optional adverbials, e.g. for verbs like *behave* in (60).

- (60) The kids behaved admirably.

McConnell-Ginet's approach distinguishes subcategorized and optional adverbials only by the mode of integration. While subcategorized adverbials already have an argument slot available in the lexical entry of the verb, optional adverbials trigger verb-augmentation. After this operation has taken place, the two types of adverbials are no longer distinguishable. In addition, verb-augmentation does not distinguish different types of Ad-Verbal modifiers. See Landman (2000) and Marten (2002) for further discussions of McConnell-Ginet's original approach and possible extensions.

4.3. The predicate approach

In his seminal paper “The logical form of action sentences” published in 1967 the language philosopher Donald Davidson argues for a new ontological category of events. This proposal has proven to be exceptionally fruitful for linguistics paving the way for simpler and more adequate analyses of a multitude of linguistic phenomena; cf. article 34 (Maienborn) *Event semantics*. Davidson (1967) argues that a sentence such as (61a) does not express a mere relation between Jones and the toast but introduces a hidden event argument, which stands for the proper event of buttering, thus yielding (61b) as a formal representation for (61a).

- (61) a. Jones buttered the toast.
 b. $\exists e$ [BUTTER (jones, the toast, e)]

One of the main motivations of Davidson’s proposal was to provide a straightforward analysis of adverbial modification. If verbs introduce a hidden event argument, then (intersective) adverbial modifiers can be analyzed as simple first order predicates that add information about this event. Thus, Davidson’s famous sentence (62a) receives a formal representation as in (62b), or—adopting the so-called Neo-Davidsonian framework of, e.g. Higginbotham (1985, 2000) and Parsons (1990)—as in (62c).

- (62) a. Jones buttered the toast in the bathroom with the knife at midnight.
 b. $\exists e$ [BUTTER (jones, the toast, e) & IN (e, the bathroom) & INSTR (e, the knife) & AT (e, midnight)]
 c. $\exists e$ [BUTTER (e) & AGENT (e, jones) & PATIENT (e, the toast) & IN (e, the bathroom) & INSTR (e, the knife) & AT (e, midnight)]

While Davidson’s original proposal was confined to participant-oriented adverbials, Parsons (1990) extends the scope of the Davidsonian approach to manner adverbials like *slowly*. Event-based treatments of mental-attitude adverbials are discussed in Eckardt (1998), Wyner (1998), and Geuder (2000).

Davidson’s analysis of adverbials has two major merits. First, it accounts for the typical entailment patterns that characterize (intersective) adverbials directly on the basis of their semantic representation. That is, the entailments in (63a–d) follow from (63) simply by virtue of the logical rule of simplification. (Due to this feature, Davidson’s approach cannot (easily) handle non-veridical adverbials.)

- (63) Jones buttered the toast in the bathroom at midnight.
 a. Jones buttered the toast in the bathroom and Jones buttered the toast at midnight.
 b. Jones buttered the toast in the bathroom.
 c. Jones buttered the toast at midnight.
 d. Jones buttered the toast.

Furthermore, Davidson’s approach does not allow us to infer (63) from (63b) and (63c), since the latter sentences might relate to different events—a feature dubbed *non-entailment* by Katz (2008). Again, this captures the data correctly.

The second major merit of Davidson's account is that it treats adverbial modifiers on a par with adnominal modifiers, thereby acknowledging their fundamental similarities. Both adverbial and standard attributive modifiers provide one-place predicates, the only difference being whether these predicates are applied to a noun's referential argument or to the verbal event argument. More generally speaking, the Davidsonian predicate approach makes a considerable step forward towards a truly compositional semantics for adverbials by teasing apart lexical and combinatorial ingredients of their meaning contribution. The lexical meaning of a manner expression such as *loud* or a locative such as *in the garden* simply denotes a certain property as in (64), irrespective of whether these expressions happen to be used as adnominal (65) or adverbial (66) modifiers (or as subcategorized arguments or main predicates together with the copula); cf., e.g., Bierwisch (1988), Wunderlich (1991), Maienborn (2001). (But see section 5.2. for some qualifications concerning an adequate representation for manner expressions.)

