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Chapter 1

Introduction

The main concern of this master’s thesis is to put forward a challenge for the classical semantic assumptions for the verb *know* – and presumably further verbs – taking new data concerning German *wissen* (*know*) as a point of departure. The type of examples I will be mainly concerned with is illustrated in (1-b)¹. Here, *genau* (*exactly*), which is usually associated with expressing precision, as in (1-a) when modifying number words, combines with the propositional attitude verb *wissen* embedding a declarative complement²:

- (1) a. In diesem Haus gibt es genau zehn Zimmer.
In this house gives it exactly ten rooms
There are exactly ten rooms in this house.
- b. Die Paula weiß genau, dass der Hans die Bank ausgeraubt hat.
The Paula knows GENAU that the Hans the bank robbed AUX
Paula knows GENAU that Hans robbed the bank.³

The verb *know* – along with e.g. *believe* or *hope* – belongs to the set of what are usually called propositional attitude verbs, a term going back to Russell (1940), exemplified in (2):

- (2) a. Paula knows that Bob loves Tim.
b. Paula believes that Bob loves Tim.
c. Paula hopes that Bob loves Tim.

One of the crucial properties of sentences containing such verbs is that – intuitively speaking – it is not the truth of the embedded clause that is in the center of the utterance. Accordingly, (2-b+c) don’t even tell us anything about the truth of the embedded sentence. But also (2-a), from which it can be inferred that the embedded sentence is true (see Kiparsky & Kiparsky (1970)), primarily conveys something else, namely a subject’s attitude towards the content of the embedded clause (Hintikka (1969)).

Accordingly, the truth conditions of sentences containing propositional attitude verbs are not entirely

¹All German examples that are not marked otherwise are based on my own judgements (Viennese variation of German) and rechecked by other German native speakers from different areas.

²Several data points as well as some of the underlying ideas that I will present within this master’s thesis are related to claims made in Wurm (2020).

³As the German modifier *genau* has a different distribution as its English counterpart *exactly*, I will use GENAU in English translations where *exactly* is not suitable and no other consistent translation is available.

obvious. In light of the puzzling semantics of such verbs, the intensional analysis of Hintikka (1969) constitutes a breakthrough. Hintikka roughly suggests that what such verbs express, is a relation between a subject – the attitude holder – and the content of an embedded clause, i.e. a proposition. In the case of *know*, this relation holds given that the proposition is compatible with everything the subject believes, or, to put it differently, if the proposition is true in all worlds that the subject considers as candidates for the actual world. Thus, given that this requirement is a statement about the entire set of a subject’s belief worlds, verbs as *know* are assumed to denote universal quantifiers.

A further class of verbs that I will be concerned with – possibly a sub-class of attitude verbs – is the class of perception verbs, all of which are modifiable by *genau*, exemplified for *sehen* (*see*) in (3):

- (3) Die Paula sieht genau, dass der Hans die Bank ausgeraubt hat.
The Paula sees GENAU that the Hans the bank robbed AUX
Paula sees GENAU that Hans robbed the bank.

Such verbs are likewise analysed as universal quantifiers over worlds (also based on Hintikka (1969)); in this case, worlds that are compatible with the perception of an individual. Accordingly, Hintikka’s idea is highly powerful, as it derives the truth conditions of a large set of verbs that express relations between individuals and propositions in a unified fashion. For simplification I will use the term ‘propositional attitude verb’ in a way that the class of perception verbs is included.

The fact that German *wissen* can combine with the precision modifier *genau* demonstrated in (1) poses a challenge for Hintikka’s analysis: how is it that this modifier that is usually known as expressing precision can combine with *wissen*, which – according to the standard semantics – doesn’t refer to a scale? On the other hand, let’s consider the intuitive contribution of *genau* in (1): it seems to add that the knowledge is specifically good, i.e. that the subject is highly certain or has extra reliable evidence in favour of the proposition in question. Given the analysis of *wissen* as universal quantifier, nothing like this is expected, as a requirement that concerns all worlds that the lexical entry of *wissen* refers to, is already the strongest statement available, thus, cannot be strengthened any further.

Accordingly, this problem will be at the center of this master’s thesis, that is structured as follows: first of all, I will contrast German *wissen* and English *know* in section 1.1. As my arguments are based on *wissen*, whereas existing accounts almost exclusively concern *know*, the differences and similarities of these two expressions are relevant in order to justify taking the semantics of *know* as point of departure for my discussion of *wissen*. After that, in chapter 2, I will start by discussing the idea of Hintikka (1969) for the analysis of propositional attitude verbs, specifically *know*, in detail. Based on this, I will then turn to an examination of the existing challenges put forward in the face of this view in section 2.3 and explore whether and how those are relevant for the issue of this master’s thesis. In section 2.3.1 I will thus discuss context sensitivity of knowledge (DeRose (1995)) and, proceeding from that, approaches that refer to the participation of *know/wissen* in degree constructions (Schmitt & Sode (2018), Stanley (2005) and Koev (2019)). In section 2.3.2 and section 2.3.3 I will discuss questions regarding the related propositional attitude verb *believe* – namely i) whether it is gradable and ii) in how far *believe* and *know* differ w.r.t. their

semantics. The examination of *believe* is relevant and informative for the issue of this thesis, as *believe* just as *know* is, according to Hintikka (1969), a universal quantifier that differs from *know* only insofar as *believe* doesn't entail the truth of its complement (Kiparsky & Kiparsky (1970)). Crucially, German *glauben* (*believe*) behaves differently to *wissen* w.r.t. the compatibility with *genau*, i.e. it is incompatible with the modifier. Thus, the question what differentiates *wissen* from *glauben* must be connected to the licensing of *genau* in the context of such verbs. In section 2.3.4 I will discuss approaches of Kratzer (2001) and Lewis (1996) that will turn out to be relevant in light of the issue of this thesis as both try to implement the potential gradability or context sensitivity of knowledge by somehow referring to relevant alternatives. Thereby, these approaches are connected to the so called Gettier-problem, which concerns the assumption that knowledge equals justified, true belief. This view that was widely held until Gettier (1963) who pointed to instances of justified, true belief that don't count as knowledge.

In chapter 3 I will turn to an examination of the German modifier *genau*. Thus, I start by investigating its general distribution, which will reveal that *genau* occurs in several other contexts besides its use as a modifier of scalar expressions. I will show that those occurrences can be roughly divided into two groups: i) *genau* functioning as discourse particle with different flavours, ii) *genau* in uses where at least an intuitive relation to precision is determinable. The only use of *genau* that stands out – as it cannot be associated to one of the two groups – is its use as a modifier of propositional attitude verbs as demonstrated in (1-b) and (3). Thereafter, I will turn to a discussion of the literature on *exactly*, the English counterpart of *genau* in several but not all occurrences, in its precision expressing use in section 3.2 (Horn (1972), Levinson (1983), Geurts (2006), Lasersohn (1999), Sauerland & Stateva (2007)). It will turn out that under the assumption that number words have an exact semantics – i.e. *sixteen* meaning *exactly sixteen* and not more or less – we run into a similar problem as in the case of *genau wissen*: an expression that doesn't give rise to a non-exact reading can be modified by *genau* that presumably conveys precision. I will argue that the existing analyses for *exactly* in scalar contexts cannot be applied to *genau* modifying propositional attitude verbs given the semantics of these verbs. Thus, in section 3.4 I will try to pursue the idea that *know* actually has the semantics of a degree expression that makes available a degree argument associated with the fully closed probabilistic scale $[0,1]$, tentatively suggested by Koev (2019), but end up arguing against it.

Faced with the question of how to account for the possibility for *genau* to occur in the context of propositional attitude verbs, given these expressions appear – according to their semantics – to be incompatible with the modifier, I will put forward the idea that *genau* modifies specific semantic components of such verbs in chapter 4. Departing from the intuitive contribution of the modifier in the context of *wissen* – which I paraphrased as conveying high certainty or extra reliable evidence – I will consider evidence and certainty as candidates for the relevant components, though rule them out, mainly based on the distribution of the modifier within the class of propositional attitude verbs. Relatedly, I will turn to a detailed examination of the distribution of *genau* in the context of such verbs in chapter 5 and argue in section 5.1.1 that the class of verbs compatible with the modifier can be generalised as follows: for all verbs *Q* compatible with *genau* it holds that from a sentence of the form 'x *Q* that p' it follows that 'x knows that p' and 'x knows that p' is not presupposed (the members of this class will be referred to as 'know-type

predicates'). Furthermore, in section 5.1, I will argue that *genau* can receive two different readings when combining with know-type predicates that can be distinguished based on different types of complements. This distinction is crucial, as I am primarily interested in only one of these readings – which I will term 'upstairs reading' – that is the only reading occurring in declarative embedding contexts.

After having limited the type of examples that are of main interest for the issue of this master's thesis, I will examine such examples in chapter 6 in detail in order to get to the bottom of the modifier's contribution. This examination will roughly reveal that the upstairs reading of *genau* in the context of know-type predicates is connected to a specifically high persistence of the relevant piece of knowledge. Thus, I will argue that if 'x weiß genau dass p' ('x knows GENAU that p') x's knowledge survives even if some aspects of the world x is in are slightly different from how x believes the actual world to be. I will further argue that this is indirectly connected to specifically good evidence, and thereby high certainty. Regarding the implementation, I will suggest that *genau* makes reference to a set of worlds unavailable in the Hintikka-semantics of *know*: namely, worlds that are incompatible with what the attitude holder believes. Furthermore, I will suggest that the contribution of *genau* can be described as inducing a widening on the set of worlds with which p is required to be compatible; thus, a widening on the set of worlds that have to be considered; i.e. the domain of quantification. In section 6.4 I will get back to Lewis (1996) and show that his differentiation between three types of possibilities is a handy classification for the intuition that if 'x weiß genau dass p' is licensed, even far-fetched circumstances may pertain, while the knowledge w.r.t. p would survive anyway. After that, I will discuss other expressions that are seemingly connected to domain widening; namely *any* (see Kadmon & Landman (1993)) in section 6.5 and reduplicated universal quantifiers in section 6.6.

Finally, in chapter 7, I will suggest an implementation of my idea. I will start by roughly summing up how the semantics of *wissen* has to be designed in order to be combinable with what I suggest to be the function of *genau*. In section 7.2 I will show why the Hintikka-analysis as universal quantifier over belief worlds is insufficient in that respect, and thus suggest a revised semantics for *wissen* in section 7.3. Roughly, I will argue that *wissen* refers to a degree that determines the size of the set of worlds that have to be compatible with what is known and that is in unmodified instances supplied by the context. Based on this, I will define the semantics of *genau* as imposing the requirement that this degree significantly exceeds the standard, i.e. that the set of worlds that have to be compatible with what is known is specifically large. What will become evident is that several aspects discussed in the course of the thesis, as the possibility of the presence of a degree, the context dependency of knowledge as well as the consideration of alternatives, will play a role in the suggested implementation, although in a modified way. In section 7.4 I will show that this analysis can be expanded to other know-type predicates, and that the indirect reference to evidence is crucial in that respect. In a final step, I will address open questions for future work in chapter 8.

1.1 *know* vs. *wissen*

As I am mainly concerned with German data in this thesis, meaning that the claims that I make are all related to German *wissen*, whereas the standard analysis as well as most of the other considerations are tailored to English *know*, I will briefly discuss the characteristics of *wissen* and *know*, respectively. First, I will explore the distribution of the two expressions w.r.t. the type of complements they take.

Both appear as proposition embedding verbs and can likewise combine with declaratives, (4-a+b) as well as wh-interrogatives, (4-c+d), and polar questions, (4-e+f):

- (4)
- a. Die Martha weiß, dass der Ralf zur Party kommt.
The Martha knows that the Ralf to party comes
Martha knows that Ralf is coming to the party.
 - b. Martha knows that Ralf is coming to the party.
 - c. Die Martha weiß, wer zur Party kommt.
The Martha knows who to party comes
Martha knows who is coming to the party.
 - d. Martha knows who is coming to the party.
 - e. Die Martha weiß, ob der Ralf zur Party kommt.
The Martha knows whether the Ralf to party comes
Martha knows whether Ralf is coming to the party.
 - f. Martha knows whether/if Ralf is coming to the party.

As pointed out by Schmitt & Sode (2018) and discussed in section 2.3.1, German *wissen* can additionally take infinitival complements, (5-a). English *know* on the other hand, seems to be more restricted w.r.t. occurring with this type of complement. Whereas the English counterpart of (5-a), is not realised with an infinitival complement, (5-b), but rather via embedded wh-complements that express a possibly related meaning, (5-c), infinitival complements are possible in other contexts, as (5-d):

- (5)
- a. Der Ralf weiß zu feiern.
The Ralf knows to party
Ralf knows how to party.
 - b. *Ralf knows to party.⁴
 - c. Ralf knows how to party.
 - d. Ralf knew to leave.

The most remarkable difference concerns probably the fact that English *know* can unrestrictedly combine with complements denoting individuals. Therefore, it has an additional sense, exemplified in (6-a), that is roughly paraphrasable as being acquainted with something or someone. This meaning cannot be realised with German *wissen*, (6-b), but is rather expressed with *kennen*, as in (6-c):

- (6)
- a. Karl knows the mayor.
 - b. *Der Karl weiß den Bürgermeister.
The Karl knows the mayor

⁴I use '*' to indicate ungrammaticality, '#' to mark examples that are infelicitous given the context provided and '??' to indicate examples that are odd but not ruled out completely.

- Karl knows the mayor.
- c. Der Karl kennt den Bürgermeister.
The Karl knows the mayor
Karl knows the mayor.

Nevertheless, there are further examples containing apparent individual denoting expressions as arguments that appear with both *know* as well as *wissen*, (7-a+b):

- (7) a. Bibi knows the answer.
b. Die Bibi weiß die Antwort.
The Bibi knows the answer
Bibi knows the answer.

However, there is debate w.r.t. examples such as (7), the complements of which are known as concealed questions. This debate roughly concerns the question whether the sentences in (7) are semantically and syntactically equivalent to embedded copular questions as in (8) (see further Greenberg (1977), Heim (1979), Nathan (2006), Frana (2010)):

- (8) a. Bibi knows what the answer is.
b. Die Bibi weiß was die Antwort ist.
The Bibi knows what the answer is
Bibi knows what the answer is.

Furthermore, English *know* has a use described by Goldman (2001) as a remnant of an ancient use that is listed by the Oxford English Dictionary, where it is paraphrased as 'to distinguish', exemplified in (9), not available for German *wissen*.

- (9) a. He doesn't know right from left. Goldman (2001)[p.772]

To sum up, both English *know* and German *wissen* exhibit uses that are unavailable in the other language. Nevertheless, both can occur with declarative as well as question denoting complements and behave basically similar in this configurations. As I will be mainly concerned with this propositional use of the verb in the remainder of this thesis, I consider the similar behaviour of *wissen* and *know* in this respect as legitimation for taking the semantics of *know* as point of departure for my discussion and claims w.r.t. *wissen*. Whether and to what extent my claims regarding German *wissen* can be adapted for *know* or equivalent attitude verbs in other languages is left open.

Chapter 2

Problems in the light of classical *know*-semantics

In chapter 2 I will present the standard Hintikka (1969)-style analysis of *know* as a universal quantifier over possible worlds and discuss existing problems that arise in light of this approach. The aim of this section is twofold: on the one hand, I want to show that the classical theory runs into fundamental problems independent of those discussed in this thesis. On the other hand, this section is intended to establish whether suggestions that were made in the context of other problems can be adopted for the current issue. Thus, I will specifically focus on challenges that are or can be linked to that.

This section is structured as follows: after presenting Hintikka's intensional analysis of *know* as well as relevant background assumptions, I will start with a discussion of the first complex of problems; namely the apparent gradability of attitude verbs that are usually not taken to be gradable expressions at all. Related to that, I will then turn to problems arising from the standard analysis of *believe* as the non-factive version of *know*. Thereafter, I will discuss approaches that relate to the traditional view of knowledge as justified, true belief and illustrate paraphrases for knowledge that are ought to exclude instances of justified, true belief that do not count as knowledge, known as Gettier-problem (see Gettier (1963)).

2.1 Propositional attitudes

The term propositional attitude goes back to Russell (1940) and refers to expressions like *know*, *believe*, *regret*, *hope*, *remember* and many more. Such verbs embed propositional complements as illustrated for *know*, *believe* and *regret* in the examples in (1) that are usually referred to as attitude reports:

- (1) a. Frido knows that autumn is coming.
- b. Bonni believes that her turtle escaped.
- c. Leif regrets that he didn't adopt a puppy.

The need for a special treatment of such verbs comes from different puzzles arising in the light of these expressions that are roughly related to the observation that the interpretation of a sentence in the scope of an attitude verb frequently differs from its usual interpretation. One such puzzle is known as Frege's

puzzle about propositional attitude reports (Frege (1892)), which – following Zalta (2020) – can be illustrated as follows. The syllogism in (2) is logically valid, i.e. given that identity holds between the two names 'Mark Twain' and 'Samuel Clemens', they can be substituted by each other without that substitution affecting the truth of a simple sentence as (2-a):

- (2) a. Mark Twain was an author.
 b. Mark Twain = Samuel Clemens.
 c. Therefore, Samuel Clemens was an author. Zalta (2020)

However, the same doesn't hold for sentences in the scope of an attitude verb as *believe*. This is illustrated in (3), where the conclusion in (3-c) – given the validity of the identity relation in (3-b) – doesn't necessarily follow from the arguments in (3-a) and (3-b). Thus, John could for example be unaware of the identity of Mark Twain and Samuel Clemens and therefore may not hold any beliefs about Samuel Clemens.

