Discourse particles in semantic composition: the case of German *denn*[*]

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1. Introduction

German discourse particles are notorious for the diversity and ineffability of their contributions to meaning, contributions often categorized as non-at issue expressive content (Potts 2005, 2007, Gutzmann 2015). This paper presents a case study on interrogative *denn*, focusing on where within its interrogative host *denn* enters the semantic composition.

Routinely used in questions, as in (1a) and (1b), *denn* adds a felicity condition on a question's use. In order for *denn* to be appropriate, the context must meet certain demands beyond those that it would need to meet in the absence of *denn*. This is illustrated by the acceptability contrast between the exchanges in (2a) and (2b). (The English translations given here and throughout do not reflect the felicity conditions added by *denn*.)

(1) a. Regnet es (**denn**)?
rains it (DENN)
'Is it raining?'

b. Wie stark regnet es (**denn**)?
how hard rains it (DENN)
'How hard is it raining?'

(2) a. A: I am looking for my umbrella.
B: Regnet es (✓**denn**)?
rains it (DENN)
'Is it raining?'

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b. A: I am looking for my bike helmet.
B: Regnet es (#**denn**)?
rains it (DENN)
'Is it raining?'

In both exchanges, speaker B responds to A with the polar question in (1a), asking whether it is raining. In (2a), but not (2b), this question is felicitous with *denn*. Intuitively, the contrast has to do with the way A's statement and B's question are linked: in (2a), but not (2b), the assumption that the question's nucleus is true (i.e., the assumption that it is raining) can plausibly help B understand why A's statement might be true. Learning that it is raining can plausibly help B understand why A is looking for an umbrella, but not why A is looking for a bike helmet.

This intuition about the contrast in (2), like the intuitions about related contrasts that we will articulate below, is aligned with Theiler's (2021) characterization of the felicity condition from *denn*. In an informal rendition, Theiler proposes that *denn* in polar questions marks a 'proposition as an explanation for the information asserted' in a previous utterance (329). The contentious issue articulated below, however, is how in general the proposition so marked by *denn* is in general identified in semantic composition.

The contrast in (2) suggests that the felicity condition from *denn* is jointly determined by *denn* and other content of the question. If so, the felicity condition introduced by *denn* can be thought of as taking the form $[\![denn]\!]([\![\phi]\!])$, where ϕ is somehow furnished by content in *denn*'s interrogative host. Now, as a crucial prerequisite for going further and spelling out the mapping $[\![denn]\!]$, one must determine the identity of ϕ. That is, what is the site within the interrogative at which *denn* enters the semantic composition?

In the analyses proposed in Csipak and Zobel (2014) and Theiler (2021), ϕ is (implicitly) identified with the interrogative CP as a whole. That is, *denn* is assigned *global* scope, as sketched in (3a).[1] However, data of the sort discussed in Bayer (2012), Bayer et al. (2016) and Czypionka et al. (2021) can be interpreted as suggesting that the scope of *denn* is local. On this view, ϕ is located at or below the level of the complement of interrogative C, the question nucleus, as sketched in (3b).

(3) a. **Global scope**
[$_{CP}$ denn [$_{CP}$ [$_{C}$?] [$_{VP}$ . . .]]]
b. **Local scope**
[$_{CP}$ [$_{C}$?] [$_{VP}$ . . . denn . . .]]

In this paper, we detail an argument based on polar interrogative data for the view that *denn* takes local scope. Tracing discussion in the literature, we present the argument in two parts. In the first part, presented in Section 2, we build on Theiler (2021) to establish that in the condition $[\![denn]\!]([\![\phi]\!])$, $[\![\phi]\!]$ cannot be identified with the question's Hamblin set.

[1] Csipak and Zobel (2014) abd Theiler (2021) propose that *denn* semantically operates on the interrogative denotation, which we take to imply that *denn* takes global scope. While less formalized, the proposals in Bayer (2012) and Thurmair (1989) also suggest that *denn* imposes a condition on the question meaning as a whole, implying global scope.

The second part, in Section 3, building on observations in Bayer (2012), Bayer et al. (2016) and Czypionka et al. (2021), argues for the stronger claim that ϕ cannot be identified with the interrogative CP, hence that *denn* cannot take global scope. Given that it is the CP that determines a question's Hamblin set, this claim implies that $[\![\phi]\!]$ is not the Hamblin set. But it also excludes Theiler's (2021) proposal which, assuming global scope, construes $[\![\phi]\!]$ as a richer question meaning, one that encodes an interrogative's 'highlighted' content, in the sense of Roelofsen and Farkas (2015), in addition to its answerhood conditions.