- (64) a. *loud*: λx [LOUD (x)]
 b. *in the garden*: λx [IN (x, the garden)]
- (65) a. *loud girl*: λy [GIRL (y) & LOUD (y)]
 b. *girl in the garden*: λy [GIRL (y) & IN (y, the garden)]
- (66) a. *sing loudly*: λe [SING (e) & LOUD (e)]
 b. *sing in the garden*: λe [SING (e) & IN (e, the garden)]

Given their common lexical roots it comes as no surprise that adverbials such as *fast* and *slowly* in (67) display the same kind of context-dependency as their adjectival counterparts, requiring the inclusion of comparison classes; cf., e.g., the degree-based analyses of these adjectives in Bierwisch (1989) and Kennedy (2007).

- (67) Compared to other swimmers, Sarah crossed the channel fast, but compared to Hovercrafts, she crossed it slowly.

In summing up we should note that the three classical accounts of the semantics of adverbials were originally proposed as alternatives to each other, although they differ considerably in scope. For instance, a Davidsonian predicate approach is not particularly well-suited for adverbials that create opaque contexts, whereas McConnell-Ginet's (1982) argument approach seems especially attractive for subcategorized adverbials. Moreover, there is no principled incompatibility between using events on the one hand and analyzing at least some adverbials as operators on predicates; cf. Eckardt (1998: 12f). Given the wide acceptance of events and their multifaceted use in present-day semantic theory, current accounts of adverbial semantics mostly rely on the use of events as formal semantic objects in some way or another. On this basis more sophisticated and differentiated analyses of adverbial classes are being developed that strive to account, e.g., for the particular behavior of adverbials wrt. information structure (see especially Eckardt 2003 on this point) as well as to deal with the further challenges that adverbials still pose. Two of them concerning compositionality and ontological issues will be discussed in the next section.

5. Challenges to compositionality and ontology

5.1. Uncovering the compositional machinery

In the previous section we pointed out that a Davidsonian predicate approach to adverbials makes a considerable step forward in separating the lexical and the combinatorial meaning components that interact in yielding the characteristic semantics of adverbials. (68) repeated from (64b) above specifies the lexical meaning of a locative adverbial for illustration. The standard combinatorics may be spelled out by a modification template MOD as in (69). MOD takes a modifier and an expression to be modified and yields a conjunction of predicates thus accounting for the fundamental insight of the Davidsonian predicate approach; cf. also Heim & Kratzer (1998) for an alternative solution.

(68) *in the garden*: λx [IN (x, the garden)]

(69) MOD: $\lambda Q \lambda P \lambda x$ [P(x) & Q(x)]

Leaving details aside, the application of MOD to an adverbial and a verbal eventuality predicate will guarantee that the adverbial is predicated of the verb's event argument as in (70).

(70) *sing in the garden*: λe [SING (e) & IN (e, the garden)]

This gives us the desired result—at least for the standard conception of intersective adverbials. Unfortunately, matters turn out to be more intricate upon closer inspection. Using locatives as a test case, Maienborn (1996, 2001, 2003) shows that, in addition to supplying a holistic predicate of the verb's event argument, circumstantial adverbials may take various further interpretations. More specifically, Maienborn distinguishes three different usages of locative adverbials: as *frame adverbial*, as *event-external adverbial*, or as *event-internal adverbial*; cf. (71a–c), respectively. Only the event-external variant in (71b) follows the standard MOD pattern in (69) whereas the frame and the event-internal variants appear to behave differently. Since it would be both implausible and theoretically unattractive to trace these meaning differences back to a lexical ambiguity of the respective locatives, they must emerge somehow in the course of composition.

- (71) a. In Argentina, Maradona is still very popular.
 b. Maradona signed the contract in Argentina.
 c. Maradona signed the contract on the last page.

The first noticeable difference is that frame adverbials (which we already mentioned in section 2.2, see the discussion of (40)–(41)) pattern with domain adverbials in being non-veridical. Frame adverbials are not part of what is properly asserted but restrict the speaker's claim. Therefore, their omission does not preserve truth if the domain restrictions expressed through the frame adverbial do not pattern with the default domain restrictions; cf. the discussion of (28) in section 2.1.1. By contrast, both event-external and event-internal locatives are veridical:

- (72) a. In Argentina, Maradona is still very popular.
 ↔ Maradona is still very popular.
 b. Maradona signed the contract in Argentina.
 → Maradona signed the contract.
 c. Maradona signed the contract on the last page.
 → Maradona signed the contract.