- (3) a. John believes that Mark Twain wrote Huckleberry Finn.
 b. Mark Twain = Samuel Clemens.
 c. #Therefore, John believes that Samuel Clemens wrote Huckleberry Finn. Zalta (2020)

Furthermore, whereas the unembedded sentence in (4-b) is true iff Henry is a spy, (4-a) can be true independent of the truth of the embedded sentence 'Henry is a spy'.

- (4) a. George believes that Henry is a spy. Fintel & Heim (2011)[p.19]
 b. Henry is a spy.

From a formal semantic perspective, the approach of Hintikka (1969) constitutes a breakthrough in this connection. The basic idea laid out in Hintikka (1969) is that a sentence as (4-a), unlike (4-b), doesn't state something about the actual world, but is rather a statement about how the world is like according to George. Thus, (4-a) is intuitively speaking true, given the embedded proposition is compatible with George's beliefs; i.e. it is true in all of his belief worlds (for an explicit semantics of *believe* see section 2.3.1). Hintikka (1969) applies this idea to every propositional attitude verb by arguing that all such verbs express relations between individuals, i.e. the attitude holder, and propositions.

According to this idea, different attitudes are connected to different accessibility relations, which are defined as binary relations on possible worlds that belong to an agent, i.e. the attitude holder (*a*). Accessibility relations are subsets of the set of ordered pairs of possible worlds. If a world w' is accessible from w relative to an agent a , w' is indistinguishable from w according to a . A possible notation for this relation is ' $w \in R_a(w)$ ', $R_a(w)$ being the set of worlds accessible from w relative to a :

$$(5) \quad R_a(w) := \{w' \in W : \langle w, w' \rangle \in R_a\} \quad \text{Rendsvig \& Symons (2019)}$$

Thus, $R_a(w)$ is a set of worlds that is defined relative to an agent and a world and is dependent on the particular attitude. In the case of *believe* or *know* for example, the accessibility relation gives us the set of ordered pairs of worlds such that a subject considers the second element of each pair as a candidate

for the actual world in the world of evaluation. On the other hand, in the case of *hope*, this relation yields a different set of worlds. Namely, a set containing those pairs of worlds where every second element of these pairs is such that the agent wishes that this world corresponds to the actual world.

Hintikka's idea to explain attitudes with the aid of differently defined accessibility relations allows a unified analysis of attitude verbs. As I am primarily concerned with *wissen*, or rather use this propositional attitude verb as point of departure, I will now turn to a detailed discussion of the intensional analysis of *know* along the lines of Hintikka (1969).

2.2 Standard Hintikka (1969)-analysis of *know*

As shown in section 1.1 and repeated below in (6), the attitude verb *know* as well as *wissen* can take three different types of sentential complements¹, namely declaratives, (6-a), wh-interrogatives, (6-b) and polar-questions, (6-c):

- (6)
- a. Die Martha weiß, dass der Frido Bäcker ist.
The Martha knows that the Frido baker is
Martha knows that Frido is a baker.
 - b. Die Martha weiß, wer den riesigen Kuchen gebacken hat.
The Martha knows who the giant cake baked has.
Martha knows who has baked the giant cake.
 - c. Die Martha weiß, ob der Ralf den riesigen Kuchen gebacken hat.
The Martha knows if the Ralf the giant cake baked has.
Martha knows whether/if Ralf has baked the giant cake.

Usually, the declarative construction, $know_{DECL}$, is taken as basic, whereas the other occurrences are derived from this (Karttunen (1977)). As discussed above, according to Hintikka (1969) $know_{DECL}$ denotes a relation between the referent x of the matrix subject and the content of the embedded clause p . This relation is such that it requires that x believes p , meaning that p holds in all of x 's doxastic alternatives in w , $Dox_{x,w}$ being the set of all worlds compatible with what x believes in w . In other words, it has to be the case that in every world that x considers a candidate for the actual world, p is true. To illustrate this, let's assume that Martha believes the three propositions p , q and r in a world w , illustrated in (7-a) and that she is agnostic w.r.t. the propositions s , t and u , illustrated in (7-b):

- (7)
- a. Martha's beliefs: Ralf is coming to the party (p), Bella is coming to the party (q), Rita is coming to the party (r)
 - b. Propositions Martha is agnostic to: It is sunny (s), Konrad is coming to the party (t), there will be a cake at the party (u)

Thus, any world in which the propositions that Martha believes are the case are such that she considers this world as candidate for the actual world. Regarding the model in (8) and under the simplified assumption that Martha believes only the propositions in (7-a) and nothing else, this yields w_1 , w_3 , w_4 and w_5 as actual world candidates according to Martha. Propositions to which Martha is agnostic can vary w.r.t. whether they are true or not across her belief worlds.

¹I will ignore infinitives and DPs for the moment.

- (8) a. w1: p, q, r, s
 b. w2: s, t, u
 c. w3: p, q, r, s, u
 d. w4: p, q, r, s, t, u
 e. w5: p, q, r
 f. w6: s, u

Now, why is it the case that a proposition has to be true in every world compatible with one's beliefs in order to ascribe knowledge, and not, say, only in some or most? If this was the case, (9), illustrated for German *wissen*, was predicted to be fine, which it is obviously not:

- (9) #Die Martha weiß, dass der Ralf einen Welpen hat, sie hält es aber auch für möglich,
 The Martha knows that the Ralf a puppy has she considers EXPL. but also for possible
 dass er keinen Welpen hat.
 that he no puppy has
 Martha knows that Ralf owns a puppy, but she considers it also possibly that he doesn't have a
 puppy.

This means that given usual circumstances, if a subject has knowledge w.r.t. a certain proposition, the subject doesn't consider it possible that not-*p*. Thus, when we talk about knowledge, we state something about all – not some or most – belief worlds of an individual. According to Hintikka's idea, the attribution of knowledge to an individual leads to a bipartition of all possible worlds: i) worlds that correspond to the attitude in question, and ii) such that are incompatible with it.² Therefore, based on Hintikka, *know* is analysed as a universal quantifier over possible worlds.

A further ingredient that is needed in order to formulate a standard lexical entry for *know/wissen* is the factivity presupposition, i.e. the requirement that the proposition embedded under *know* is the case, thus true (see Kiparsky & Kiparsky (1970)). This can be illustrated based on the contrast between *know* and *believe* in (10). Whereas *know* triggers such a presupposition, *believe* doesn't; thus it follows from (10-a) that the embedded sentence is true, but not from (10-b):

- (10) a. Pina knows that Tom owns a puppy. \Rightarrow Tom owns a puppy.
 b. Pina believes that Tom owns a puppy. \nRightarrow Tom owns a puppy.

The diagnosis that this truth requirement is indeed a presupposition and no other form of entailment, i.e. an assertion, can be shown based on its projection behaviour: whereas presupposed content projects, e.g. is preserved under negation, asserted content does not (Langendoen & Savin (1971)). This becomes evident when applying this negation-test to the sentence in (10-a) containing *know* as well as a sentence containing *true*, which is an example of a predicate that entails the truth of its complement by asserting and not by presupposing it. Whereas the truth of the complement is preserved in the case of *know*, as 'Tom owns a puppy' follows from the unmodified as well as the negated version in (11-a+b), this entailment is lost when *true* is negated, (11-c+d):

²This bipartition on the set of possible worlds is claimed to hold for any propositional attitude; Hintikka (1969) lists the following attitudes in this connection: knowledge, belief, memory, perception, hope, wish, striving and desire.

- (11) a. Pina knows that Tom owns a puppy. \Rightarrow Tom owns a puppy.
 b. Pina doesn't know that Tom owns a puppy. \Rightarrow Tom owns a puppy.
 c. It is true that Tom owns a puppy. \Rightarrow Tom owns a puppy.
 d. It is not true that Tom owns a puppy. \nRightarrow Tom owns a puppy.

The last ingredient that needs to be discussed before stating a version of the classical lexical entry for *wissen* is the notion of evidence included in the classical view of knowledge as justified, true belief (which I will deal with in more depth in section 2.3.4). As I will discuss this requirement in detail in section 4.1, I motivate the requirement of having enough evidence only briefly based on the contrast of the example-scenario pairs in (12). Whereas the knowledge ascription in (12-b) is infelicitous in light of the scenario in (12-a), it is felicitous in the scenario in (12-c), illustrated in (12-d):

- (12) a. Scenario A: It's Christmas. Pina just woke up and didn't look outside the window yet. Since she was born, it has always been snowing on Christmas day. Thus, when her brother asks her whether she believes it to be snowing, her answer is yes. The brother reports:
 b. #Die Pina weiß, dass es schneit.
 The Pina knows that EXPL. snows
 Pina knows that it is snowing.
 c. Scenario B: It's Christmas and Pina just woke up. She looks out of the window and sees snowflakes whirling around and children building snowmen all around the house. Her brother who watched her, reports:
 d. Die Pina weiß, dass es schneit.
 The Pina knows that EXPL. snows
 Pina knows that it is snowing.

(12-b) is infelicitous because Pina's reasons in (12-a) for believing the proposition in question don't count as sufficient evidence in order for her belief/assumption to qualify as knowledge. This is independent of whether her assumption turns out to be true or not. Pina's reasons for believing the proposition in question according to (12-c) on the other hand, count as good enough evidence in order to speak of knowledge – gaining insights via direct perception is usually a proper way of forming knowledge. Therefore, whereas Pina lacks proper evidence in the scenario in (12-a) and hence the knowledge ascription in (12-b) fails, (12-d) is valid as Pina is indeed having genuine evidence for the proposition in question according to the scenario in (12-c).

Finally, combining all necessary ingredients discussed above yields the lexical entry in (13) for *wissen*_{DECL}:

- (13) $[[wissen_{DECL}]]^w = \lambda p. \lambda x : p(w) = 1 . \forall w' \in Do_{x,w} (p(w') = 1) \ \& \ x \text{ has enough evidence for } p \text{ in } w$

(14-b) illustrates the semantics of *wissen*_{DECL} based on the example in (14-a):

- (14) a. Die Pina weiß dass es schneit.
 The Pina knows that EXPL. snows
 Pina knows that it is snowing.

- b. Pina weiß dass es schneit in $w = 1$ iff
 - 1) it is snowing in w ,
 - 2) for all worlds w' that are compatible with what Pina believes in w it is the case that it snows in them,
 - 3) Pina has enough evidence for the proposition 'it is snowing' in w .

2.2.1 Deriving *wissen* in question embedding contexts

As illustrated in (6) and repeated below in (15), *wissen* embeds not only declaratives but also wh-interrogatives, (15-a), as well as polar questions, (15-b):

- (15) a. Die Martha weiß, wer den riesigen Kuchen gebacken hat.
 Martha knows who the giant cake baked has.
 Martha knows who has baked the giant cake.
- b. Die Martha weiß, ob der Ralf den riesigen Kuchen gebacken hat.
 Martha knows if the Ralf the giant cake baked has.
 Martha knows whether/if Ralf has baked the giant cake.

wissen_Q, the interrogative embedding construction, is, as pointed out above, usually derived from *wissen_{DECL}* (Karttunen (1977)). The basic intuition that Karttunen captures thereby is that the *wissen*-relation holds between a subject and a question if the subject believes all and only the true answers to the question. Thus, *wissen_Q* resembles *wissen_{DECL}*. Formulated along the lines of Heim (1994), the Karttunen-analysis (adapted to *wissen*) is given in (16):

- (16) for any world w , question-intension q and individual x :
- $$\llbracket \textit{wissen}_Q \rrbracket(w)(q)(x) = 1 \text{ iff}$$
- x believes $\cap q(w)$ in w ,
- if $q(w) = \emptyset$, then x believes $\lambda w' [q(w') = \emptyset]$ in w Heim (1994)[p. 130]

$q(w)$ is a set of propositions, $\cap(q)w$ its intersection. In the case of a constituent question this set contains all true answers to the question, whereas in the case of a polar question $q(w)$ is a unit set with $\cap(q)w$ being its only member. If $q(w)$ is empty, i.e. if there is no true answer to the embedded question, the lexical entry requires, as stated in the last line, that the subject believes that $q(w)$ is empty.

Following the lexical entries for *wissen_{DECL}* and *wissen_Q*, respectively, *wissen* is a quantifier with universal force and therefore should be incompatible with any kind of gradability. (18) illustrates this for universal quantification in the individual domain, namely the universal quantifiers *alle* (*all*) and *jed-* (*each*). Gradability is a property applying for example to gradable adjectives and surfaces for instance as the possibility to participate in comparatives as in (18-a), or combine with modifiers that cause intensification as in (18-c) (see e.g. Kennedy (2007), Lassiter (2014)). (18-b) and (18-d) on the other hand show that the universal quantifiers *alle* and *jed-* can't participate in such constructions, as both sentences are odd³:

³There is a reading that arises in examples as (17) where *alle* and *jed-* indeed seem to get modified in an intensifying way:

- (18) a. Der Franz ist schön, aber der Pius ist schöner.
The Franz is beautiful but the Pius is more-beautiful
Franz is beautiful but Pius is more beautiful.
- b. ??Der Franz hat alle Zähne verloren, aber der Pius hat mehr (als) alle Zähne verloren.
The Franz AUX all teeth lost but the Pius AUX more (than) all teeth lost
Franz lost all his teeth but Pius lost more (than) all his teeth.⁴
- c. Der Pius ist sehr / extrem schön.
The Pius is very / extremely beautiful
Pius is very extremely beautiful
- d. *Der Franz hat sehr / extrem jedes Keks gegessen.
The Franz AUX very / extremely each cookie eaten.
Franz ate very / extremely each cookie.

In the next sections I will deal with properties of *wissen/know* that are seemingly incompatible with or problematic in light of the predictions that arise from the standard treatment of the verb illustrated in (13) and (16).

2.3 Challenges for the standard analysis

I start by summing up relevant discussion threads regarding apparent degree-uses of *know* and questions w.r.t. their implementation (Stanley (2005), Schmitt & Sode (2018)). As these uses are connected to the context sensitivity of knowledge and via this, arguably, to gradable adjectives, I will briefly discuss arguments of epistemic contextualism (e.g. Cohen (1999), DeRose (1995)). After that, I will turn to the semantic distinction between *know* and *believe*. While according to the standard treatment these attitude verbs are semantically equivalent with the exception of *know* being factive (Hintikka (1969), Kiparsky & Kiparsky (1970)), empirical observations suggest that *believe* might be weaker (Hawthorne et al. (2016), Koev (2019)). The semantic differences of these two attitudes are especially interesting in light of the puzzle of this thesis as *glauben* (*believe*) and *wissen* differ w.r.t. the compatibility with *genau* (see section 5.1 for further discussion). Furthermore, I will discuss issues related to the Gettier-problem as well as attempts to solve them that share the crucial property of targeting context sensitivity (Kratzer (2009) and Lewis (1996)).

2.3.1 Context sensitivity and gradability of knowledge ascriptions

Proponents of epistemic contextualism, according to which knowledge ascriptions are context sensitive, have often drawn analogies between *know* and context sensitive, gradable adjectives like *tall*, *cheap* or *flat* (e.g. Cohen (1999) and DeRose (1995); see Ichikawa & Steup (2018) for an overview). Gradable

-
- (17) Der Pius hat wirklich alle Kekse gegessen.
The Pius AUX actually all cookies eaten
Pius ate absolutely all cookies.

However, these examples seem rather to induce a widening of the domain – as discussed for *any* in section 6.5 – than to be ‘genuine’ instance of gradability. I will get back to that in section 6.6

⁴The interpretation that is ruled out here can be paraphrased as *Franz lost all his teeth but Pius lost more of his teeth (than) all his teeth*. Another possible interpretation, where Pius lost his teeth and additionally, say, his hair and his horse can be very well expressed by (18-b) but is not the reading that I am concerned with here

adjectives are considered as context sensitive in so far, as what counts for example as *cheap* depends on the context and is sensitive to the respective reference class. Thus, *cheap* in the context of castles differs from *cheap* in the context of shoes – a cheap castle is usually much more expensive than an expensive shoe (see e.g. Kamp (1975), Kennedy (2007), Solt (2011)).

Context sensitivity of knowledge ascriptions on the other hand concerns for example the observation that knowledge ascriptions contextually differ w.r.t. the degree of strength they are associated with. DeRose (2009) models this for instance by suggesting a general notion of strength of epistemic position and argues that what counts as a strong enough position in order to justify *know* depends on the context. Examples illustrating this are given in DeRose (1992) and sketched below. Given Scenario A in (19), A's assertion in (19-a) appears reasonable:

(19) Scenario A: it's Friday and A and B want to deposit their pay checks at the bank as they do every Friday. From outside they notice long lines inside the bank. A suggests to deposit the checks tomorrow, but B is worried that the bank will be closed on Saturdays. A is convinced that the bank will be open the next day because she was just there two weeks ago on a Saturday and replies:

a. A: No, I know it will be open, I was just there two weeks ago on Saturday. DeRose (1992).[p.913]

On the other hand, given Scenario B in (20), A's reply in (20-a) appears just as reasonable:

(20) Scenario B: It's Friday and A and B want to deposit a large and very important check. From outside they notice long lines in the bank. A suggests to deposit the checks tomorrow, but B is worried that the bank will be closed on Saturdays. A tells B that she is convinced that the bank will be open the next day because she was just there two weeks ago on a Saturday. B reminds A that the paycheck bounces if it wasn't deposited by Monday which would leave A and B in a very bad situation. B also remarks that banks can change their opening hours and asks A whether she really knows that it will be opened tomorrow. A replies:

a. A: Well no, I'd go better in and make sure. DeRose (1992)[p.913]

The examples in (20) and (19) show that the same piece of evidence may in one situation be evaluated as good enough to infer knowledge from it, but in another situation be insufficient. This again seems to be connected to the different severity of consequences that an erroneous belief (here of A) would involve.