2. Part 1: The nucleus sensitivity of *denn*

Theiler (2021) presents an argument that the felicity condition imposed by interrogative *denn* is not a function of the interrogative's answerhood conditions relative to the common ground. Theiler considers a scenario where it is common belief between A and B that they know exactly two people called 'Anna,' one of which is from Munich, and the other from Berlin. Theiler imagines this scenario as the background for the two conceivable exchanges between A and B in (4).

(4) a. A: Earlier today, Anna called.
B: Welche Anna meinst du (✓**denn**)?
which Anna mean you (DENN)
'Which Anna do you mean?'

b. A: Earlier today, Anna called.
B: Meinst du (#**denn**) Anna aus München?
mean you (DENN) Anna from Munich
'Do you mean Anna from Munich?'

A's statement is the same in both exchanges, but B's interrogative response varies. B replies with a *wh*-interrogative in (4a), and with a polar interrogative in (4b). Theiler's scenario is designed to ensure that modulo *denn*, the two interrogatives nevertheless have the same answerhood conditions relative to the interlocutors' common ground. Since this common ground, call it CG, guarantees the equivalence in (5), the two Hamblin sets in (6) coincide in it. That is, the two questions yield the same set of propositions when restricting their respective Hamblin answers with CG.

(5) $\text{mean(A, Anna from Berlin)} \wedge \text{CG} \Leftrightarrow$
$\neg\text{mean(A, Anna from Munich)} \wedge \text{CG}$

(6) a. {mean(A, Anna from Munich), mean(A, Anna from Berlin)}
b. {mean(A, Anna from Munich), ¬mean(A, Anna from Munich)}

Given this, Theiler concludes from the acceptability contrast in (4) that the felicity condition that *denn* introduces cannot be a function of a question's answerhood condition in the common ground.

This conclusion indeed seems inevitable. However, given that (6a) and (6b) themselves are different sets, the contrast in (4) is consistent with the hypothesis that the felicity condition from *denn* is a function of the interrogative's Hamblin set itself, as opposed to the set of Hamblin answers restricted by the common ground. After all, the fact that the felicity condition is a condition *on* the context does not imply that its content is *a function of* contextual meaning. The condition's content may well be a function of the unaltered output of semantic composition. In fact, by suggesting above that the felicity condition has the format $[\![denn]\!]([\![\phi]\!])$, we simply took it for granted that the condition is composed from semantic meaning alone.

That said, we can extend Theiler's argument based on (4) to establish that $[\![\phi]\!]$ in $[\![denn]\!]([\![\phi]\!])$ cannot be identified with the Hamblin set itself any more than it can be identified with the Hamblin set restricted by the common ground. To set the stage, consider the two polar interrogatives in (7).

(7) a. Bist du Raucher?
are you smoker
'Are you a smoker?'

b. Bist du Nichtraucher?
are you non-smoker
'Are you a non-smoker?'

Crucially, given the semantic complementarity of the predicates *Raucher* ('smoker') and *Nichtraucher* ('non-smoker'), semantic composition yields the same Hamblin set for both (7a) and (7b). Regardless of context, the two sets coincide. Assuming that *du* ('you') refers to, say, A, the two questions share the Hamblin set in (8).

(8) $\{\text{smoker(A)}, \neg\text{smoker(A)}\}$

Despite this, we can show that the pair of polar questions in (7) participates in contrasts much like the one in Theiler's data in (4). Consider, for example, the two exchanges between A and B in (9).

(9) a. A: I'm really worried about passing the physical.
B: Bist du (✓**denn**) Raucher?
are you (DENN) smoker
'Are you a smoker?'

b. A: I'm really worried about passing the physical.
B: Bist du (**#denn**) Nichtraucher?
are you (DENN) non-smoker
'Are you a non-smoker?'

Like the exchanges in (4), those in (9) feature the same statement by A, and only differ in B's interrogative response. The relevant observation is that, paralleling (4), the use of *denn* is felicitous in (9a), but clearly infelicitous in (9b).[2]

The contrast in (9) establishes, then, that $[\![\phi]\!]$ in $[\![denn]\!]([\![\phi]\!])$ cannot be identified with the interrogative's Hamblin set. By the same token, it establishes that the felicity condition from *denn* is sensitive to its interrogative's nucleus. Even though the Hamblin sets for (9a) and (9b) coincide, their nuclei express different, in fact contradictory, propositions—that A is a smoker in (9a)B, and that A is a non-smoker in (9b)B. There is in fact a clear intuition that the contrast in (9) references those propositions. Intuitively, what is odd about (9a)B with *denn* is the suggestion that learning that A is a non-smoker would help B understand why A is worried about the physical. After all, in ordinary contexts, being a non-smoker is not a reason for worrying about a physical exam. In contrast, being a smoker *is* a plausible cause for concern, and intuitively this is what renders the use of *denn* natural in (9a).