Secondly, frame and event-internal adverbials differ from event-external adverbials in being semantically underspecified in crucial respects. A frame adverbial such as (73) may receive several interpretations along the dimensions spelled out, e.g., in (73a–c).

- (73) In Italy, Maradona was married.
 a. When he was in Italy, Maradona was married.
 b. According to the laws in Italy, Maradona was married.
 c. According to the belief of the people in Italy, Maradona was married.

That is, one can only say that frame adverbials restrict the speaker's claim, but which dimension exactly is being restricted is left semantically underspecified. Basically the same holds true for event-internal adverbials. Their common semantic contribution consists in specifying some internal aspect of the verb's event argument, whose exact role is left semantically implicit and can only be determined when taking into account conceptual knowledge about the respective event type. Take, e.g., (71c): The locative (in its preferred, event-internal, reading) does not express a location for the overall event of Maradona signing the contract—this would be the event-external reading—but only for one of its parts, viz. Maradona's signature (which, by the way, isn't referred to overtly in the sentence).

A particularly puzzling feature of frame and event-internal locatives that is related to their semantic indeterminacy is that they may take on non-locative interpretations. More specifically, frame adverbials may have a temporal reading (cf. the paraphrase (73a)), whereas event-internal adverbials tend to allow additional instrumental or manner readings; cf. (74).

- (74) a. The cook prepared the chicken in a Marihuana sauce.
 b. The bank robbers escaped on bicycles.
 c. Paul is standing on his head.

The adverbial in (74a) specifies a particular mode of preparing the food. Thus, it makes some sort of manner contribution. The adverbial in (74b) supplies information about the means of transport that was used by the bank robbers. It could be replaced by an instrumental phrase like *with the cab*. In the case of (74c), one might even doubt whether the original locative meaning of the preposition is still present at all. In this case, there should be an entity that is located on Paul's head. What could that sensibly be? (Note that it can't be the regular subject referent Paul, which would include the head as a proper part. Maienborn (2003: 498ff) proposes a possible answer to this puzzle that is based on the locative's regular meaning. According to this solution it is Paul's remaining body (modulo his head) that is located on—and thus supported by—Paul's head.)

Note that these supplementary, non-locative readings of frame and event-internal adverbials are most appropriately queried by using the respective non-locative interrogatives:

- (73')a. When was Maradona married?
- (74')a. How did the cook prepare the chicken?
 b. How / With what did the bank robbers escape?
 c. How is Paul standing?

Standard event-external adverbials, on the other hand, always refer to the overall location of the verb's event argument. They do not share the ability of event-internal and frame modifiers to convey additional non-locative information, and they can only be questioned by a locative interrogative.

The challenge that circumstantial adverbials such as locatives pose to a formal semantics of adverbs is, on the one hand, that there is good reason to assume that expressions such as *in Argentina* or *on the last page* have a unique lexical meaning, i.e. they express the property of some entity being located in a particular spatial location. On the other hand, we have to account for the different readings of locatives and their characteristic properties in terms of inferential behavior, semantic indeterminacy and the emergence of supplementary non-locative interpretations.

In a nutshell, the solution proposed in Maienborn (1996, 2001, 2003) takes the following track. First, it is shown that there is a strict correlation between the position of a locative adverbial and its interpretation. More specifically, the three types of locatives are argued to have distinctive syntactic base positions, each corresponding to one of Frey's (2003) adverbial positions; see (50). Event-internal adverbials are base-generated at the V-periphery, event-external adverbials are base-generated at the VP-periphery, and frame adverbials have a high base-adjunction site within the C-Domain. These distinct structural positions provide the key for a compositional account, since an adverbial will be linked up with different target referents depending on its structural position. While event-external adverbials are linked up to the verb's event argument, event-internal and frame adverbials are semantically underspecified in this respect. Event-internal adverbials are linked up to a referent that is related to the verb's event argument, and frame adverbials are linked up to a referent that is related to the topic of the sentence. The identification of these target referents is shown to depend on discourse and world knowledge. The non-locative readings of event-internal and frame adverbials are reconstructed as a side effect of the pragmatic resolution of semantic indeterminacy; cf. also articles 24 (Egg) *Semantic underspecification* and 31 (Lang & Maienborn) *Two-level Semantics*. Maienborn proposes a compositional account for these adverbials that is sensitive to the observed structural and pragmatic influences while still preserving the basic insights of the classical Davidsonian approach. To this end, the template MOD in (69) is replaced by a more general variant MOD* in (75), whose application is regulated by the interface condition in (76); cf. Maienborn (2003: 489).