Thus, one of the parallels between knowledge ascriptions and gradable adjectives detected by epistemic contextualists can, informally speaking, be put as follows: whether an attitude between an individual and a proposition built on certain pieces of evidence counts as knowledge is dependent on the context just as whether something that costs, say, 1000 euro counts as cheap.

Opposed to this, Stanley (2005) argues against certain versions of contextualism by claiming that *know* lacks a property that is one of the hallmarks of context sensitive adjectives, namely gradability. Manifest-

tations of gradability in the context of adjectives are, as already touched on in section 2.2.1, for example their modifiability by modifiers like *very*, (21-a,) as well as their occurrence in comparative constructions, (21-b):

- (21) a. Tina is very tall.
b. Beth is taller than Bill.

Stanley (2005) argues that despite the fact that *know* is likewise found in such constructions, as for example the modified construction in (22-a) as well as the comparative in (22-b), such examples are no genuine instances of gradability.

- (22) a. Kate knows very well that the blue team is winning.
b. Hannah knows better than anyone that she is poor. Stanley (2005)[p.4]

Accordingly, he claims that *very* in (22-a) is no real semantic modifier of the knowledge relation. This is, among others, motivated by the differing behaviour of such constructions compared to modified adjectives when it comes for example to negation. Thus, whereas embedding *very well*-modified *know* under negation is odd, (23-a), negating modified adjectives is fine, (23-b):

- (23) a. #Kate doesn't know very well that the blue team is winning.
b. Tina is not very tall.

For the comparative case in (22-b) Stanley argues that *better than anyone* is idiomatic, thus is no genuine comparative. Nevertheless, as will be shown below in (24), at least German *wissen* occurs in comparatives more productively. Additionally, even under the assumption that *know* is not gradable in the sense of context sensitive, gradable adjectives, the arguments of Stanley (2005) concern one specific idea of handling the context sensitivity of knowledge, namely along the lines of gradable adjectives. Thus, his objection doesn't contribute to the question of whether knowledge is context sensitive on a more general level. I will now discuss claims related to the specific property of gradability of knowledge (and belief, respectively) and turn to different ideas that relate to the implementation of context sensitivity in section 2.3.4, found in the approaches of Kratzer (2009) and Lewis (1996).

Apart from Stanley (2005), to my knowledge, there are only very few attempts to tackle the relation of gradability and knowledge from a linguistic perspective that try to explain or incorporate certain empirical facts into the theory. Besides Koev (2019), who suggests within his approach of analysing *believe* along the lines of gradable adjectives (to which I will turn below) that *know* makes available a degree argument, I am only aware of one other attempt to implement one of these, albeit restricted, occurrences of *know* in degree contexts found in the account of Schmitt & Sode (2018) to German *wissen*. The configuration discussed here involves German *besser*-modification that can apply to *wissen* with embedded declaratives, illustrated by their example in (24):

- (24) a. Der Frank weiß, dass der Hedde gefährlich ist, aber die arme Viola weiß es noch viel
The Frank knows that the Hedde dangerous is but the poor Viola knows it PRT much

besser.
 better
 Frank knows that Hedde is dangerous, but poor Viola knows it even better. (Schmitt & Sode 2018:p.1106)

Schmitt & Sode (2018)s account departs from data involving German *wissen* with infinitival complements as in (25-a), which are according to the intellectualist view e.g. held by Stanley & Williams (2011) reducible to *wissen* with interrogative complements as in (25-b):

- (25) a. Der Frank weiß sich zu verteidigen.
 The Frank knows REFL. to defend
 Frank knows how to defend himself. Schmitt & Sode (2018)[p.1092]
- b. Der Frank weiß, wie er/man sich verteidigen kann/soll.
 The Frank knows how he/one REFL. defend can/should
 Frank knows how he/one can/should defend him/oneself. Schmitt & Sode (2018)[p.1093]

Schmitt & Sode (2018) on the other hand argue that *wissen* with finite complements is reducible to *wissen* with infinitives and therefore assume that both have the semantic properties of an ability modal. Under this view, 'x weiß p besser als y' ('x knows p better than y') in (24) can roughly be paraphrased as 'x is better acquainted with p than y', which is intuitively an appropriate paraphrase.

Interestingly, *genau* and *gut* (*good*) – the positive form of *besser* – in the context of *wissen* seem to have a similar distribution. Thus, *genau* can likewise occur in comparatives (at least limited – see section 5.2) as suggested by an adaption of the example in (24) where *besser* is replaced by the comparative of *genau* in (26), resulting in a quite similar meaning:

- (26) a. Der Frank weiß, dass der Hedde gefährlich ist, aber die arme Viola weiß es noch viel
 The Frank knows that the Hedde dangerous is but the poor Viola knows it PRT much
 genauer.
 GENAUER
 Frank knows that Hedde is dangerous, but poor Viola knows it even GENAUER.

Likewise, *wissen* can be modified by *gut*, the positive form of *besser* which parallels *genau*-modification of *wissen* with declaratives, (27-b):

- (27) a. Der Frank weiß gut, dass der Hedde gefährlich ist.
 The Frank knows good that the Hedde dangerous is
 Frank knows well that Hedde is dangerous.
- b. Der Frank weiß genau, dass der Hedde gefährlich ist.
 The Frank knows GENAU that the Hedde dangerous is
 Frank knows GENAU that Hedde is dangerous.

Additionally, as will be shown in section 5.1, *genau* can occur as a modifier of several other attitude verbs as well as perception verbs, which are – except for one exception – those verbs that also *gut* and *besser*, respectively, can combine with. This is exemplified for *sehen* (*see*) and *verstehen* (*understand*) in (28-a+b); (28-c) shows that *merken* (*realise*) is compatible with *genau* but not with *gut*, constituting

the only exception I am aware of:

- (28) a. Der Frank versteht, dass der Hedde gefährlich ist, aber die arme Viola versteht es
The Frank understands that the Hedde dangerous is but the poor Viola understands it
noch viel *genauer* / *besser*.
PRT much *GENAUER* / better
Frank understands that Hedde is dangerous, but poor Viola understands it even *GENAUER*
/ better.
- b. Der Frank sieht gut / *genau*, dass der Hedde gefährlich ist.
The Frank sees well / *GENAUER* that the Hedde dangerous is
Frank sees well / *GENAU* that Hedde is dangerous.
- c. Der Frank merkt *genau* / **gut*, dass der Hedde gefährlich ist.
The Frank realises *GENAU* / well that the Hedde dangerous is
Frank realises *GENAU* / *weill* that Hedde is dangerous.

However, there is a crucial difference between *besser* and *genauer* in the context of *wissen*. Whereas *besser* can occur in sentences containing *wissen* with infinitival complements, (29-a), *genauer* cannot, (29-b):

- (29) a. Die Viola weiß den Hedde *besser* abzulenken als der Frank.
the Viola knows the Hedde better to-distract than the Frank
Viola has a better ability to distract Hedde than Frank. Schmitt & Sode (2018)[p.1106]
- b. *Die Viola weiß den Hedde *genauer* abzulenken als der Frank.
the Viola knows the Hedde *GENAUER* to-distract than the Frank
Viola has a *GENAUER* ability to distract Hedde than Frank.

Thus, I think that given *genauer* cannot modify *wissen* in the construction that is actually the main motivator for the analysis suggested by Schmitt & Sode (2018), it is not very promising to adopt the idea that *wissen* with any complement does in fact have the semantic properties of a modal in order to account for the compatibility of *genau* with certain propositional attitude verbs.

However, in light of *genau*-modification of *wissen*, the question whether *wissen* is possibly gradable is crucial. If so, the occurrence of *genau* in such contexts may not be surprising, as the modifier could simply be said to contribute what it is known for in scalar contexts; i.e. point to a precise degree (but see the discussion in section 3.2). Whereas the occurrence of *wissen* in comparative-like constructions as in (28) suggests that *wissen* may indeed be gradable, I will argue against a degree analysis of *wissen* along the lines of gradable adjectives in section 3.4 and claim that examples including *wissen*, where it appears to refer to degrees, are no genuine instances of this form of gradability. Nevertheless, I will end up suggesting a revision of the lexical entry of *wissen* in chapter 7 that indirectly refers to degrees. The intuition that what counts as knowledge is context dependent, illustrated above in (19) and (20), will likewise play a crucial role for my account. Via this, the connection to evidence will be established – even if implemented in an abstract way.

2.3.2 Gradability of *believe*

I will now discuss instances of the propositional attitude verb *believe* in degree constructions. As *believe* is according to standard assumptions analysed as a universal quantifier as well, such uses of *believe* pose a challenge that is possibly connected to the apparent gradability of *know*. The classical analysis for *believe* (based on Hintikka (1969)) differs from the one for *know* only in that it lacks the factivity presupposition; i.e. a declarative complement embedded under *believe* does not have to be true, which is illustrated for German *glauben* in (30):

- (30) a. Der Franz glaubt fäschlicherweise, dass die Petra gewonnen hat.
 The Franz believes wrongly that the Petra won AUX
 Franz wrongly believes that Petra has won.

(30) shows that there is no problem with believing something wrongly, thus the truth of the proposition that is believed can not be a requirement for felicitously uttering a belief ascription. Relatedly, belief ascriptions don't require the same amount/quality of evidence. This is illustrated in (31). Given the scenario, there is no genuine evidence in favour of the possibility that Petra won, though, (31-a) containing *glauben* is completely fine, whereas *wissen* in the same scenario is impossible, (31-b):

- (31) Scenario: Petra participated in a car race. Her friend Franz didn't watch it but is convinced that Petra is a very good driver and therefore thinks that she won. Susi reports:
- a. Der Franz glaubt, dass die Petra gewonnen hat.
 The Franz believes that the Petra won AUX
 Franz believes that Petra won.
- b. #Der Franz weiß, dass die Petra gewonnen hat.
 The Franz knows that the Petra won AUX
 Franz knows that Petra won.

Accordingly, *believe* is analysed as a quantifier with universal force, denoting a relation between the referent x of the matrix subject and the content of the embedded clause p , requiring that p holds in all of x 's doxastic alternatives. This yields roughly the following lexical entry for *believe*:

- (32) $[[\textit{believe}]]^w = \lambda p. \lambda x. \forall w' \in \text{Dox}_{x,w} (p(w') = 1)$

Lassiter (2017), who investigates the question whether some modal concepts are gradable, provides the examples in (33) in order to put the idea forward that *believe* might express a gradable concept:

- (33) a. What do you believe more, that the CIA killed JFK or that the government did 9/11?
 b. I consider myself a feminist and believe very much that many women, like me, excel at entrepreneurship. Lassiter (2017)[p.18]

Just as it was shown for *know* in (22) and (26), *believe* can occur in comparatives, (33-a), as well as with degree modifiers, (33-b), which are typically contexts for gradable adjectives. Whereas Lassiter (2017) doesn't explicitly argue for changes to the classical *believe*-analysis, Koev (2019), building on this, proposes a scalar semantics for *believe* based on Kennedy & McNally (2005)s analysis for gradable adjectives. Adopting Kennedy & McNally (2005)s classification of adjectives depending on the type of

scale they are associated with, Koev (2019) argues that *believe* is a maximum-degree predicate encoding a totally closed scale, thus falling in a class with adjectives like *full*. Since Kennedy and McNally’s argumentation is empirically supported by the distribution of different degree modifiers, the classification of *believe* as maximum-degree predicate builds on its compatibility with modifiers as in (34):

(34) I partially/fully/slightly believe that the end of the world is near.

According to Kennedy, adjectives associated with a totally closed scale can be modified by proportional modifiers as *half* or *mostly*, (35-a), maximum-degree modifiers like *perfectly* are compatible with adjectives encoding either upper-closed or totally closed scales, (35-b), minimum-degree modifiers like *slightly* can occur with adjectives associated with lower-closed or totally closed scales, (35-c). Adjectives like *tall* on the other hand, that are associated with totally opened scales, cannot (or very marginally) occur with either minimum-degree or maximum-degree modifiers, nor with proportional modifiers, (35-d):

- (35) a. half full, partially empty
 b. perfectly certain, perfectly full
 c. slightly bent, slightly empty
 d. *half tall, *perfectly tall, *slightly tall

Adapting the resulting distinction drawn by Kennedy & McNally (2005) between relative predicates – the standard is determined by the context as in the case of *tall* – and absolute predicates – the standard is the maximal or minimal degree as in the case of *full* or *empty* – Koev (2019) reasons that *believe* has an absolute standard: according to (34), *believe* is compatible with minimum, maximum and proportional modifiers, therefore associated with a totally closed scale. He thus adopts the lexical entry proposed for gradable adjectives (see e.g. von Stechow (1984), Kennedy (2015) and Lassiter (2017)) stated in (36), where Cr is a credence function (that encodes a measure of subjective probabilities which he claims to be the solution for the strong/weak belief debate I will briefly discuss in section 2.3.3) and p , d and x are variables over propositions, degrees and individuals:

- (36) a. $\llbracket \text{believe} \rrbracket = \lambda p \lambda d \lambda x . Cr_x(p) \geq d$
 b. $\llbracket \text{pos} \rrbracket^C = \lambda P \lambda x . \exists d [\text{standard}(d, P, C) \wedge P(d)(x)]$

This semantics entails that *believe* is associated with the (fully closed) probabilistic scale $[0,1]$; in unmodified uses the degree argument is filled by the covert morpheme *pos* in (36-b) (adapted from Kennedy & McNally (2005)) where C is a contextually determined comparison class of appropriate objects and which in the case of an absolute predicate like *believe* corresponds to the maximum of the scale, 1.

This degree analysis of *believe* is relevant because a parallel analysis is in principle imaginable for *know* as well, which will be briefly brought up in section 2.3.3 and considered in more detail in section 3.4. Before that, I will now turn to an issue related to the possibility of *believe* to combine with degree modifiers, namely the question whether belief is weak or strong. Within this distinction, the strong-belief-assumption roughly refers to the view that if a subject x believes a proposition p , x doesn’t consider not- p possible, whereas under the weak-belief-assumption, x may believe p while at the same time consider

not-*p* possible. The position that one takes up within this debate obviously has consequences for the question, how far the semantics of *believe* differs from the semantics of *know*. This in turn is related to the question of gradability: if *believe* were as strong as *know*, its gradability would be just as puzzling. Furthermore, as under the strong-assumption the only semantic difference between *believe* and *know* should be factivity, any differences between the two attitudes – for example w.r.t. the extent to which they are gradable – should be relatable to this property. On the other hand, if *believe* was weak, i.e. weaker than *know* and thus doesn't denote a universal quantifier, its combinability with degree modifiers as *slightly* that intuitively indicate rather weak belief could be reflected in a varying amount of belief worlds in which the proposition that is believed, holds.

2.3.3 Is *believe* non-factive *know*?

Skepticism involving the standard assumptions about the lexical entry of *believe* in (34), according to which *believe* has the same force as *know*, namely universal, arises from the intuition that *believe* is somehow weak. Hawthorne et al. (2016) for example argue based on (37-a) that one can believe a proposition *p* without ruling out the doxastic possibility of *p* being false, whereas this is not the case for assertions, as (37-b) is a Moore-paradoxical sentence:

- (37) a. I believe it's raining, but I'm not sure it's raining.
 b. #It's raining but I'm not sure it's raining. Hawthorne et al. (2016)[p. 2–3]

Departing from this, they claim that the standards for belief are weaker than those for assertions and therefore weaker than those for knowledge. Arguments in favour of their view come from the comparison of *believe* with weaker epistemic states suggesting that *believe* is as weak as at least some of them. One such weaker epistemic state is *have the opinion*, for which they give the example in (40-a), suggesting that *believe* is of the same strength, as contrasting *believe* and *have the opinion* is odd. They further claim that *believe* might even be as weak as *suspect*, but only give the example in (40-b) in support of this, where *suspect* is contrasted with *think*, for which they report that at least some people find it odd (indicated by a single question mark). They claim that to be a valid argument because they assume *believe* and *think* to be of the same strength, which they motivate with (40-c), that is according to them contradictory⁵.

- (40) a. ??Tim is of the opinion that it will rain, but he doesn't go so far as to believe that it will.
 b. ?Tim doesn't actually think that John stole the painting, but he suspects that he did.
 c. ??Tim thinks it's raining, but he doesn't believe that it is. (Hawthorne et al. 2016:p. 5-6)

⁵Additionally, the fact that *believe* gives rise to neg-raising (see Fillmore (1963)), meaning that an utterance of the form 'x doesn't believe that p' often conveys 'x believes that not p' is taken as support for their claim as this behaviour tends to occur with weak mental states rather than with strong. This is illustrated in (38)

- (38) Tim doesn't believe that he will win the race. \rightsquigarrow Tim believes that he will not win the race.

in (38), the negated belief ascription ('not believing p') entails that the subject believes not-p ('believing not-p'). *know* on the other hand, behaves differently w.r.t. that respect, i.e. doesn't give rise to neg-raising, as shown in (39):

- (39) Tim doesn't know that he will win the race. $\not\rightsquigarrow$ Tim knows that he will not win the race.