Given this nucleus sensitivity of *denn*, can we conclude that *denn* takes scope within the question nucleus, as opposed to taking global scope over the question as a whole? We would be able to draw this conclusion if we could take it for granted that the semantic content of an interrogative CP encodes a Hamblin set and nothing else. However, it is this very assumption that is explicitly rejected in Theiler (2021). Theiler proposes that in addition to a Hamblin set, the denotation of a polar interrogative encodes the proposition expressed by the nucleus. This could be implemented, for example, by construing the denotation of an interrogative CP as an ordered pair of a Hamblin set and a proposition. The denotations of the two polar questions in (7) would then come apart, with (7a) and (7b) denoting (10a) and (10b), respectively. This would reconcile the contrast in (9) with the assumption that *denn* takes global scope.

(10) a. $<\{\text{smoker(A)}, \neg\text{smoker(A)}\}, \text{smoker(A)}>$
b. $<\{\text{smoker(A)}, \neg\text{smoker(A)}\}, \neg\text{smoker(A)}>$

Theiler suggests that the second coordinates in the denotations in (10) can be viewed as the interrogatives' 'highlighted' contents, a dimension of conventional meaning motivated in Roelofsen and Farkas (2015). Given this link, denotations like those in (10) may have independent motivation, so that the global scope view of *denn* could conceivably be maintained at no theoretical cost.

However, we will now proceed to showing that Theiler's appeal to highlighted content falls short of capturing the range of ways in which nucleus-internal content can shape the content of the felicity condition from *denn*. In the end, we argue, there is no escape from the conclusion that *denn* operates on such content by virtue of scoping locally.[3]

[2]Crucially, the question in (9b)B can be felicitous when rendered without *denn*. It would be natural, for example, for B to extend (9b)B by stating that non-smokers have no reasons to worry about the physical exam.

[3]For polar questions, an alternative to Theiler's appeal to highlighting would be to reject the standard view (adopted above without comment) that a polar interrogative's Hamblin set is a doubleton. Biezma and Rawlins (2012) propose that polar interrogatives denote singletons, consisting of the positive answer only. This proposal, too, could reconcile the contrast in (9) with the global scope assumption, as (7a) and (7b)

3. Part 2: The height sensitivity of *denn*

To start, interrogative *denn* is invariably pronounced in a position following the finite verb in the C position. As (11) illustrates, interrogative *denn* is strictly barred from the sentence initial position.

(11) *__Denn__ regnet es?
DENN rains it

However, the overt position of *denn* is to some extent variable. Bayer et al. (2016) and Czypionka et al. (2021) observe that in cases of clause embedding, it is sometimes possible for *denn* to appear either *high*, in the matrix, or *low*, in the embedded clause. For example, the examples in (12) only differ in that *denn* is high in (12a) but low in (12b). These two particular sentences moreover seem equally natural, and in fact seem hard to tell apart in terms of meaning.

(12) a. Meint ihr **denn**, dass das wichtig ist?
think you.pl DENN that this important is
'Do you think that this is important?'

b. Meint ihr, dass das **denn** wichtig ist?
think you.pl that this DENN important is
'Do you think that this is important?'

Under the view that *denn* takes global scope, the two sentences in (12) are in fact predicted to be synonymous. In both cases, *denn* should compose with the denotation of the interrogative CP as a whole. Hence *denn* should contribute the same felicity condition in the two cases. In the absence of additional assumptions, the global scope view leaves no room for variation in the surface height of *denn* to yield a difference in meaning.

However, the height of *denn* sometimes *does* have tangible effects on the felicity condition that *denn* is intuited to contribute. A first illustration is provided by the contrast in (13), two exchanges between A and B that are identical save for the placement of *denn* in B's response: *denn* appears high in (13a), and low in (13b). As indicated, while high *denn* in (13a)B is judged felicitous, low *denn* in (13b)B is not.

(13) a. A: I consider myself a typical Trump supporter.
B: Glaubst du (✓**denn**), dass Klimawandel ein Hirngespinst ist?
believe you (DENN) that climate.change a fabrication is
'Do you believe that climate change is a fabrication?'

would have different denotations, viz. {smoker(A)} and {¬smoker(A)}, respectively. Our arguments below apply to this option and to Theiler's proposal alike.

b. A: I consider myself a typical Trump supporter.
B: Glaubst du, dass Klimawandel (**#denn**) ein Hirngespinst ist?
believe you that climate.change (DENN) a fabrication is
'Do you believe that climate change is a fabrication?'