(75) MOD*: $\lambda Q \lambda P \lambda x [P(x) \ \& \ R(x, v) \ \& \ Q(v)]$

(76) Condition on the application of MOD*:

If MOD* is applied in a structural environment of categorial type X, then R = PART-OF, otherwise (i.e. in an XP-environment) R is the identity function.

MOD* introduces a free variable *v* and a relational variable R. If applied in an XP-environment, R is instantiated as identity, i.e. *v* is identified with the referential argument

of the modified expression, thus yielding the standard variant MOD. This is the case with event-external adverbials. If MOD* is applied in an X-environment, R is instantiated as PART-OF; cf. also Dölling (2003) for a formal account of the flexibility of adverbial modification that is similar in spirit.

The relation PART-OF pairs entities with their integral constituents. In the case of events, among these are the event's participants. The result of applying MOD* to a sentence with an event-internal adverbial such as (77a) is given in (77b).

- (77) a. The bank robber escaped on the bicycle.
 b. $\exists e$ [ESCAPE (e) & THEME (e, bank robber) & PART-OF (e, v) & ON (v, bike)]

According to the semantic representation in (77b), an entity v which is involved in the escaping event is located on the bicycle. This is as far as the compositional semantics of event-internal adverbials takes us. The identification of v and its exact role in e can only be spelled out at the conceptual level taking into account world knowledge, e.g., about extrinsic and intrinsic movement, the use of vehicles for extrinsic movement, spatial prerequisites that need to be fulfilled in order for a vehicle to function properly, etc. A simplified conceptual spell-out for (77b) is given in (77c); cf. Maienborn (2003: 490ff) for details; see also article 31 (Lang & Maienborn) *Two-level Semantics*.

- (77) c. $\exists e$ [ESCAPE (e) & EXTRINSIC-MOVE (e) & THEME (e, bank robber)
 & INSTR (e, bike) & VEHICLE (bike) & SUPPORT (bike, bank robber)
 & ON (bank robber, bike)]

This conceptual spell-out provides a plausible utterance meaning for sentence (77a). It goes beyond the compositionally determined meaning in the following respects: (a) it specifies that the escape was taken by extrinsic means (EXTRINSIC-MOVE). As a consequence, (b) the bike is identified as the instrument of locomotion in the given event. This in turn leads (c) to an instantiation of the free variable v by the discourse referent representing the bank robber and an identification of the PART-OF relation with the THEME-role. For other cases, as, e.g., (78) more conceptual inferencing will be required in order to identify a suitable referent to which the event-internal locative applies.

- (78) Paul tickled Maria on her neck.

That is, what turns out to be located on Maria's neck in (78) could be, e.g., Paul's hand or maybe some feather he used for tickling Maria. Although not manifest at the linguistic surface, such conceptually inferred units qualify as potential instantiations of the compositionally introduced free variable v.

Maienborn (2001: §6) sketches how MOD* may also account for the semantics of frame adverbials. Generalizing Klein's (1994) notion of *topic time*, frame adverbials can be seen as providing an underspecified restriction on an integral part of a *topic situation*.

All in all Maienborn's proposal suggests that the flexibility of adverbial modification is the result of adverbials (a) having several potential structural integration sites in combination with (b) being subject to a particular kind of semantic indeterminacy.

5.2. What are manners?

In section 2 above, we distinguished, among other things, between manner adverbials, degree adverbials, and other adverbials, *half-way* being one of them. But already the notion of manner adverbials is not very clearly defined, and is usually taken to comprise a rather large group of adverbials. Thus, all adverbs in (79) are typically considered manner adverbials.

- (79) a. Peter runs fast/slowly.
 b. Marie sings loudly/quietly.
 c. Kim dances beautifully/woodenly.
 d. Claire solved the problem skillfully/intelligently.