Koev (2019) on the other hand, although arguing against the standard semantics of *believe* by claiming that it lacks predictions regarding the commitment strength that the referent of the matrix subject has to have towards the content of the embedded clause in order to use bare *believe*, argues for *believe* to be strong. He notes that although the classical lexical entry states that the embedded proposition is true in all belief worlds of the attitude holder, it does not specify what degree of certainty this belief-relation actually requires; i.e. whether it is sufficient to find something likely or the attitude holder rather has to be certain about a specific state of affairs in order to believe it. Koev (2019) points out that both options can get empirical support in principle as examples as (41-a) can – depending on the context – receive both interpretations:

- (41) a. Beth believes that it is raining.
 b. Context A: Beth is inside a building without windows and without any evidence w.r.t. the weather situation outside. Toni, who knows Beth’s situation, asks her to guess what the weather is like and as it is November, Beth guesses that it is raining.
 c. Context B: Toni asks Beth what the weather is like and Beth replies that it is raining.

Koev reasons that if *believe* can express a guess and a strong belief with conviction likewise, there are three options regarding the analysis: i) the weak reading is the basic one and the strong reading is somehow derived, ii) the strong reading is the basic one and the weak reading is somehow derived or iii) *believe* is lexically ambiguous between a strong and a weak reading. Based on the fact that the strong reading entails the weak reading and the contradiction that a sentence like *I believe_{weak} that it is raining but I don’t believe_{strong} it is* produces, Koev (2019) argues against the ambiguity option. Therefore the remaining options are the strong view, according to which the attitude holder regards the believed proposition *p* as true, and the weak view, following which the subjective probability that *p* is true is above some contextually specified threshold. Koev (2019) goes for the latter option, i.e. assumes that *believe* is strong. Among others, he motivates this decision by the lack of systematic quantity implicatures illustrated in (42-b), arising from sentences as (42-a):

- (42) a. Beth believes that kittens need their mother.
 b. ↗ Beth is not fully convinced that kittens need their mother.

The argument is that if *believe* was weak, the implicature that the attitude holder is *not fully convinced* exemplified in (42-b), should arise from *belief* reports, which is not the case. As further evidence in favour of the strong view, Koev (2019) provides examples showing that *believe* is closed under conjunction with respect to its internal argument. Closure under conjunction is a typical property of strong modals and refers to the observation that sentences containing such modals, as *be certain* in (43-b), license an entailment of the form illustrated in (43-a), where *M* ranges over modals and *p* and *q* over propositions, spelled out in (43-c):

- (43) a. $M(p) \wedge M(q) \models M(p \wedge q)$
 b. It’s certain that Sean is in Rome and it’s certain that he is catholic.
 c. \models It’s certain that Sean is in Rome and that he is catholic.. Koev (2019)[p.7]

The same holds for *believe*. The sentential conjunction in (44-a) of two belief ascriptions to the same

attitude holder entails (44-b) where the embedded propositions are coordinated and embedded under one occurrence of the attitude verb:

- (44) a. Kora believes that polar bears are endangered and she believes that they can weigh half a ton.
 b. \models Kora believes that polar bears are endangered and can weigh half a ton.

Regarding examples as those in (37) put forward by Hawthorne et al. (2016), Koev (2019) argues that they don't show something about the basic strength of the attitude, but rather about the public commitment. He therefore distinguishes subjective certainty, which is privately held and strong, from objective certainty, which is publicly expressed, needs to be supported by evidence and can at the same time be weak (objective certainty is measured by the probability function Pr – a more conservative version of Cr). He argues that the intuition of weakness that can arise in *believe*-sentences results from a particular scalar inference caused by the presuppositionally stronger alternative *know*, for which he assumes the lexical entry in (45). According to that, *know* it is truth-conditionally equivalent to *believe* and differs from the presuppositionally weaker alternative only in that it includes a factivity presupposition. In unmodified uses the degree argument is again filled by the covert morpheme *pos* in (45-b).

- (45) a. $\llbracket \text{know} \rrbracket^w = \lambda p \lambda d \lambda x : p(w) \cdot Cr_{x,w}(p) \geq d$
 b. $\llbracket \text{pos} \rrbracket^c = \lambda P \lambda x. \exists d [\text{standard}(d, P, C) \wedge P(d)(x)]$

The scalar inference that Koev (2019) suggests is based on the idea of presupposition-based scales (e.g. Percus (2006)), Chemla (2008), Schlenker (2012)). This again goes back to Hawkins (1991), who argues that the indefinite *a(n)* and the definite article *the* share an entailment, while *the* additionally introduces an implication of uniqueness which is according to him a regular entailment. Hence, Hawkins (1991) assumes the entailment-based lexical scale $\langle a(n), the \rangle$. Heim (1992) on the other hand suggests that this alleged uniqueness implication is a presupposition rather than an entailment, as the non-uniqueness inference of the indefinite arises through competition with a presuppositionally stronger lexical item. She derives this via the principle of Maximize Presupposition: if two truth conditionally equivalent sentences compete and one is presuppositionally stronger, it is preferred, given the presuppositions are met. Koev (2019) thus adopts the presupposition-based scale $\langle believe, know \rangle$ for which it is assumed that *know* only differs from *believe* in so far as it includes a factivity presupposition. Thus, following Heim (1992), the usage of *believe* implies that the presupposition associated with *know* is not (certainly) met.

Koev (2019) reformulates this idea in terms of an antipresupposition (adopted from Percus (2006)) that *believe* gives rise to, illustrated in (46):

- (46) a. Actual utterance: John believes it's raining.
 b. Alternative utterance: John knows it's raining.
 c. Antipresupposition: It's not certain that it's raining. Koev (2019)[p.13]

Koev (2019) suggests that this antipresupposition should be derived via a covert exhaustivity operator that captures the idea of Maximize Presupposition but can occur in subordinate clauses and thus generate presuppositions locally. The occurrence of such antipresuppositions, hence the weak reading, is accord-

ing to Koev (2019) limited to particular contexts, namely to such where the belief attribution itself is not relevant to the question under discussion (see (47)). To account for this, he assumes that the set of alternatives that underlies the exhaustivity operator is limited to non-relevant propositions, i.e. such that don't provide a partial answer to the question under discussion (see e.g. Groenendijk & Stokhof (1984)).

As suggested by the lexical entry in (45-a), Koev (2019) (tentatively) assumes that *know* also makes available a degree argument. However, he does so only based on the felicitousness of examples like 'He knows very/quite well that I don't like alcohol' and without further consideration, stating that it has no consequences for his analysis. Although, even without the assumption of the presence of a degree argument in the lexical entry of *know*, i.e. under the assumption that $Cr_{x,w}(p)=1$ in (45-a), *know* and *believe* in its unmodified versions are according to Koev semantically equal, the only difference being the factivity presupposition. Crucially, as will be discussed extensively in section 5.1, *genau* can attach to *wissen* but not to *glauben* (*believe*). Therefore, assuming Koev's semantics for the two expressions, the compatibility of the modifier should be related to factivity. However, this hypothesis is flawed given the fact that not every verb including a factivity presupposition is compatible with *genau*, as for example **Die Babsi hat genau vergessen, dass es regnet* (*Babsi GENAU forgot that it is raining*) is out (see section 5.1 for discussion).

In light of this, I will not pursue Koev (2019)'s degree analysis of attitude verbs further. Additionally, I think that his analysis of *believe* as subjective but strong runs into independent problems. On the one hand, Koev argues for not putting the apparent weakness of *believe* in its lexical entry based on the claim that weakness can only arise if the belief attribution itself is not relevant in the current discourse. In this contexts he provides the examples in (47) and claims that it is odd to be uncertain w.r.t. one's own belief if it is specifically asked what kind of belief one holds, (47-c-d), whereas it is possible, if the question under discussion rather relates to 'belief-contents', (47-a-b):

- (47) a. Q: Is capitalism better than socialism?
 b. A: I believe so (but I'm not sure).
 c. Q: Tell us about your political beliefs.
 d. A: I believe capitalism is better than socialism (?but I'm not sure). (Koev 2019:p.9)

First, I think that (47) doesn't really show what Koev (2019) suggests, as the question in (47-c) seems to be rather about a conviction than about a belief. German *glauben* in its seemingly weak version is for example completely fine in contexts where the belief itself is under consideration, as shown in (48):

- (48) Given an unstable weather situation as well as conflicting forecasts, a group of friends is discussing whether they should go hiking on the next day. According to one forecast there should be a storm, a second one says it's gonna be sunny, and a third one predicts heavy rain. Alma asks Tom, who didn't utter an opinion yet:
 a. Q: Tom, tell us about your beliefs w.r.t. tomorrow's weather situation.
 b. A: Ich glaube, dass es regnen wird, aber ganz sicher bin ich natürlich auch
 A: I believe that EXPL. rain will but completely sure am I obviously also
 nicht.
 not

A: I believe it will rain, though I am not completely sure.

My second concern relates to Koev's consequent suggestion that belief is subjective but strong, meaning that whereas the subjective certainty that is built in the lexical entry is 1 (in unmodified cases), the objective certainty that enters via an antipresupposition is at the same time below a certain threshold. This lexically not-encoded and relatively low objective certainty is again what distinguishes *believe* or *think* (which according to him has the same semantics as *believe* besides lacking a degree argument) from *certain*, which lexically encodes objective certainty above a certain threshold.

Accordingly, Koev (2019) claims that a belief ascription of the form 'x believe/s that it is raining' can, depending on the referent of the subject, be paraphrased as follows: 'the belief-holder is subjectively certain that it is raining but the speaker lacks appropriate evidence for this being the case' (subject in third person); or 'the speaker is subjectively certain but is not committed to it being the case that it is raining, presumably because she lacks sufficient evidence to back up her claim' (subject in first person). Assuming that German *glauben* and English *believe* do not fundamentally differ, I claim that this split of subjective certainty and non-verifiability is problematic in several respects: first, it is not the case that subjective certainty is present in any context including a weak use of *glauben* – e.g. what is uttered in (48-b) is more a tendency than subjective certainty. Second, the shift of the objective certainty from the attitude holder to the speaker in the case of third person subjects seems flawed, as it might very well be the case that the speaker has in fact appropriate evidence that only the attitude holder lacks. This is demonstrated in (49) where the speaker reports someone else's belief while simultaneously committing to the truth of the content of the attitude holder's belief :

- (49) Der Karli glaubt, dass sein Freund ihn verlassen wird und leider weiß ich, dass
The Karli believes that his boyfriend him leave AUX and unfortunately knows I that
das stimmt.
that correct
Karli believes that his boyfriend will leave him and unfortunately I know that he will.

Finally, I think that Koev's way of differentiating between *believe* and *certain* – which according to him encodes objective certainty – is not right as (50) seems fine, both in English and in German:

- (50) Die Bella ist sicher, dass es morgen regnet, aber ich habe für diese Behauptung nicht
The Bella is certain that EXPL. tomorrow rains but I have for this claim nit
ausreichend Evidenz.
sufficient evidence
Bella is certain that it will rain tomorrow, but I lack appropriate evidence for this being the case.

Therefore, if *certain* contained what Koev calls objective certainty, which he claims is absent in the case of *believe* and furthermore responsible for the speaker's uncertainty, the speaker's dissociation from what the belief holder is certain about in (50) shouldn't be felicitous.

The question of the semantics of *glauben/believe* is relevant to this thesis because it is probably the attitude verb that is closest connected to *wissen*, though it isn't compatible with *genau*. Hence, as noted above, whatever differentiates *wissen* from *glauben* is likely to be related to the compatibility with the

modifier. According to the lexical entries of the two verbs provided by Koev (2019), this distinctive feature is factivity. However, I argued above that there are factive attitude verbs that are not compatible with *genau*, which suggests that factivity is not the crucial property responsible for *genau*-modification and might also indicate that there is more to the difference between *wissen* and *glauben* than the factivity presupposition. The objective uncertainty on the other hand, i.e. the weakness that arises according to Koev from *believe* in certain contexts, is obviously also not the property that prohibits *genau* from combining with *genau* as i) this would predict that it is only prohibited in weak uses, which is not the case as *glauben* never occurs with *genau* and ii) given Koev's claim that objective uncertainty is what distinguishes *believe* from *certain*, the latter should be modifiable by *genau*, which it is not (see section 5.1).

I will now turn to the third complex of challenges arising in the context of the semantics of *know* that concerns instances of pseudo-knowledge that a proper analysis has to distinguish from genuine knowledge.

2.3.4 Knowledge as justified, true belief

I will now discuss two accounts that both, by one means or another, address context sensitivity in light of knowledge, namely Kratzer (2001) and Lewis (1996). This is especially interesting for the purpose of this thesis because context sensitivity, as discussed in section 2.3.1, is connected to the idea to have knowledge in various degrees, which is on the other hand perhaps connected to *genau*-modification of *wissen*. These accounts furthermore share the claim to explain certain Gettier-examples.

Before Gettier (1963) knowledge was widely equated to justified, true belief. The motivation for these ingredients is relatively straightforward. First, as already illustrated in section 2.2 in (12) and repeated in (51) below, knowledge cannot be based on guesses or anything the like, as shown by the infelicitousness of (51-b) in the scenario (51-a). Rather, knowledge needs to be based on proper justification, for instance grounded on visual perception as in the scenario in (51-c) in which the knowledge ascription in (51-d) is felicitous:

- (51) a. Scenario A: It's Christmas. Pina just woke up and didn't look outside the window yet. Since she was born, it has always been snowing on Christmas day. Thus, when her brother asks her whether she believes it to be snowing, her answer is yes. The brother reports:
- b. #Die Pina weiß dass es schneit.
The Pina knows that EXPL. snows
Pina knows that it is snowing.
- c. Scenario B: It's Christmas and Pina just woke up. She looks out of the window and sees snowflakes whirling around and children building snowmen all around the house. Her brother, who watched her, says:
- d. Die Pina weiß dass es schneit.
The Pina knows that EXPL. snows
Pina knows that it is snowing.

The second ingredient, truth, enters the classical lexical entry of *know* via the factivity presupposition discussed in section 2.2. (52) illustrates the requirement that the complement of a knowledge ascription has to be true in a simple way. In contradistinction to (30) in section 2.3.2, repeated in (52-a), showing

that *glauben* doesn't require the truth of the complement, *wissen* does and therefore cannot combine with *fälschlicherweise* (*wrongly*), illustrated in (52-b):

- (52) a. Der Franz glaubt fälschlicherweise, dass die Petra gewonnen hat.
 The Franz believes wrongly that the Petra won AUX
 Franz wrongly believes that Petra has won.
- b. #Der Franz weiß fälschlicherweise, dass die Petra gewonnen hat.
 The Franz knows wrongly that the Petra won AUX
 Franz wrongly knows that Petra won.

Belief, the last requirement, refers to the observation that if one stands in a *wissen*-relation to a certain proposition, one has to believe this proposition, which is illustrated by the oddity of (54)⁶:

- (54) a. #Der Franz weiß, dass die Petra gewonnen hat, aber er glaubt es nicht.
 The Franz knows that the Petra won AUX but he believes it not
 Franz knows that Petra won but he doesn't believe it.

Obviously, motivating these suggested ingredients of knowledge – justification, truth and belief – is quite straightforward and seems also reasonable. However, Gettier (1963) objected to this view by constructing examples showing that there are instances of justified, true belief that in fact do not amount to knowledge. One such example is given in (55).

- (55) Scenario: Smith has strong evidence and reason to believe that Jones owns a Ford: he knows that Jones had a Ford for years and just saw him driving one. Smith has another friend, Brown, about whose whereabouts he is completely agnostic. Based on this, Smith can believe the following proposition:
- a. Either Jones owns a Ford or Brown is in Barcelona.

However, if it turns out that unknown to Smith, Jones sold his Ford last year and drove one that he rented and, coincidentally, Brown is in fact in Barcelona, Smith would have justified, true belief w.r.t. the proposition in (55-a). Still, it is claimed that one would not want to judge the proposition in (56) as true.

- (56) ??Smith knows that either Jones owns a Ford or Brown is in Barcelona.

The problem with this type of examples is, intuitively speaking, that the attitude holder, here Smith, has justified, true belief w.r.t. a wrong proposition and simultaneously, by accident, happens to be right regarding a proposition for which he neither has justification, nor does he believe it. However, as a sentence containing a disjunction is usually true if at least one of its conjuncts is true, Smith can properly

⁶There is a certain use of *glauben* which can occur in such constructions without leading to a contradiction. This use of *glauben*, in which it occurs with the ability model *können* (*can*), is illustrated in (53), which merely conveys that the attitude holder finds the content of the embedded proposition especially extraordinary or surprising.

- (53) a. Der Franz weiß, dass die Petra gewonnen hat, aber er kann es (noch) nicht glauben.
 The Franz knows that the Petra won AUX but e can EXPL. (yet) not believe
 Franz knows that Petra won but he can't believe it (yet).

hold the belief in (55) as he is convinced (although wrongly) of the truth of one of the conjuncts. So, in principal, regarding the sentence in (56), all three requirements discussed – justification, truth and belief – are met: Smith holds justified belief w.r.t. the first conjunct, whereas the second conjunct fulfils the last requirement, truth. Nevertheless, again, (56) is in this context reported to be intuitively wrong. Sentences containing disjunctions are by far not the only context were this kind of pseudo-knowledge can be detected; I will bring up some more in the discussion of attempts to correctly exclude such examples from the definition of knowledge below.

Kratzer (2001) aims to rescue the traditional view of knowledge as justified, true belief while avoiding this problem of treating such instances of justified, true belief as knowledge. Embedded in situation semantics she suggests the following paraphrase for knowledge ascription:

- (57) x knows p iff
- a. there is a fact f that exemplifies p,
 - b. x believes p de re of f and
 - c. x can rule out relevant alternatives of f that do not exemplify p.