The contrast between (13a) and (13b) is inconsistent with the view that *denn* invariably takes global scope over the interrogative CP as a whole, as this view would render (13a)B and (13b)B indistinguishable. The contrast moreover invites a straightforward elaboration of the local scope view, call it the *transparent scope* hypothesis: the scope of *denn*—the constituent ϕ in the condition $[\![denn]\!]([\![\phi]\!])$—is the smallest clause that hosts the surface position of *denn*. On this hypothesis, high *denn* scopes over the entire question nucleus, whereas low *denn* scopes over the embedded clause only, hence operating on different propositions in (13a)B and (13b)B. The transparent scope hypothesis, then, correctly allows for felicity intuitions to vary with the height of *denn*.

Not only does the transparent scope hypothesis allow for variation of felicity, but it lends itself to capturing the direction of this variation in (13)—the fact that high, but not low, *denn* yields felicity there. This specific pattern can be understood under a construal of the condition $[\![denn]\!]([\![\phi]\!])$ that was already assumed in our discussion of the contrasts in (2) and (9) above, and elaborated in Theiler) (2021): in polar questions, $[\![denn]\!]([\![\phi]\!])$ is the condition that the speaker must confirm the truth of ϕ as an explanation for the information provided in an interlocutor's preceding utterance.

With $[\![denn]\!]([\![\phi]\!])$ so construed, under the transparent scope hypothesis, high *denn* in (13a) is predicted to signal that B must confirm that A doesn't believe in climate change in order to understand why A portrays themselves as a typical Trump supporter. This seems natural enough, given that climate change denial is plausibly considered a stereotypical feature of a Trump supporter. The felicity of (13a) is accordingly expected. In contrast, low *denn* in (13b) is predicted to communicate that B must confirm that climate change is not real in order to understand A's self-portrayal as a Trump supporter. In the absence of unusual circumstances, this requirement is incoherent: the issue whether or not climate change is *actually* real does not normally bear on the question of why people might depict themselves as Trump supporters.

The transparent scope hypothesis, in conjunction with the proposed construal of $[\![denn]\!]([\![\phi]\!])$, gives rise to a further expectation. Alongside cases like (13), where high *denn* is more felicitous than low *denn*, we should find cases where low *denn* is more felicitous than high *denn*. [4] The contrast in (14) confirms that this is indeed so. Here too the two exchanges only differ in the placement of *denn*, which appears high in (14a) but low in (14b). In this case, it is low *denn* that is judged more felicitous.

[4]Under the present assumptions, it is also unsurprising that both high and low *denn* are judged natural out of context in the examples in (12). It is easy enough to imagine contexts where the speaker must confirm either that a certain issue is important, or that the addressee considers it important, in order to understand the reasons behind a previous utterance, presumably an utterance about the same issue.

(14) a. A: Fei's successor eats kale every day.
B: Glaubt Fei (#**denn**), dass Grünkohl gesund ist?
thinks Fei (DENN) that kale healthy is
'Does Fei think that kale is healthy?'

b. A: Fei's successor eats kale every day.
B: Glaubt Fei, dass Grünkohl (✓?**denn**) gesund ist?
thinks Fei that kale (DENN) healthy is
'Does Fei think that kale is healthy?'

In (14a), high *denn* is predicted to indicate that A must confirm that Fei considers kale healthy in order to understand why Fei's successor eats kale. In the absence of further context, this is implausible. The mere assumption that a person's predecessor (in a job, say) considers kale healthy does nothing to help explain why that person eats kale. The oddness of (14b) is accordingly expected. In contrast, low *denn* in (14b) is predicted to signal that B must confirm that kale is *actually* healthy in order to explain why someone eats kale. This is plausible in rather natural sorts of contexts, for example in conversations that aim to illustrate the prevalence of people with healthy life styles.

Now, as signalled by our choice of diacritic, in the absence of further context, the low *denn* response in (14b)B is not quite as natural as the other cases of felicitous *denn* that we have seen. More to the point, (14b) is also noticeably less natural than the fully felicitous exchange in (15), where B's reply is a polar question whose nucleus is furnished by the embedded clause in (14b)B. Under present assumptions, the condition $[\![\textit{denn}]\!]([\![\phi]\!])$ is the same in (14b) and (15), since $[\![\phi]\!]$ in both cases is the same proposition, the proposition that kale is healthy, stated in (16) for reference. On what grounds, then, is (14b) less natural than (15)?

(15) A: Fei's successor eats kale every day.
B: Ist Grünkohl (✓**denn**) gesund?
is kale (DENN) healthy
'Is kale healthy?'