All these adverbials can be questioned by *How ...?* They are all veridical, and they cannot take scope over sentence negation nor do they create opaque contexts. Nevertheless, their meaning contributions to the sentence are very different. This can be easily seen by looking at the behavior of the adverbials in (79) with regard to standard paraphrases for manner adverbials. Standard paraphrases like ... *in a ADJ manner* or *The way X VERBs is ADJ* are not appropriate for all these items. They are perfectly applicable to (79c): *Kim dances beautifully/in a beautiful manner* and *The way Kim dances is beautiful* are synonymous. However, they do not fit for (79a/b): *to run fast* means that the speed of the running was fast, not the manner. Similarly, *to sing loudly* means that the sound-volume of the singing was loud, not the manner. Finally, (79d) seems to correspond to these paraphrases only on one reading, according to which Claire reached the solution by a series of intelligent steps. On a reading of (79d) according to which the solution arrived at is an intelligent one, the paraphrases turn out to be inappropriate, and a classification of this reading as an resultative or a blend might be more fitting. A further difference between (79d) and the other adverbials in (79a–c) is that it involves a direct relation to the subject: Roughly, the subject appears as intelligent through the way of solving the problem or the kind of the solution s/he provided. Obviously, assuming a plain analysis as one-place predicates over events for the adverbials in (79) won't suffice to account properly for all these peculiarities.

- (80) a. Peter talked loudly.
 b. $\exists e$ [AGENT (e, peter) & TALK (e) & LOUD (e)]

An analysis of (80a) along the lines of (80b) does not make explicit that the adverbial specifies the sound-volume of the talking, i.e., that it is specifying one particular aspect of the talking event. Another strange effect of a plain Neo-Davidsonian representation is that the verb and the manner adverbial appear to be semantically on a par (both providing one-place predicates over events) while intuitively and syntactically, they are not.

One possible way toward a more elaborate theory of manner adverbials that helps overcome some of these shortcomings consists in introducing manners as a further ontological category in our formal language. This idea has recently been brought back into the discussion by Piñón (2007, 2008). Its first, dismissive, discussion can be found in Fodor (1972), whereas Dik (1975) was the first champion of this approach. The main idea is simple enough: we need to be able to access the conceptual properties of the events introduced by the verb in order to gain an adequate understanding of manner modification.

Thus, in order to capture the fact that *loudly* assigns the property LOUD to the sound-volume of the talking, we need to retrieve the corresponding conceptual coordinate of the talking event. Similarly, for *fast*, we need the conceptual coordinate for speed. What kind of coordinate do we need for adverbs like *beautifully* and *intelligently*? The availability of the manner paraphrase for these adverbs shows us that we need a coordinate that is more complex than those needed for *loudly* and *fast* and that it cannot be reduced to what are essentially quite straightforward, monodimensional scales of the intuitively clear concepts speed and sound-volume. For the sake of simplicity, we will assume that in both cases the required coordinate is in fact a manner of the events in question, so that, consequently, *beautifully* is predicated of the manner of dancing, and *intelligently* of the manner of answering the question. A simplified illustration of a semantic representation for (79c) is given below, where the conceptual coordinate manner is linked to the event argument via an underspecified relation R; cf. (81). (This corresponds to one of the versions considered in Fodor 1972.)

- (81) a. Peter danced beautifully.
 b. $\exists e$ [AGENT (e, peter) & DANCE (e) & $\exists m$ [R (e, m) & BEAUTIFUL (m)]]

While clearly pointing in the right direction, this approach obviously also raises many intricate questions. While we cannot do justice to all of them here, it is helpful to briefly consider the pros and cons of this approach.

As Piñón (2007) points out, one argument in favor of assuming manner as an ontological entity is that it can be perceived, as evidenced by expressions such as (82); cf. the discussion on perception reports as one of the main criteria for assuming the ontological category of events in article 34 (Maienborn) *Event semantics*.

- (82) I saw how Linda danced.

Furthermore, as Piñón (2007) argues, assuming manners also allows us to systematically relate the *in an X manner* paraphrase to manner adverbials, since in both cases we have predicates of manners. The head noun of the paraphrasing prepositional phrase refers to a manner, and the attributive adjective predicates of this manner. In the very same way, its adverbial counterpart predicates of the manner made available as a conceptual coordinate of the event referred to by the verb.