The first two lines of the definition are intended to circumvent the Gettier-problem sketched above; Kratzer (2001) assumes facts to be particulars, therefore they cannot be equated with propositions. Rather, under this view, facts exemplify propositions, just as individuals exemplify properties. W.r.t. to the example in (55) above that means that the actual fact exemplifying the proposition 'either Jones owns a Ford or Brown is Barcelona' is the fact that 'Brown is in Barcelona'. A fact Smith doesn't have a de re belief about. Knowledge ascriptions of such instances of justified, true belief are thus correctly predicted to be false.

The last condition of the paraphrase concerns justification or reliability. This additional requirement of ruling out alternatives arises from an example of Goldman (2001) which shows that the requirement of believing a proposition de re of a fact that exemplifies *p* is still not enough to exclude certain instances of justified, true belief that do not, intuitively, count as knowledge. Goldman's example is given in (58):

- (58) Scenario: Henry, who has a perfect eyesight, sees a barn alongside the road while driving slowly in a car. Accordingly, one could ascribe the knowledge that there is a barn next to the road to Henry, thus, utter the following sentence:
- a. Henry knows that there is a barn next to the road.

However, receiving the information that Henry, unbeknownst to him, just entered a district full of papier-mâché reproductions of barns which are so deceptively real that anyone would mistake them for real ones, one would want to withdraw the claim that Henry knows that the object under discussion is a barn, even if Henry actually sees one of the few real barns in this district. In this case Henry believes *p* de re of a fact that exemplifies *p* – though, there is something causing hesitation w.r.t. ascribing knowledge to Henry.

Kratzer (2001) argues that questioning the reliability of the method via which knowledge is acquired cannot be on the right track in this case as one wouldn't want to deny the reliability of visual perception.

Therefore, she argues that an additional requirement regarding the method of belief formation is needed and follows Goldman in suggesting that this condition can be stated in terms of a requirement on Henry of being able to distinguish real barn situations from relevant alternatives including fake barns; a requirement that isn't met in the story above. The introduction of relevant alternatives to the notion of reliability, again, can possibly account for vagueness and context dependency in the light of knowledge ascriptions, as what counts as relevant as well as the amount of relevant alternatives that have to be distinguished, can vary with context.

Lewis (1996) also targets Gettier cases within his account of knowledge ascription according to which 'x knows p iff x's evidence eliminates every possibility in which not-p except for those possibilities that can be properly ignored'. A possibility is according to Lewis uneliminated if a subject's entire perceptual experience and memory in that possibility is exactly as they actually are. Thus, eliminating a possibility means that it is ruled out by a subject as candidate for the actual world based on this subject's perceptual experience and memory. Additionally, there is another option to treat possibilities according to Lewis' paraphrase, namely ignoring them. The distinction between eliminating and ignoring possibilities is actually a crucial property of Lewis' account via which he claims to account for the problem that while knowledge is – strictly speaking – never infallible, it is likewise undesired to say that we generally have no or very little knowledge (see section 6.4 for more discussion on what it means to ignore a possibility). Lewis states a bunch of rules that determine which kind of possibilities may or may not be ignored, one of them being the Rule of Resemblance. With this rule, he claims, Gettier problems can be solved. According to the Rule of Resemblance, if one possibility saliently resembles another one and one of those – in virtue of other rules – cannot be properly ignored, the other one cannot be ignored either. To illustrate the Rule of Resemblance, a further rule involved in the treatment of Gettier cases is needed, namely the Rule of Actuality. This rule states that actuality may never be properly ignored. Actuality is according to Lewis that possibility that actually obtains defined relative to a certain subject and at a certain time. Thus, actuality is always uneliminated by the subject's evidence. Now, according to the Rule of Resemblance (if one possibility saliently resembles another one and one of them cannot be properly ignored, neither can the other) any possibility *a* that cannot be eliminated based on the subject's evidence, resembles actuality in that respect. Thus, due to this resemblance and because actuality can never be ignored, *a* cannot be ignored either.

Based on the interaction between the Rule of Resemblance and the Rule of Actuality, Lewis tries to differentiate real knowledge from other cases of justified, true belief that don't count as knowledge. Lewis uses the following Gettier example for his argumentation (slightly modified for reasons of illustration):

- (59) Scenario: Paul saw Nogot drive a Ford and thinks now that Nogot owns one, while Nogot rented the car and doesn't own a Ford. Havit on the other hand owns a Ford, a fact that Paul doesn't know as he has never seen Havit driving one, but rather has seen him taking the tram.
- a. Paul's justified, true belief: Nogot or Havit owns a Ford.

Just as in other Gettier examples, it is argued that while Paul may have the justified, true belief in (59-a) according to the scenario in (59), he doesn't have proper knowledge but is rather right by accident. Lewis

argues that this follows from his account: Paul can't have proper knowledge because the possibility *A* that Nogot drives a Ford he doesn't own and Havit neither owns nor drives one is uneliminated. However, this possibility has to be eliminated as it resembles actuality and, as illustrated above, a possibility that resembles actuality cannot be properly ignored as per the Rule of Actuality and the Rule of Resemblance. Lewis argues that possibility *A* resembles actuality perfectly w.r.t. to Nogot – he actually drives a car he doesn't own – and well w.r.t. Havit, since it matches actuality i) with respect to Havit's behaviour of taking the tram and not driving a car, and ii) with respect to the general connection between this behaviour and having no car.

Via the same ratio Lewis claims to exclude the barn-example of Goldman (2001), that Kratzer (2001) rules out independently from standard Gettier examples: as per the Rule of Resemblance, Henry may not properly ignore the possibility that he is in fact seeing a papier-mâché reproduction of a barn, as this possibility resembles actuality well given the ratio between fake barns (many) and real barns (few) in this district. Lewis additionally mentions another frequently debated construct in the literature on knowledge ascription in this context, the lottery paradox, and states that it is explainable via the Rule of Resemblance as well. The lottery paradox concerns the fact that no matter how tiny the chances that one's own ticket wins might be (say for example 1:1000 in the case of 1000 tickets) and no matter how sure one is that one will lose, one cannot truthfully utter *I know that I will lose*. Lewis' story to differentiate lottery cases from knowledge goes like this: for every ticket there is a possibility that it will win. All of these possibilities are saliently similar to each other and can therefore either all be properly ignored or none of them may. Nevertheless, one possibility, namely the one that actually obtains can never be ignored – therefore this possibility can neither be eliminated nor ignored and Lewis' paraphrase for knowledge ascription is not met in this context.

Although Lewis' account is not formalised and therefore leaves open several questions w.r.t. possible implementations, his fine grained observations are highly relevant in light of the issue of this thesis. Especially his rules for ignoring possibilities, more precisely the different types of rules, will turn out to be crucial in the light of the approach laid out in chapter 7. Likewise, Kratzer (2001)s suggestion of an additional requirement according to which relevant alternatives have to be distinguished from actuality is conceptually reminiscent to what I will suggest in chapter 7 as the component the modifier manipulates.

2.4 Summary

In this section I presented and discussed the classical lexical entry of English *know*, adapted for German *wissen*. After introducing the traditional view, I pointed to three different types of challenges for such an analysis: first, the apparent gradability of verbs that supposedly denote a universal quantifier, thus should be fixed in its force once and for all. Second, the related issue arising from the treatment of the seemingly weaker attitude *believe* as more or less semantically equivalent to *know* – if those attitudes indeed only differed w.r.t. factivity, the relatively productive use of *believe* in constructions typical for gradable expressions remains puzzling. That there might be more to the difference between *wissen* and *glauben* is also supported by the distribution of *genau* which cannot be reduced to factivity. Third, I dis-

cussed different instances of pseudo-knowledge that have to be distinguished from genuine knowledge that are, some in a broader sense, connected to the Gettier-problem and presented two accounts that deal with context sensitivity of knowledge.

In the context of the first complex of problems I discussed Schmitt & Sode (2018) who deliver an alternative analysis for German *wissen* based on its compatibility with infinitival complements that also includes a brief discussion of *besser*-modification of *wissen*, i.e. *wissen* in comparative constructions. As such constructions can be also – at least limited – realised with *genauer*, I considered the possibility of adapting their analysis. However, I discarded it, roughly because *genauer* cannot occur in infinitival constructions which is the point of origin of that analysis. After that, I brought up the potential gradability of *believe* as a related challenge and presented Koev (2019)s analysis of *believe* along the lines of gradable adjectives. Related to that, I discussed the question regarding the strength of *believe*, a question that is connected to that of the semantic differences between *believe* and *know*. In this context, I argued that the semantic contribution of *genau* in light of Koev (2019)s assumption that *believe* is subjective but strong? would have to be related to factivity, which I discarded based on the empirical fact that the modifier is not compatible with every factive propositional attitude verb. Additionally, I pointed to some independent shortcomings of Koev’s analysis that are mainly connected to his distinction between subjective and objective certainty. The discussion of the third complex of problems, i.e. issues related to the Gettier-problem targeted in Kratzer (2001) and Lewis (1996), revealed interesting insights w.r.t. the consideration of alternatives. Whereas Kratzer (2001) includes alternatives to the conditions associated with knowledge ascriptions by stating the requirement that the attitude holder has to be able to exclude relevant alternatives of the proposition in question, Lewis (1996) provides certain rules based on which relevant and not-relevant alternatives can be distinguished.

The aim of this section was to present the classical view of *know* as a universal quantifier as well as existing problems that arise in the light of this. Thus, I discussed different issues as well as alternative accounts that have been pointed out and brought up in the literature on attitude verbs. Based on this, I will now turn to a brief description of the main puzzle dealt with in this thesis, namely, *genau*-modification of *wissen*, and argue that it poses a further problem for the traditional analysis. Thereafter, I will discuss existing work w.r.t. the modifier’s function in the context of scalar expressions in order to figure out whether these can be – even if only partially – adapted for the semantic contribution of *genau* in the context of propositional attitude verbs.

Chapter 3

Genau-modification

In chapter 2 I collected and discussed weak spots of the standard semantics suggested for *know* and *wissen*, respectively, as well as the presumably related propositional attitude verb *believe*. It turned out that although the traditional analysis cannot capture every property of the semantics of such verbs and a refinement concerning different aspects is needed, the Hintikka (1969)-style analysis doesn't seem to have serious competitors, in so far as it is still widely taken for granted.

In this section I will present a further challenge for the classical view of *know* that concerns the compatibility of its German counterpart *wissen* with the modifier *genau* (*exactly*) that is usually associated with expressing precision when modifying number words. (1) below is a repetition of example (1) from chapter 1, that shows the modifier in one of its usual uses where it modifies a numeral, (1-a), as well as in the use that I am concerned with, namely the modification of *wissen* in declarative embedding contexts, (1-b):

- (1) a. In diesem Haus gibt es genau zehn Zimmer.
In this house gives it exactly ten rooms
There are exactly ten rooms in this house.
- b. Die Paula weiß genau, dass der Hans die Bank ausgeraubt hat.
The Paula knows GENAU that the Hans the bank robbed has
Paula knows GENAU that Hans robbed the bank.

There are two questions immediately arising from this observation: i) what does it mean if 'x weiß genau dass p' ('x knows GENAU that p')? and ii) if *wissen* is a universal quantifier, how should it combine with a modifier like *genau*, that is usually associated with modifying precision? Within this section, I will treat the first question only roughly, the second one not at all. The question what *genau* exactly adds to bare *wissen* will be investigated more explicitly in chapter 5, the related issue of how such a modification could be compatible with the semantics of the attitude verb will be tackled in chapter 7. However, before getting there, this section will focus on classical uses of *genau* and the question in how far insights arising from this discussion can be adapted for *genau* modifying *wissen*.

Intuitively, what the modifier adds to the unmodified construction is that the relevant attitude holds to specifically high degree, which is illustrated in the dialog in (2):

- (2) Scenario: Lutz and Berta are discussing whether Fini is coming tonight. Berta told Lutz that the answer is yes because her friend Maria knows that Fini is coming. Lutz is still skeptical, because he thought that Fini was in the South Sea. Berta says:
- a. Die Fini ist nicht in der Südsee, die Maria weiß genau, dass sie heute kommt.
The Fini is not in the South-Sea, the Maria knows GENAU that she today comes
Fini can't be in the South Sea, Maria knows GENAU that she is coming today.

Very roughly, *genau* seems to be used in (2-a) to convey that the knowledge that Maria has extra strong, such that Berta is convinced that anything that contradicts the content of Maria's knowledge is wrong. According to the first intuition, this high certainty must somehow be caused by extra strong or reliable evidence, the attitude holder is building her knowledge on. Before diving deeper into this question of which semantic component of the verb the modifier may modify and how this can be implemented, I will first turn to an examination of the modifier in other, more prototypical contexts. Although the modification of number words is by far not the only other context where *genau* appears (see section 3.1), I am not aware of any work that deals with the modifier in other contexts, besides from small remarks and König (1991) who deals with German *genau* in a use as focus particle. Similar to *wissen*, where most existing approaches are tailored for the English version *know*, I am not aware of literature dealing with German *genau* in scalar contexts from a formal semantic perspective. Therefore, I will discuss different approaches to the English modifier *exactly* in the following. Before that, I will provide an overview about the general distribution of *genau*.

3.1 Distribution of German *genau*

The most prominent use of German *genau* – at least the one most often examined in formal semantic literature – is as a precision modifier of scalar expressions, illustrated in (3-a) (repeated from (1-a)) and (3-b):

- (3) a. In diesem Haus gibt es genau zehn Zimmer.
In this house gives it exactly ten rooms
There are exactly ten rooms in this house.
- b. Der Bus kommt in genau sechzehn Minuten.
The bus comes in exactly sixteen minutes
The bus is coming in exactly sixteen minutes

As suggested by the English translations above, *genau* shares this use with its English counterpart *exactly*, which will be discussed in detail in section 3.2. Furthermore, *genau* as well as *exactly* are used in equative constructions as in (4-a+b), which obviously involve scalar concepts (age and height). Thus, the modifier can contribute what it is usually associated with, namely precision. Furthermore, the modifier can occur in construction as (4-c+d), where the modifier's impact is less obvious:

- (4) a. Der Fritz ist genau so groß wie der Hans.
The Frith is exactly as tall as the Hans
Fritz has exactly the same height as Hans.
- b. James is exactly twice as old as Bob.

- c. Der Otto hat genau dasselbe Auto wie die Lisa.
The Otto has exactly the-same car as the Lisa
Otto drives exactly the same car as Lisa.
- d. Exactly the same thing happened to me yesterday.

Intuitively, what the modifier conveys in (4-c+d) is that even when you look at the properties of the car or the 'thing' in great detail, i.e. given a high granularity of considered properties, the identity-relation between car A and car B or thing A and thing B, respectively, still holds.

Possibly related, *genau* and *exactly* can modify DPs as in (5), where no comparison is involved. However, the contribution of *genau* in these contexts seems to be connected to precision as well. Intuitively, in (5-a+b) the modifier excludes salient alternatives of *this pizza/product* that are comparable, though somehow different. (5-b+c) on the other hand, although having intuitively a similar flavour, seem a little idiomised. (5-c) without *genau* is, even if not completely out, slightly odd, (5-d).

- (5) a. Der Franz will genau diese Pizza haben.
The Franz wants exactly this Pizza have
Franz wants exactly this Pizza.
- b. Beth wants exactly this product.
- c. Ein Bier wäre jetzt genau das Richtige.
A beer were now exactly the right
A beer would be the perfect thing.
- d. ?Ein Bier wäre jetzt das richtige.
A beer were now the right
A beer would be the thing.

A further use of *genau* with which I will deal in section 5.2, is *genau*-modification of wh-words, (6-a+c). Again, this use also works for English *exactly*, (6-b+d):

- (6) a. Warum genau hast du die Bank ausgeraubt?
Why exactly have you the bank robbed
Why exactly did you rob the bank?
- b. Why exactly do you need a bodyguard?
- c. Wo genau wohnst du?
Where exactly lives you
Where exactly do you live?
- d. Where exactly is your grandfather?

I think that both (6-a+b) as well as (6-c+d) can receive a reading where the granularity of the required answer appears to be modified (see section 5.2). Thus, (6-a) may be paraphrased as *tell me your exact reasons for robbing the bank*, (6-c) as *tell me your exact address including city, street and house number*. However, according to my intuition, *genau* in (6-a) can receive a different – though possibly connected – reading, conveying something like 'the speaker is genuinely wondering what the answer to the question might be and she can't believe what the person that is asked, did'. In this use, *genau* seems to have discourse particle flavour. Interestingly, this flavour vanishes when *genau* is focused (see (11)). Possibly

related, there is another use of German *genau* that is illustrated in (7-a) where it appears to function as a focus particle and distributionally overlaps with the particles *ausgerechnet* (*of all things*), (7-b), and *gerade* (*straight*), (7-c) (see König (1991) for an analysis of what he calls focus particle uses of these expressions). Intuitively, as argued for one possible reading of (6-a), the contribution of the particles in (7) is related to the expression of surprise.

- (7) a. Warum hast du genau die Bank ausgeraubt?
 Why has you exactly this bank robbed
 Intended: Why of all banks did you rob this bank?
- b. Warum hast du ausgerechnet die Bank ausgeraubt?
 Why has you of-all-things this bank robbed
 Why of all banks did you rob this bank?
- c. Warum hast du gerade die Bank ausgeraubt?
 Why has you straight this bank robbed
 Intended: Why of all banks did you rob this bank?