(16) healthy(kale)

We propose that the condition $[\![\textit{denn}]\!]([\![\phi]\!])$ is actually stronger than stated above: not only does *denn* indicate that the speaker must confirm the truth of ϕ in order to understand the reason for a previous utterance, but at the same time *denn* introduces the request that this confirmation be provided by the addressee. The difference between (14b) and (15) is that only in the latter case is this request from *denn* aligned with the request from the question act expressed by *denn*'s host. The proposition (16) is entailed, in fact, identical to one of the Hamblin answers to (15)B, listed in (17a), viz. the positive answer. Hence the question can be answered while at the same time responding to the request encoded by *denn*. In contrast, (16) is not semantically entailed by either of the Hamblin answers to (14b)B, listed in (17b).

(17) a. {healthy(kale), ¬healthy(kale)}
b. {believe(Fei, healthy(kale)), ¬believe(Fei, healthy(kale))}

In this case, then, an answer to the question cannot by itself respond to the request from *denn* at the same time. We suggest that it is this misalignment that renders (14b) less natural than (15). What this predicts is that (14b) will be fully felicitous under the assumption that Fei has *correct* beliefs about the issue of whether kale is healthy, since in that case, (16) *is* contextually entailed by the positive answer. Our intuitions are indeed consistent with this prediction. We intuit that the use of low *denn* in B's response forces hearers to accommodate the assumption that Fei, apart from being the predecessor of the person referred to in A's statement, happens to be an authority on the health effects of kale, and (14b) is acceptable to the extent that this accommodation is successful.[5]

In sum, intuitions about the effect of *denn*'s height on the felicity condition contributed by *denn* lend support to the transparent scope hypothesis, and by implication confirm that *denn* takes local scope within the question nucleus rather than global scope over the interrogative CP as a whole.[6]

4. Conclusion

Extending observations in Bayer et al. (2016), Czypionka et al. (2021), and Theiler (2021) with novel acceptability contrasts from clause embeddings, we have argued that interrogative *denn* takes transparent scope. This means that *denn* is interpreted within the question nucleus in the clause where it appears on the surface and the felicity condition *denn* adds to its interrogative host is a function of the proposition expressed by that clause. In many cases, the scope of *denn* could be characterized as a proposition that is highlighted in the sense of Roelofsen and Farkas (2015). However, the evidence does not seem to support Theiler's (2021) proposal that reference to highlighted content is crucial to understand *denn*'s contribution to meaning. We have arrived at this conclusion on the basis of obser-

[5]Bayer et al. (2016) argue that interrogative *denn* resists semantic embedding altogether, and that examples that seem to show otherwise, like our (12b) and (14b) are not cases of genuine embedding. Building on Simons (2007), they propose that in such cases 'the matrix predicate is backgrounded to such an extent that it functions rather like an interrogative prefix to the embedded CP' (598). We understand our proposal as an attempt to derive Bayer et al.'s intuition from assumptions about *denn*. Note that our proposal can accommodate Bayer et al.'s intuition that, aligned with the full acceptability of (12b), low *denn* is most acceptable in cases with second person subjects. This is expected on our view, given that an answer like *We believe this is important* implies *This is important* in typical contexts. We believe that our perspective also has the potential to additionally explain why cases of low *denn* appear to be restricted to particular attitude verbs.

[6]Theiler's particular rendition of the global scope analysis, which assumes that *denn* in polar interrogatives operates on the positive answer, both over- and undergenerates for low *denn* data: it incorrectly predicts low *denn* in (13b)B to be felicitous, and low *denn* in (14b)B to be infelicitous. Now, on Theiler's view, *denn* operates on the positive answer in virtue of that answer being highlighted. In a conceivable revision, a polar question can furnish multiple highlighted proposition, so that in cases of embedding, both the matrix proposition and the embedded proposition could be highlighted. However, this revision still falls short of capturing the height effect that (13) and (14) illustrate. Now overgenerating for both high and low *denn*, the revised construal of highlighting incorrectly predicts both (13b)B and (14a)B to be felicitous.

vations about *denn* in polar interrogatives only. We expect that it can be further supported by *wh*-question data, but we leave the demonstration for another occasion.[7]

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[7] Theiler proposes that *wh*-questions highlight a property and that the felicity condition from interrogative *denn* is a function of that property. To be sure, however, the assumption that *denn* operates on a property in *wh*-questions is compatible with the local scope view, given that the nucleus of a *wh*-question could be construed as furnishing a property. Alternatively, *denn* in a *wh*-question could be taken to operate on an open proposition.