Finally, this fine-grained analysis of manner modification can also be used to account for otherwise unexplainable patterns, e.g., the different behavior of the adverb *audibly* in (83a/b) discussed in Cresswell (1985: 186ff).

- (83) a. Isolde audibly precedes/follows Jeremy.
 b. Kiri sings/dances audibly.

As Cresswell points out, in the case of (83a), it can be some activity other than the preceding/following itself that causes the audibility, whereas in the case of (83b), what is audible is the sound of the singing/dancing. This observation can be accounted for by assuming that the conceptual structure of dancing/singing events differs from the conceptual structure of preceding/following events in that only the former but not the latter readily provide the corresponding sound-coordinate. The scope-taking usages of manner

adverbials discussed in section 4.1 can also be accounted for by resorting to an analysis based on manners, cf. Piñón (2007) and Schäfer (2008) for two formal accounts.

Obvious objections to this approach concern matters of ontology: What exactly are manners supposed to be, and what do we mean when we speak of coordinates of events? Manners, speeds, and sound volumes are all ontologically dependent on the events introduced by the verbs in the respective sentences, that is, they do not and cannot exist by themselves. These ontologically dependent entities can be viewed as coordinates in the conceptual structure of their host events. The exact nature and internal structure of these coordinates is still an unanswered question, but Geuder's (2006) discussion of manner adverbs and their relation to conceptual dimensions is a promising starting point; cf. also the notion of *dossiers* in article 16 (Bierwisch) *Semantic features and primes*.

Note that this analysis has some striking resemblance to the semantics for event-internal adverbials proposed in the previous section; cf. the discussion of MOD* in (75). That is, conceptually dependent units such as speed, sound-volume, or manner may be made accessible for further specification via a semantically underspecified event relation.

Event-internal circumstantials and manner adverbials thus both enable and enforce a closer look into the internal structure of events. Obviously, much remains to be done in this area. Manner adverbials, despite their innocent appearance as being the paradigmatic case for a textbook Davidsonian analysis, still turn out to pose many riddles that a formal semantics for adverbials will have to solve.

6. Conclusion

Adverbials and their dedicated word class, the adverbs, comprise a heterogeneous set of lexical and semantic classes and subclasses with very specific inferential and distributional properties. They are only loosely tied to the surrounding syntactic and semantic structure, leaving much space for variation and adaptation. What the vast majority of adverbs has in common is that they are non-subcategorized linguistic parasites: Wherever they find a suitable integration site, they attach to it and supply additional and uncalled-for information. Precisely because of this parasitic nature and their frappant flexibility, adverbials constitute a challenge for linguistic theory, which, in turn, must account for this flexible means of natural language expression in terms of a sufficiently rigid account of their lexical, compositional, and conceptual semantics.

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55. Adverbial clauses

1. Introduction
2. Temporal clauses
3. Modal clauses
4. Instrumental and free adjunct clauses
5. Conclusions
6. References

Abstract

Adverbial clauses are subordinate clauses that modify their superordinate clauses. This modification can occur at various levels (such as verb phrase, tense phrase, mood phrase) and in various dimensions (such as times and worlds) and ways. These variations give rise to a categorization of adverbial clauses (temporal, modal, ...) and a subcategorization according to a range of relations within these dimensions, depending on the subjunction. Thus within the modal category it is customary to distinguish between causal, conditional, purpose, result, and concessive clauses. Sometimes the subjunction does not seem to encode much meaning of its own and the clause acts more like a relative clause, modifying a quantificational adverb or a modal, or specifying an underspecified predicate; sometimes, when there is no subjunction (“free” adjunct clauses), the contribution of the clause is underspecified.

1. Introduction

Adverbial clauses are a proper subclass of the class of all adverbials. To a considerable extent, this subclass relation distributes over the major semantic categories of adverbials commonly identified (see article 54 (Maienborn & Schäfer) *Adverbs and adverbials*). Thus in the temporal category, there are closely comparable clausal and nonclausal adverbials, e.g.: “since Benitez arrived at Anfield” - “since June 2004”. Locative adverbials and manner adverbials tend to be nonclausal, but instrumental adverbials can be both: “by hammering it” - “with a hammer”. In the modal category, clausal adverbials predominate; there are no close counterparts to conditional or causal clauses in the form of (nonanaphoric) adverbs or prepositional phrases.