Additionally, German *genau* can function as an answer particle as in (8):

- (8) a. A: Du kommst heute nicht, weil du arbeiten musst?
 A: You comes today not because you work must
 A: You won't come today because you have to work, right?
- b. B: Genau.
 B: Exactly
 B: Exactly/Precisely.

Furthermore, *genau* can occur in examples as (9-a+b), where it appears to modify negative universals and has an emotive flavour by conveying indignation. Another way of paraphrasing the intuitive flavour of *genau* in (9-a+b) may be the expression of negative surprise. Thus, this use might be a further instance of the modifier as discourse particle. English has a seemingly similar construction, exemplified in (9-c):

- (9) a. Die haben mir genau nichts vom Essen übergelassen.
 They have refl. GENAU nothing of food left.
 They left GENAU nothing of the food for me.
- b. Der Otto hat genau keinen von den Lollies bekommen.
 The Otto has GENAU none of the Lollies get
 Otto got GENAU no Lolly.
- c. So you know exactly nothing can be done.

Finally, German *genau* occurs in constructions as (1-b), which are at the heart of this thesis, repeated in (10-a). Crucially, *exactly*-modification of English *know* embedding declaratives is not possible, (10-b) :

- (10) a. Die Paula weiß genau, dass der Hans die Bank ausgeraubt hat.
 The Paula knows GENAU that the Hans the bank robbed has
 Paula knows GENAU that Hans robbed the bank.
- b. *Paula knows exactly that Hans robbed the bank.

To sum up, it looks like *genau* has several different uses. The most stereotypical use is its precision

modifying use, occurring when scalar expressions are involved. Apart from this, the modifier also occurs in equatives and comparisons that lack scalar expressions, even if these uses are intuitively clearly related to scalar contexts. In some other uses, *genau* seems to act as discourse particle receiving different flavours, all of which seem to be connected to expressing surprise, as argued for (7), (6-a), (6-b) and (9). Interestingly, *genau* in this discourse particle use cannot be stressed, whereas this is possible for all the other occurrences of *genau*, shown in (11). Thus, (11-a) where I diagnosed 'negative surprise' or 'indignation' as the flavour contributed by *genau* is clearly out. (11-b+c) are in brackets as both sentences are possible with major stress on *genau*, but in this case only receive the 'tell me your exact reasons for robbing the bank'-reading. However, the discourse particle reading of (11-b+c) is ruled out if *genau* is stressed. On the other hand, all other occurrences of *genau*, as exemplified by (11-d-g), are fine.

- (11) a. #Die haben mir GENAU nichts vom Essen übergelassen.
They have refl. GENAU nothing of food left.
They left GENAU nothing of the food for me.
- b. (#)Warum hast du GENAU die Bank ausgeraubt?
Why has you exactly this bank robbed
Intended: Why of all banks did you rob this bank?
- c. (#)Warum GENAU hast du die Bank ausgeraubt?
Why exactly have you the bank robbed
Why exactly did you rob the bank?
- d. In diesem Haus gibt es GENAU zehn Zimmer.
In this house gives it exactly ten rooms
There are exactly ten rooms in this house.
- e. Der Fritz ist GENAU so groß wie der Hans.
The Frith is exactly as tall as the Hans
Fritz has exactly the same hight as Hans.
- f. Der Franz will GENAU diese Pizza haben.
The Franz wants exactly this Pizza have
Franz wants exactly this Pizza.
- g. Die Paula weiß GENAU, dass der Hans die Bank ausgeraubt hat.
The Paula knows GENAU that the Hans the bank robbed AUX
Paula knows GENAU that Hans robbed the bank.

I conclude that one first division between the different occurrences of *genau* can be drawn between *genau* as focus/discourse particle on the one hand, and all the other uses on the other hand and that this distinction is linked to focus. Within the non-focus/discourse particle uses, a further division may be drawn. Whereas the occurrences of *genau* in the available readings of (11-b+c) as well as in (11-d-f) are intuitively clearly connected to precision, this connection is not obvious in the case of (11-g), which is the use that is at the center of this thesis.

To begin with, I will discuss existing approaches to *genau* exactly as a modifier of scalar expressions in the next subsections (a possible connection between the modifier in uses as (11-g) and its use as precision modifier will be discussed in chapter 8).

3.2 *exactly* as a modifier of scalar expressions

As the literature on numerals is characterised by a long lasting debate concerning the question of what number words actually mean, the semantic assumptions w.r.t. *exactly* in this context directly depend on the theory of numeric expressions one assumes. Based on the consideration of examples as in (12), it was noticed that it is not at all evident that the literal meaning of, say, *seven* is *exactly seven*:

- (12) a. My cat Merry is seven years old.
b. You have to be seven years old in order to use the elevator alone.
c. If you are seven years old you can get a price reduction.

Whereas the prominent reading of *seven years* in (12-a) is (up to a certain point) exact, the same expression in a context like (12-b) most naturally receives an at-least-reading: it is understood that one has to be *seven years old or more* in order to use the elevator by oneself. Thus, it doesn't mean that you have to be accompanied by your parents again as soon as you are eight years old. However, (12-c) suggests the opposite as the prominent interpretation of *seven years* receives an at-most-reading in this context: it suggests that you will get a price reduction given that you are *seven years old or less*.

The consequences for the semantics of *exactly* that arise in the light of a non-exact theory for numerals (e.g. Horn (1972), Horn (1989), Levinson (1983) for an at-least meaning) seem at first sight evident: it possibly creates exactness. This seems to be validated by the examples in (13) and (14). (13) is a further example that illustrates two different readings number words can receive depending on the context. So, whereas given Scenario A in (13-a), *two* in (13-b) most naturally receives an exact meaning, in light of Scenario B in (13-c), *two* in the same sentence repeated in (13-d) can have an at least meaning, as indicated by the continuation in the brackets:

- (13) a. Scenario A: Peter asks Harry, how many apples he has in his shopping bag.
b. H: I have two apples in my bag.
c. Scenario B: Peter is feeding his five horses. Each horse should get ten apples, but Peter brought only 48 apples. As the supermarkets just closed, Peter tells Harry that he is desperate because he doesn't know where to get two apples now.
d. H: No problem, I have two apples in my bag (actually, I have twenty).

Now, modifying the number word in (13-d) by *exactly*, illustrated in (14-b), while keeping the scenario constant, (14-a), the continuation in the brackets becomes less acceptable, suggesting that *exactly* removes the at least reading in favour of an exact reading.

- (14) a. Scenario B: Peter is feeding his five horses. Each horse should get ten apples, but Peter brought only 48 apples. As the supermarkets just closed, Peter tells Harry that he is desperate because he doesn't know where to get two apples now.
b. H: No problem, I have exactly two apples in my bag (??actually, I have twenty).

Nevertheless, at least in the case of German *genau*, the modifier doesn't remove at least readings of numerals universally. This is illustrated in the German example in (15):

- (15) Mit 18 Jahren ist man in Österreich volljährig.
 With 18 years is one in Austria full-aged
 In Austria, people are full-aged with 18 years.

(15) obviously receives an at least reading conveying that one starts to be full-aged with 18 years and thus is still with, say, 29. Interestingly, this seems to survive *genau*-modification, as shown in (16) where the number word is modified by *genau* while at the same time a continuation that indicates the at least reading is felicitous:

- (16) Mit genau 18 Jahren ist man in Österreich volljährig, also ist es der Hans mit 29 schon
 With exactly 18 years is one in Austria full-aged thus is it the Hans with 29 already
 lange.
 long
 In Austria, people are full-aged with exactly 18 years, thus, with 29 Hans is by now full-aged.

What *genau* seems to modify in (16) is rather the lower-bound, thus, emphasises that one is not full-aged, say, two days before the 18th birthday. Therefore, the modifier's function under a non-exact view of number words can at best be taken to disambiguate some (but not all) occurrences of number words in the sense of turning an at least or at most reading into an exact one.

On the other hand, in the case of theories according to which number words have an exact underlying meaning (e.g. Geurts (2006), Lasersohn (1999), Sauerland & Stateva (2007)) it seems to be even more complicated, as, if number words are exact itself, *exactly*-modification should be redundant in any context. As this potential redundancy seems to be slightly reminiscent of *genau*-modification of *wissen* – a concept which is not imprecise itself appears to get modified w.r.t. its precision – I will now discuss approaches of *exactly* within theories that assume number words to be bounded, i.e. according to which *seven* means 'seven and not more or less than seven'.

3.3 *exactly* in the light of granularity analyses

Sauerland & Stateva (2007) suggest that number words are evaluated on scales whose granularity is dependent on contextually provided parameters of interpretation. This idea is based on Krifka (2007), who suggests that scales are simultaneously divided into intervals of different granularities. Given the level of precision an expression is interpreted on, it thus refers either to precise values or to different intervals. Krifka (2007) argues that if a measurement is reported precisely, the level of approximation is 0 and the value stands for an exact value, whereas if a measurement is reported in an approximate way, the level of approximation is above 0 and the reported value stands for a range of possible values. (17) is an example from Meier (2010), who builds on the idea of Krifka (2007) and captures approximation by declaring a percentage of deviation from the precise value. Given an approximation level of 0 as in (17-a), the interpretation is precise, i.e. *the size of Spain* names a degree. On the other hand, if the approximation level exceeds 0 as in (17-b+c), the interpretation is not precise and the *the size of Spain* describes an interval.

- (17) a. $\llbracket \text{the size of Spain} \rrbracket_{0\%} = 505.992 \text{ km}^2$

- b. $\llbracket \text{the size of Spain} \rrbracket_{1,45\%} = [498.655,12 \dots 513,328,88] \text{ km}^2$
- c. $\llbracket \text{the size of Spain} \rrbracket_{4,45\%} = [483.475,36 \dots 528.508,64] \text{ km}^2$ Meier (2010)[p.14]

Sauerland & Stateva (2007) on the other hand differentiate only between three levels of granularity: fine, mid and coarse. They argue that a granularity function maps each point of a scale to an interval that contains it. Thus, expressions containing number words have different denotations that depend on the setting of the scale granularity, exemplified for *5 meters* in (18):

- (18) a. $\text{gran}_{\text{fine}}(5\text{m}) = [4.95\text{m}, \dots, 5.00\text{m}, \dots, 5.05\text{m}]$
- b. $\text{gran}_{\text{mid}}(5\text{m}) = [4.75\text{m}, \dots, \dots, 5.00\text{m}, \dots, \dots, 5.25\text{m}]$
- c. $\text{gran}_{\text{coarse}}(5\text{m}) = [4.50\text{m}, \dots, \dots, \dots, 5.00, \dots, \dots, \dots, 5.50\text{m}]$ Sauerland & Stateva (2007)[p.232]

They apply this approach also to non-numeric expressions as *the middle of the circle around A*, exemplified in (19):

- (19) a. $\text{gran}_{\text{fine}}(\text{S})(\text{A}) = \text{the 1mm circle surrounding A}$
- b. $\text{gran}_{\text{mid}}(\text{S})(\text{A}) = \text{the 1cm circle surrounding A}$
- c. $\text{gran}_{\text{coarse}}(\text{S})(\text{A}) = \text{the 2cm circle surrounding A}$ Sauerland & Stateva (2007)[p.233]

Given this idea, Sauerland & Stateva (2007) claim that modifiers like *exactly* or *approximately* can set this parameter to the finest or coarsest level, respectively, that the context makes available. Based on examples as in (20) they claim that *exactly* combines only with scalar expression denoting a non-endpoint of a scale whereas modifiers as *absolutely*, *completely* and *totally* are used only with endpoint denoting expressions (see Kennedy & McNally (2005)):

- (20) a. The glass is *absolutely*/?*exactly* full.
- b. The glass is *exactly*/**absolutely* half full. Sauerland & Stateva (2007)[p.237]

They mention that *exactly full* in (20-a) is not ruled out completely, i.e. gets more acceptable when thinking about it, and claim that this is due to a coercion of the scale structure where *full* doesn't denote an endpoint anymore. Likewise, they suggest coerced scales for some expressions that – according to a corpus study – depart from their claim that *exactly* is restricted to non-endpoint scales, as *exactly right* or *exactly satisfactory* occurs frequently. Related to that, Beltrama (2018) discusses a specific use of the intensifier *totally* in which it – although usually occurring with expressions referring to an upper bounded scale, as in (21-a) – can also combine with expressions that don't lexicalise a bounded scale at all, (21-b):

- (21) a. The glass is *totally* full.
- b. Skiing around Salt Lake is *totally* awesome. Beltrama (2018)[p.2]

Thus, in light of this use of *totally* a similar problem as in the case of *genau* in the context of *wissen* arises: an expression that is usually assumed to appeal to degrees attaches to an expression that is not gradable. Beltrama analyses this non-classical use in (21-b), which she calls 'pragmatic *totally*', as an operator that manages the Common Ground (CG), conveying that from the speaker's perspective, there is no other option than adding the proposition in question to the CG.

Another account of Morzycki (2011) deals with a related problem arising from metalinguistic comparatives as (22), where the scales along which the expressions participating in the comparative are evaluated, are compared.

(22) a. George is more dumb than crazy. Morzycki (2011)[p.1]

Building on the idea of Lasersohn (1999) that certain expressions are surrounded by so called halos, Morzycki (2011) analyses metalinguistic comparatives in terms of alternatives: he suggests that metalinguistic *more* in 'x is more a than b' compares degrees of imprecision, i.e. the size of halos that consist of alternatives, and requires that *a* is closer to being true of *x* than *b*.

Sauerland & Stateva (2007) discuss a further, under their account unexpected use of *exactly* in negative contexts exemplified in (23):

(23) Red wine isn't exactly healthy. Sauerland & Stateva (2007)[p.3]

Based on their claim that such constructions aren't possible in German and Bulgarian, they suggest a further lexical entry of *exactly* that is a negative polarity item.¹

A further approach that builds on the assumption of a bounded reading of number words comes from Geurts (2006), who argues that *exactly* is semantically empty. Based on the empirical fact that *exactly* can combine with 'exact expressions' as in *exactly five* or *exactly half of the dough*, but not with expressions that have according to him an 'at least' meaning as **exactly warm*, he claims that *exactly* doesn't make it's argument exact but rather only combines with expressions that have an exact construal in the first place. Following Lasersohn (1999), Geurts sees the function of *exactly* thus in reducing the context depending pragmatic slack observed for expressions like *3 o'clock* or round numbers. However, he does not spell this idea out in detail and it is unclear to me how to combine it with the presumed semantic vacuity of *exactly*.

To sum up, approaches to *exactly* that build on the assumption that numeric expressions are exact, see the function of the modifier, in one way or the other, in reducing context dependent imprecision.

Generally, while there is no doubt that round numbers can exhibit an imprecise use, non-round numbers like 98 usually do not allow for imprecision. This is visible in (25): whereas (25-a) allows for some imprecision, meaning that the sentence could be uttered felicitously in a situation were farmer Bob owns say 99 or 102 sheep, (25-c) seems not to allow for such a use – it would probably be judged as wrong in a situation where farmer Bob owns 99 sheep.

¹I do not completely agree with their judgement regarding the grammaticality of the German version in (24), which they mark as unfelicitously:

(24) a. Rotwein is nicht genau gesund.
red-wine is not exactly healthy
Red wine isn't exactly Sauerland & Stateva (2007)[p.4]

Although, *nicht gerade* might be more natural in (24), according to my intuition *nicht genau* is fine as well.

- (25) a. Der Bauer Bob hat 100 Schafe.
The Farmer Bob has 100 sheep
Farmer Bob owns 100 sheep.
- b. Der Bauer Bob hat genau 100 Schafe.
The Farmer Bob has exactly 100 sheep
Farmer Bob owns exactly 100 Schafe.
- c. Der Bauer Bob hat 98 Schafe.
The Farmer Bob has 98 sheep
Farmer Bob owns 98 sheep.
- d. Der Bauer Bob hat genau 98 Schafe.
The Farmer Bob has exactly 98 sheep
Farmer Bob owns exactly 98 sheep.

Nevertheless, (25-d) shows that *exactly 98* is just as felicitous as *exactly 100* in (25-b). This poses a problem for analyses where *exactly* is assumed to reduce pragmatic slack or set a granularity parameter: if there is no imprecision in the first place, the modifier should be redundant. This puzzle seems again connected to the issue discussed in this thesis, as an expression that is neither gradable nor imprecise can combine with *exactly*.

Regarding the suggested solutions for related problems provided by Morzycki (2011) and Beltrama (2018), in principle, both, a metalinguistic analysis as well as a speaker-oriented requirement on the common ground are imaginable for *genau wissen*. Under a metalinguistic approach along the lines of Morzycki (2011) one could for example assume that metalinguistic *genau* in *x weiß genau dass p* just as *more* in 'x is more a than b' is related to degrees of imprecision. Morzycki (2011) suggests that *dumb* denotes a set of alternatives that depends on the degree of precision required by the context. (26-a) for example illustrates the set of alternatives of *dumb* if interpreted absolutely precisely (1), (26-b) a set that corresponds to a lower degree of imprecision (0.9):

- (26) a. $[[dumb]]^{1,C} = \{dumb\}$
b. $[[dumb]]^{0.9,C} = \{dumb, ignorant, dopey, foolish, slow-witted, \dots\}$ Morzycki (2011)[p.5–6]

Accordingly, it would have to be assumed that *wissen* likewise denotes sets of alternatives whose size depend on the context as (27-a) if interpreted absolutely precisely (1), or (27-b) if interpreted less precisely (0.9):

- (27) a. $[[wissen]]^{1,C} = \{wissen\}$
b. $[[wissen]]^{0.9,C} = \{be\ sure, be\ convinced, believe\ with\ great\ certainty, \dots\}$

Based on this it could be further claimed that *genau* requires that the size of the alternative set corresponds to the minimum, illustrated in (27-a).

Analysing *genau wissen* along the lines of Beltrama (2018) on the other hand could look roughly like this: just as pragmatic *totally*, *genau* could be modelled as a CG managing operator conveying that from the speaker's (and/or the attitude holder's) perspective there is no other option than adding the attitude-relation of a given subject towards the proposition in question to the CG.

However, as it will turn out in chapter 5, *genau* is incompatible with other attitude verbs, that are usually, i.e. based on other properties, classified together with *wissen* and I believe that neither a degree that has to be stipulated, nor an operator managing the CG, can account for this restrictions of the modifier. In the case of the latter, if *genau* was an operator requiring that a certain attitude ascription is added to the CG as I suggested above, I don't see a reason why this shouldn't work with any attitude, as e.g. *glauben* (*believe*), which is incompatible with the modifier as illustrated in (28-a) (for more discussion see section 5.1):

- (28) a. *Ruth glaubt genau, dass es gestern regnete.
 Ruth believes GENAU that EXPL. yesterday rained
 Ruth believes GENAU that it has rained yesterday.

Likewise, a Morzycki (2011)-style metalinguistic analysis of *genau* doesn't predict a restriction on the set of verbs compatible with the modifier that e.g. excludes *glauben*. However, the idea of Morzycki (2011) predicts that *glauben* likewise denotes sets of alternatives as it can participate in metalinguistics comparison just as *wissen*:

- (29) a. George glaubt mehr, dass die Mizi ihn heiraten will, als dass er es weiß.
 George believes more that the Mizi him merry wants as that he it knows
 George more believes than knows that Mizi wants to merry.

Crucially, as shown in (28), *glauben* can't combine with *genau*. Thus, I exclude an adaption of the approaches of Beltrama (2018) as well as Morzycki (2011) for explaining *genau*-modification of *wissen*.

3.4 Degree analysis of *wissen*

On the other hand, in order to adapt any of the claims w.r.t. *exactly/genau* as a precision modifier for its use in the context of *wissen*, *wissen* would have to be a somehow scalar expression that gives rise to imprecision, which it is, taking the standard semantics as a universal quantifier presented in section 2.2 for granted, obviously not.

Thus, one option is to adapt a degree semantics for *know* along the lines of Koev (2019)s suggestion that *know*, just like he claims that it is the case for *believe*, makes available a degree argument discussed in section 2.3.1 and section 2.3.3 above. (30), where *know* is modified by *quite well* and *very well*, respectively, repeats the type of example that motivates his idea:

- (30) a. Kate knows very/quite well that I don't like alcohol.

Additional support in favour of this view supposedly comes from *wissen* in comparative constructions as illustrated in section 2.3.1 in (24), discussed in the context of Schmitt & Sode (2018)s alternative account for *wissen*, repeated in (31):

- (31) a. Der Frank weiß, dass der Hedde gefährlich ist, aber die arme Viola weiß es noch viel besser.
 The Frank knows that the Hedde dangerous is but the poor Viola knows it PRT much better

Frank knows that Hedde is dangerous, but poor Viola knows it even better. Schmitt & Sode (2018)[p.1106]

However, I don't think that a degree analysis for *know* along the lines of Koev (2019) is on the right track: first, under the assumption that *know*, just as *believe*, has an absolute standard and is likewise associated with the fully closed probabilistic scale [0,1], the value of the degree argument should in unmodified uses correspond to the maximum of the scale. Now, *know* as well as *wissen* seem to be only modifiable by modifiers targeting the upper end of the scale as *very/quite well* in (30) or, ultimately, *genau*. Crucially, in the context of *wissen* with embedded declaratives, modifiers that relate to a lower point on the scale – as for example *teilweise (partially)* in the case of *believe* – are infelicitous. Thus, as will be discussed in greater detail in 5, *ungefähr (approximately)*, the counterpart of *genau*, as well as *teilweise (partially)* cannot occur as a modifier of the attitude verb given the embedded complement is a declarative², demonstrated in (32):

- (32) a. *Die Lisi weiß ungefähr, dass es regnet.
The Lisi knows approximately that EXPL. rains
Lisi approximately knows that it is raining.
- b. *Die Lisi weiß teilweise, dass es regnet.
The Lisi knows partially that EXPL. rains
Lisi partially knows that it is raining.

Accordingly, if *know/wissen* actually was associated with a probabilistic scale [0,1], it should be possible to somehow refer to a point on this scale that is below 1, which doesn't seem to be the case. On the other hand, for *wissen* in comparative-like constructions, as in (31), one could obviously claim that if 'x knows that p better than y' this means that 'the degree to which y knows p is below the degree to which x knows p', thus, below 1. However, I also don't believe that this is what the comparative in (31) expresses as I think that it doesn't actually compare degrees of *wissen* in the sense of Koev (2019), but rather compares something like 'amounts or kinds of experiences exemplifying the embedded proposition'. Thus, I think that what (31) expresses is that Viola made more or more direct experience that proves that Hedde is dangerous compared to Frank, who also made enough experience to conclude that Hedde is dangerous.

Thus, I conclude that whatever the indirect comparative in (31) expresses, it is not related to a comparison between degrees of knowledge along the lines of Koev (2019). Furthermore, based on the discussion above, I exclude the possibility that the lexical entry of *wissen* contains a degree argument that is associated with a probabilistic scale [0,1] that is targeted by *genau*. Nevertheless, as will be motivated and implemented in chapter 6, I will end up arguing that *wissen* is indeed associated to a degree argument, though, one that determines the size of the set of worlds that are required to be compatible with the proposition that is known.

Before getting to that, I will now, in chapter 4, turn to the question whether there is another way of explaining the compatibility of *wissen* with *genau* while maintaining the traditional Hintikka-semantics.

²These modifiers can occur in constructions containing embedded wh-interrogatives or polar question. Though, as it will turn out in section 5.2.2, it isn't the attitude itself that is modified in such contexts but rather the embedded clause.

3.5 Summary

The current section opened with a presentation of the problem dealt with in this thesis, namely the compatibility of propositional attitudes verbs as *wissen* with the precision modifier *genau*. After presenting this puzzle and discussing the distribution of the German modifier, I discussed existing approaches regarding the semantics of *exactly/genau* that turned out to be dependent on the underlying theory of number words. Thus, I discussed possible semantic contributions of the modifier w.r.t. scalar expressions in light of theories that assume number words to be exact as well as in light of such that take a non-exact, i.e. an at least or at most meaning of number words for granted. It turned out that independent of the theory one puzzle that seems reminiscent of the main problem discussed in this thesis arises: *exactly/genau* can perfectly modify scalar expressions that are – given the assumptions of the respective theory – exact itself. Hence, the question emerges, what the modifier contributes if not precision (given an expression is precise itself). I furthermore discussed approaches to related problems, namely a puzzling use of the modifier *totally* as well as an account for metalinguistic comparisons and brought up the idea to analyse *genau* in the context of *wissen* along these lines. However, I concluded that such approaches don't predict the distribution of *genau* in the context of propositional attitude verbs that will be discussed in section 5.1 in detail. After that I pursued the idea of *wissen* containing a degree argument but discarded it based on an interpretation of the relevant data suggesting that there is nothing like *wissen* to a low degree.

In the next section I will consider a further option to obtain some kind of gradability by pursuing the idea that the modifier strengthens specific semantic components of *wissen*. Based on the intuitive paraphrase of the contribution of *genau* to *wissen*, I select two obvious candidates for such components: evidence and certainty.

Chapter 4

Attempts for saving the classical view

In the last section I showed that whatever *exactly* does to number words can not be directly adapted for *genau*-modification of *wissen*. In this section I will now try to put forward an idea that may explain the role of *genau* in the context of *wissen* while leaving the traditional analysis untouched. I will consider specific semantic components of *wissen* and examine whether it could be one of those components that is strengthened by the modifier. The focus of this examination lies on spotting one or more components that are shared by all and only the verbs that are compatible with *genau*.

Based on the intuition put forward in chapter 3 that the modifier in the context of interest expresses specifically high certainty that might be caused by extra strong or reliable evidence, I will discuss certainty and evidence as possible candidates for such components. In order to do so, (1) is a characterisation of the classical semantics of *wissen* that explicitly contains those components:

- (1) x weiß dass p iff:
 - a. x is certain about p being the case (\approx p is true in all belief-worlds of x)
 - b. x has enough/proper evidence for p
 - c. p is true

However, I will end up arguing that the modifier cannot directly relate to one of these components. In order to capture the intuition that evidence and certainty are involved in the semantic contribution of *genau* to *wissen*, I will suggest that these components will have to be implemented in a rather abstract way in chapter 6.

4.1 Evidence

As represented by the first requirement of the classical view of knowledge as justified, true belief, knowledge requires justification, i.e. evidence. This condition is based on observations according to which true belief is insufficient for defining knowledge as also improperly formed belief can be true. This is illustrated in the example in (2-a) which is odd in the scenario provided:

- (2) Scenario: There was a bank robbery. Paul witnessed the incident from the street. He only heard people screaming and saw three persons running out of the bank. Paul thinks that one of them, a guy with a blue hat – who actually happens to be the one who robbed the bank – looks especially

evil and is therefore convinced that this guy is the criminal. He didn't see or hear anything else. Paul reports to the police:

- a. #Ich weiß, dass der Typ mit der blauen Kappe die Bank ausgeraubt hat.
I know that the guy with the blue hat the bank robbed AUX
I know that the guy with the blue hat robbed the bank.

(2) makes evident that a subject, Paul, can hold a belief, that although it might be true, isn't such that it classifies as knowledge. It seems that what goes wrong here is that Paul has a, by accident, true belief based on wrong or insufficient reasons – it just doesn't seem legitimate to infer knowledge from a mere intuition. In short, what Paul is missing in order to hold knowledge is a proper piece of evidence. Ichikawa & Steup (2018) give a similar example to illustrate the requirement of justification, presented in (3):

(3) Scenario: William flips a coin and guesses that it will land tails, which it coincidentally does. Thus, he has a true belief. Bonnie says:

- a. #William knew that the coin would land tails. Ichikawa & Steup (2018)

Their point is that (3-a) is infelicitous as William's belief that the coin will land tails constitutes rather a lucky guess than knowledge. In order to hold knowledge, Ichikawa & Steup (2018) state, William's belief must in some epistemic sense be appropriate.

Therefore, having good enough evidence, i.e. justification, is a requirement of bare *wissen* already. Thus, in order to claim that *genau* strengthens the evidence component, I would have to assume that it changes the requirement of having enough evidence into the requirement of having more than enough evidence. However, an argument against the idea that *genau* directly manipulates the evidence-component arises from the distribution of the modifier, that will be discussed more extensively in chapter 5. Specifically relevant in this context is the fact that *erinnern* (*remember*) can combine with *genau*, shown in (4-a):

- (4) a. Der Otti erinnert sich genau, dass der Kurt die Bank ausgeraubt hat.
The Otti remembers refl. GENAU that the Kurt the bank robbed AUX
Otti remembers GENAU that Kurt has robbed the bank.

First, it appears that evidence plays a different role in the case of *erinnern* than w.r.t. *wissen* (an analogous difference will be shown in section 5.1 for verbs of perception). This is illustrated by the dialogue in (5):

- (5) Scenario: Alma and Bella are searching for lost keys in their house. They call Lisa, who had just left, as she might have been the last person that used the keys.
- a. A: Do you have any idea where the keys might be?
b. L: Ich erinnere mich, dass sie am Tisch liegen.
L: I remember refl. that they on table lie
L: I remember that the keys are on the table.
c. A: #Warum erinnerst du dich daran?
A: Why remember you refl. thereon
A: Why do you remember this?

(5) shows that it is somehow odd to ask for someone's reasons for remembering a certain proposition – possibly, because the most natural answer to Alma's question in (5-c) in the given context may be something like 'because I remember' which is slightly redundant as it is a repetition of the attitude the subject has just uttered towards the proposition. Crucially, by replacing *erinnern* with *wissen* in this dialogue, (6-b), the question in (6-c) becomes completely felicitous and an expected answer is one that reveals the reasons, i.e. evidence, for the subject's knowledge, as in (6-d):

- (6) Scenario: Alma and Bella are searching for lost keys in their house. They call Lisa, who had just left, as she might have been the last person that used the keys.
- a. A: Do you have any ideas where the keys might be?
 - b. L: Ich weiß, dass sie am Tisch liegen.
L: I know that they on table lie
I know that the keys are on the table.
 - c. A: Warum/woher weißt du das?
A: Why/from-where knows you that
A: Why/how do you know that?
 - d. Because I put them on the table two minutes ago.

Thus, whereas in the case of knowledge it is reasonable to ask for the reasons, i.e. the evidence on which someone is building her knowledge, questioning the evidence is odd in the case of *erinnern*. I suggest that this is because in the case of *erinnern* as opposed to *wissen* the piece of evidence is already revealed along with the utterance – it's a memory. Connected to this, the question to what extent memory counts as evidence arises. Memories may be based on some kind of pictures in front of the mind's eye – i.e. in the case of remembering a visual experience – or they might just be related to internal states that can't be decomposed further. Thus, it seems that one can stand in an *erinnern*-relation to a certain proposition without having consciously accessible reasons for that.

Accordingly, I submit that justification is no requirement for *erinnern*, and therefore that this verb doesn't (obligatorily) involve evidence. Based on this I conclude that the modifier cannot directly relate to the quality of evidence. Therefore, I will now consider certainty as a further potential component targeted by the modifier.

4.2 Certainty

Certainty obviously represents another (sub)component of *wissen*: if 'x weiß dass p' ('x knows that p') it follows that 'x ist sicher dass p' ('x is certain that p') illustrated by (7), which is infelicitous:

- (7) a. #Die Susi weiß, dass der Karl gewonnen hat, aber sicher ist sie sich nicht.
The Susi knows that the Karl won AUX but sure is she refl. not
Susi knows that Karli won but she isn't sure about that.

The certainty component is connected to evidence, i.e. the requirement of justification, in so far, as certainty is usually gained via evidence, which is illustrated in (8):

- (8) a. Der Hugo hat immer vermutet, dass der Bert ein Doppelleben hat und ist sich jetzt,
 The Hugo AUX always suspected that the Bert a double-life has and is refl. now
 nachdem er ihn mit aufgeklebtem Bart und einem Hund im Park gesehen hat,
 after he him with affixed beard and a dog in park saw AUX
 diesbezüglich sicher.
 w.r.t. certain
 Hugo always suspected that Bert leads a double life; now, as he has seen him with a fake
 beard and a dog in the park, he is certain about that.

Based on the paraphrase provided in chapter 3 that *genau* in the context of *wissen* intuitively conveys that the knowledge is held with specifically high certainty, I will now consider whether it could possibly be the certainty-component that is manipulated by the modifier.

However, an argument immediately arising against the idea of certainty as the component targeted by *genau* is presented in the following: if this assumption was on the right track, any verb containing the certainty component should be modifiable by *genau*, which is not the case, as the verb containing such a component most obviously, *sicher sein* (*be certain*), cannot combine with the modifier, as shown in (9):

- (9) a. *Die Mini ist genau sicher, dass es morgen regnet.
 The Mini is GENAU certain that it tomorrow rains
 Mini is GENAU certain that it will rain tomorrow.

Before turning to a detailed empirical investigation in chapter 5 in order to reveal the exact distribution of *genau* in the context of propositional attitude verbs and thus get nearer to the actual impact of the modifier, it might be worth looking more closely into the differences between *wissen* and *sicher sein*. Eventually, those attitudes are semantically related, although whatever sets *wissen* apart from *sicher sein* is likely to be related to the combinability of the former – in contrast to the latter – with *genau*.

A first obvious difference relates to the direction of the entailment. Whereas, as mentioned above, *wissen* entails *sicher sein*, the entailment relation doesn't hold the other way around. This is illustrated in the dialog in (10) suggesting that one can stand in a *sicher sein*-relation to a certain proposition without knowing it:

- (10) a. A: Do you know whether Lisa is coming to the party?
 b. B: Nein, aber ich bin sicher, dass sie kommt, sie liebt doch Parties.
 B: No but I am sure that she comes she loves prt. parties
 B: No, I don't, but I am certain that she will for she loves parties.

Furthermore, whereas *wissen* comes with requirement that the complement expresses a true proposition, which is included in the lexical entry in section 2.2 in example (13) as a factivity presupposition, *sicher sein* does not, which is suggested by (11):

- (11) a. Der Pepi ist sicher, dass die Susi kommt, aber ich glaube nicht, dass das stimmt.
 The Pepi is certain that the Susi comes but I believe not that that right
 Pepi is certain that Susi will come but I don't think that's true.
 b. #Der Pepi weiß, dass die Susi kommt, aber ich glaube nicht, dass das stimmt.
 The Pepi know that the Susi comes but I believe not that that correct

Pepi knows that Susi is going to come but I don't believe that to be true.

Whereas the knowledge ascription in (11-b) cannot – under usual circumstances¹ – be followed up by a sentence questioning the truth of the proposition embedded under *wissen*, such a supplement is very well possible in (11-a) where the propositional attitude ascribed to Pepi is *sicher sein*. Thus, whereas *wissen* is factive, i.e. it meets the requirement that the embedded proposition is true in the world of evaluation, *sicher sein* is not, as it can be ascribed to someone while the truth of the proposition that a subject is certain about can simultaneously be denied or questioned.

Accordingly, factivity seems to be again the property that sets a propositional attitude verb that is incompatible with *genau* apart from *wissen* to which it is in other respects related. Nevertheless, I already excluded that factivity is the property responsible for whether a propositional verb is combinable with the modifier or not. Thus, in order to explore this connection and other properties that distinguish verbs that can combine with *genau* from those that can not, I will now turn to an empirical investigation of the modifier's distribution in the context of propositional attitude verbs.

4.3 Summary

In this section I tried to pursue the hypothesis that *genau* directly manipulates a specific component included in the classical lexical entry of *wissen*. Based on the intuitive semantic contribution of the modifier, I took evidence and certainty in consideration as the components in question. However, both candidates were ruled out; evidence was excluded based on the fact that i) bare *wissen* already includes the requirement of having enough evidence and ii) due to the compatibility of *erinnern* (*remember*) with the modifier which apparently doesn't involve evidence. Certainty on the other hand was ruled out as the crucial component due to the incompatibility of *sicher sein* (*be certain*) with *genau* that obviously involves the certainty component.

¹(11-b) marginally works with a specific prosody indicating a meaning like *Pepi will wissen dass p* (*Pepi claims/believes to know that p*).

Chapter 5

Distribution of *genau* in the context of propositional attitude verbs

The current section investigates the distribution of *genau* in the context of propositional attitude verbs in order to determine the class of such verbs that is compatible with the modifier. Thus, in section 5.1 I will first provide the relevant data, then in section 5.1.1 state a generalisation via which the propositional attitude verbs compatible with *genau* can be captured. Thereafter, in section 5.2, I will argue that the modifier can receive two different readings in such contexts that can be differentiated via the type of the embedded complement. As I am mainly interested in only one of these readings – which is the one that occurs in the context of embedded declaratives – this distinction is crucial.

5.1 Propositional attitude verbs compatible with *genau* when embedding declaratives

Taking for granted that whatever *genau* modifies has to be present in every propositional attitude verb that combines with the modifier, I will start by determining the set of verbs that are compatible with *genau*. In the course of this, it will turn out that, apart from *wissen*, *genau* can combine with several other propositional attitude verbs as well as all verbs of perception. Interestingly, taking the property of being compatible with the modifier as a diagnostic, a set of verbs will be revealed that usually, according to other properties, don't belong to the same class. Thus, for example the verb *riechen* (*smell*), that refers to a subject's perception will likewise belong to that class as *wissen* that refers to a rather mental attitude (see Hintikka (1969) & Bourget (2016) for verbs of perception and also Hintikka (1969) for attitude verbs). On the other hand, verbs that are normally treated on a par behave differently regarding the property in question. Hence, while all verbs belonging to that class are factive, not all factive verbs are members of that class (see Kiparsky & Kiparsky (1970)). Likewise, whereas all verbs combinable with *genau* are analysed as having universal force, not all verbs that are usually taken to be universal quantifiers belong to that class (Hintikka (1969)).

After identifying this new class of verbs, I will formulate a generalisation via which these verbs can be classified independently, which roughly boils down to the property of asserting knowledge. This will be taken as a starting point for a more detailed evaluation of the semantic contribution of the modifier in

chapter 6.

First, I consider the class of propositional attitude verbs in the context of embedded declaratives. Apart from those I already brought up – *wissen*, illustrated in chapter 1 in (1-b) and repeated below in (1-a), as well as *erinnern*, illustrated in section 4.1 in (4) repeated below in (1-b), a few other attitude verbs can combine with *genau* as shown for *merken* (*be-aware*) in (1-c) and *verstehen* (*understand*) in (1-d):

- (1) a. Die Paula weiß genau, dass der Hans die Bank ausgeraubt hat.
The Paula knows GENAU that the Hans the bank robbed AUX
Paula knows GENAU that Hans robbed the bank
- b. Der Otti erinnert sich genau, dass der Kurt die Bank ausgeraubt hat.
The Otti remembers REFL. GENAU that the Kurt the bank robbed AUX
Otti remembers GENAU that Kurt has robbed the bank.
- c. Die Karli merkt genau, dass es im Nachbarhaus brennt.
The Karli is-aware GENAU that EXPL. in neighbour-house burns
Karli is GENAU aware of that there is a fire in the neighbour's house.
- d. Der Danger versteht genau, dass er nicht ins Bett darf.
The Danger understands GENAU that he not in bed may
Danger understands GENAU that he is not allowed in bed.

Interestingly, in terms of compatibility with *genau* those attitude verbs fall into a class with verbs of perception (VoP), all of which can combine with the modifier (2-a):

- (2) a. Die Mona hört / sieht / riecht / erkennt / spürt / fühlt genau, dass ein Schwein im
The Mona hears / sees / smells / realises / feels / feels GENAU that a pig in
Zimmer ist.
room is
Mona hears / sees / smells / realises / feels /feels that there is a pig in the room.

However, several other attitude verbs – specifically *glauben* (*believe*), *bedauern* (*regret*), *bereuen* (*regret*), *vergessen* (*forget*), *sich wundern* (*be surprised*) or *sich freuen* (*be happy*) – that are usually, due to other properties – namely factivity and/or their universal force – taken to be similar to those in (1), are not compatible with *genau*, as shown in (3):

- (3) a. *Ruth vergaß / bedauert / glaubt / bereut / wundert sich / freut sich genau, dass es
Ruth forgot / regrets / believes / regrets / wonders refl. / please refl. GENAU that EXPL.
gestern regnete.
yesterday rained
Ruth forgot / regrets / believes / is surprised / is happy GENAU that it has rained yesterday.

Hence, the resulting class i) contains only factive verbs, while not all factive verbs belong to that class; ii) it summarises verbs that refer to a subject's perception and verbs that refer to a more mental attitude, and iii) it furthermore consists only of verbs that are analysed as universal quantifiers over possible worlds, while not all verbs analysed as universal quantifiers are members of that class.

Point i) relates to the exclusion of *vergessen*, *bereuen*, *sich wundern* and *sich freuen* from the class, that are – as all the members of the class (but see the discussion of the different readings of VoPs below) –

factive, i.e. entail the truth of their compliments, as illustrated in (4-a):

- (4) a. Ruth vergaß / bedauert / wundert sich / freut sich, dass es gestern regnete. ↔
Ruth forgot / regrets / wonders refl. / please refl that EXPL. yesterday rained ↔
Gestern regnete es.
yesterday rained EXPL.
Ruth forgot / regrets / is surprised / is happy that it rained yesterday. ↔ Yesterday, it rained.

Point ii) refers to the fact that the VoPs in (2) are usually analysed as quantifiers over worlds that are compatible with the perception of an individual, whereas in the case of the attitude verbs in (1) the quantification concerns worlds that are compatible with an individual's beliefs (Hintikka (1969)).

Point iii) relates to the standard view, discussed in chapter 2, according to which the semantics of *glauben* (*believe*) and *wissen* are closely related and only differ w.r.t. factivity. Disregarding everything else, the fact that *wissen* is compatible with *genau* but not *glauben* (which is also analysed as universal quantifier), seems to suggest once again that the compatibility with the modifier might be connected to factivity. However – as already pointed out in section 2.3.3 – factivity can't be the only property responsible for *genau*-compatibility: all the other verbs listed in (4) are factive verbs, which is actually the property based on which they are usually semantically associated with *wissen*. Nevertheless, all of them are incompatible with the modifier.

Therefore, a better story that explains why the attitude verbs in (1) as well as the perception verbs in (2) – which I will subsume under the label 'know-type predicates' from now on – can be modified by *genau*, whereas those in (3) cannot, is required.

5.1.1 Characterising know-type predicates

I will first make an assertion w.r.t. a generalisation that distinguishes know-type predicates from other verbs and subsequently motivate it. Thus, I suggest the following, preliminary generalisation:

- (5) GENERALISATION (Version I)
A propositional verb Q is combinable with *genau* iff:
- Every statement of the form 'x Q that p' entails that x knows that p (at the time the sentence is evaluated and judged true).
 - 'x knows that p' is not presupposed.

Via the first condition in (5-a) *glauben* and *vergessen* are correctly ruled out. The former obviously doesn't meet this requirement as a statement of the form *Pepi believes that it is raining* doesn't entail that *Pepi knows that it is raining* – actually, while accepting the former statement, Pepi's belief might very well be wrong and he might even consider this option himself. *vergessen* similarly doesn't meet this requirement as from *Pepi forgot that it is raining* it doesn't follow that *Pepi knows that it is raining* as *vergessen* rather conveys the opposite, i.e. that the proposition in question is not known (anymore) by the subject at the time the sentence is evaluated. The second requirement in (5-b) excludes the other incompatible, but factive, attitude verbs mentioned in (3), *bedauern* and *bereuen* (*regret*), *sich wundern* (*be surprised*) as well as *sich freuen* (*be happy*). Presupposed and asserted content differ in terms of

their projection behaviour: while the former projects, e.g. is preserved under negation, the latter does not (Langendoen & Savin (1971)). Applying this presupposition test to the relevant verbs reveals that in the case of know-type predicates, exemplified in (6-a+b) by *merken* (*realise*), the know-part vanishes under negation of the matrix phrase, while it remains when the negated verb is *bedauern* and *bereuen*, as in (6-c+d). That suggests that the know-part is presupposed in the latter cases, while it is asserted in the former:

- (6) a. Die Bella merkt, dass sie die Chance auf die Kanzlerschaft verpasst hat.
 The Bella realises that she the chance on the chancellorship missed AUX
 Bella realises that she missed the chance of becoming chancellor
 ⊨ Bella knows that she missed the chance of becoming chancellor.
- b. Die Bella merkt nicht, dass sie die Chance auf die Kanzlerschaft verpasst hat.
 The Bella realises not that she the chance on the chancellorship missed AUX
 Bella realises that she missed the chance of becoming chancellor
 ≠ Bella knows that she missed the chance of becoming chancellor.
- c. Die Bella bereut, dass die die Chance auf die Kanzlerschaft verpasst hat.
 The Bella regrets that she the chance on the chancellorship missed AUX
 Bella regrets that she missed the chance of becoming chancellor
 ⊨ Bella knows that she missed the chance of becoming chancellor.
- d. Die Bella bereut nicht, dass die die Chance auf die Kanzlerschaft verpasst hat.
 The Bella regrets not that she the chance on the chancellorship missed AUX
 Bella doesn't regret that she missed the chance of becoming chancellor
 ⊨ Bella knows that she missed the chance of becoming chancellor.

Applying this test to any verb belonging to the know-type class yields the same result that was obtained in (6-a+b): sentences containing any of those verbs with a propositional argument, when the matrix sentence is embedded under negation, the entailment of the form 'x knows that p' is lost. On the other hand, when embedding any other factive verb (as *sich freuen* (*be happy*) or *sich wundern* (*be surprised*)) in such a configuration under negation that does not belong to the know-type class, i.e. that is incompatible with *genau*, the entailment is preserved. Thus, the class of know-type predicates is distinguishable via a semantic property independent of its compatibility with *genau*.

Alternatively, it is possible to reformulate the second condition from a rather syntactic perspective, stated in (7-b):

(7) GENERALISATION (Version II)

A propositional verb Q is combinable with *genau* iff:

- a. Every statement of the form 'x Q that p' entails that x knows that p (at the time the sentence is evaluated and judged true).
- b. Q embeds polar questions

Via (7-b) three of four verbs for which it was shown in (3) that they are incompatible with *genau* can be ruled out as they cannot embed polar question, shown in (8):

- (8) a. *Ruth bedauert / glaubt / bereut, ob es gestern regnete.
 Ruth regrets / believes / regrets whether EXPL. yesterday rained
 Ruth regrets / believes whether it has rained yesterday.
- b. Ruth vergaß, ob es gestern regnete.
 Ruth forgot whether EXPL. yesterday rained
 Ruth forgot whether it was raining yesterday.

Vergessen (forget), which embeds polar questions as demonstrated in (8-b), is ruled out by (7-a). As already pointed out above, if 'x vergaß that p' ('x forgot that p') it is definitely not the case that 'x weiß dass p' ('x knows that p'). On the other hand, any know-type predicate can embed polar questions as exemplified for *wissen* and *riechen (smell)* in (9):

- (9) a. Der Karli weiß, ob es regnet.
 The Karli knows whether EXPL. rains
 Karli knows whether it is raining.
- b. Der Karli riecht, ob es regnet.
 The Karli smells whether EXPL. rains
 Karli smells whether it is raining.

Condition (5-a)/(7-a) stating that for any verb Q that is compatible with *genau* it holds that if 'x Q that p' it also holds that 'x knows that p' deserves a little more discussion.

Besides *wissen*, that obviously meets this requirement, for two of the four know-type predicates discussed in (1), *verstehen (understand)* and *merken (realise)*, the entailment in question is also clearly valid. For *merken* this is shown in (6), (10) demonstrates the same for *verstehen*:

- (10) a. Die Hansi versteht, dass man Katzen nicht badet.
 The Hansi understands that one cats not bathing
 Hansi understands that you don't bath cats.
 ⊨ Hansi knows that you don't bath cats.

In the case of *erinnern (remember)*, on the other hand, it is not completely obvious that the requirement in question is met – do I know that, say, Hansi was at the party yesterday if I remember it? First, one possible problem for this entailment-relation might be, as I argued in section 4.1, that *erinnern* apparently doesn't obligatorily involve proper or consciously accessible evidence, as in order to utter a sentence of the form 'x remembers that p' x's memory might also very well be based on an internal state, maybe even some kind of intuition. However, this is not incompatible w.r.t. the entailment in question, as there are contexts where such intuitive reasons for having a certain attitude towards a proposition suffice even in the case of *wissen*, as demonstrated in (11):

- (11) Scenario: Hansi and Karli are giving a dinner party tonight. They are discussing the menu. Mara, of the expected guests, has announced to bring a new friend, who neither Hansi nor Karli know. Hansi says that she is not aware that any vegetarian will come, but Karli disagrees:
- a. Ich weiß nicht wieso, aber ich weiß, dass Maras neue Freundin kein Fleisch isst.
 I know not why but I know that Maras new friend no meat eats
 I don't know why I know this, but I know that Mara's new friend doesn't eat meat.

In (11) Karli holds knowledge w.r.t. a certain proposition although he isn't aware of how he received this information, i.e. what kind of evidence he is building his knowledge on. Thus, similar to *erinnern*, apparently, not even *wissen* requires the subject to have conscious access to the evidence or reasons she builds her knowledge on – intuitively speaking, it suffices if she is certain about the truth of her belief, i.e. is certain *that* her knowledge is built on proper evidence, independent of the content of that evidence. Thus, w.r.t. this, the generalisation stated for distinguishing the know-type class can be maintained for now.

Another challenge regarding *erinnern* in light of the knowledge-entailment-condition included in both generalisations concerns the observation that it is possible to ascribe wrong memories, even by using constructions containing *dass*-complements, while it is not possible to ascribe wrong knowledge. This is illustrated by the contrast in (12). Whereas (12-a) shows that with German 'x erinnert sich dass p' constructions, memories can be ascribed to a subject while, at the same time, the speaker can reveal that the memories are wrong, (12-b) shows that the same doesn't hold for 'x weiß dass p':

- (12) a. Die Hansi erinnert sich, dass sie mit ihrem Großvater im Gartenbaukino
 The Hansi remembers refl. that she with her grandfather in Gartenbau-cinema
 gewesen ist, dabei wurde das Kino erst zehn Jahre nach dessen Tod gebaut.
 was AUX though was the cinema only ten years after his death built
 Hansi remembers being in Gartenbau-cinema with her grandfather, although this cinema
 was only built ten years after the grandfather's death.
- b. #Die Hansi weiß, dass sie mit ihrem Großvater im Gartenbaukino gewesen ist,
 The Hansi knows that she with her grandfather in Gartenbau-cinema was AUX
 dabei wurde das Kino erst zehn Jahre nach dessen Tod gebaut.
 though was the cinema only ten years after his death built
 Hansi knows that she was in Gartenbau-cinema with her grandfather, although this cinema
 was only built ten years after the grandfather's death.

Furthermore, it is to a certain extent possible to ascribe wrong perceptions using constructions containing *dass*-complements, as shown in (13), which is even though a little odd, not completely ruled out:

- (13) ?Der Karli hört, dass sein Großvater mit ihm spricht, dabei ist der schon lange
 The Karli hears that his grandfather with him speaks although is he already long
 gestorben.
 died
 Karli hears his grandfather speaking to him although the grandfather died years ago.

Thus, whereas – as discussed before – *erinnern* as well as VoPs are usually analysed as factive verbs, they seem to have non-factive uses, even in constructions where they embed *dass*-complements. Therefore, neither (13) nor (12-a) entails that the attitude/perception holder knows the embedded proposition.

Related to that, Bourget (2016) argues that perceptual ascriptions as 'Jones sees a car' can receive a reading where they state a proposition that is existence-neutral regarding the names and existential quantifiers that occur within the object of the verb, i.e. they don't have their normal existential import (see Moore (1905), Smythies (1956), Hintikka (1969)). According to Bourget (2016), such readings occur

frequently in the context of hallucination; he invokes, among others, the following examples taken from the scientific literature on perceptual anomalies:

- (14) a. I might see, hear, smell and taste things that aren't there [...]. French (1905)
b. They feel insects on the hands and arms. Brown & Devine (1916)

Thus, according to these examples, it is possible to perceive 'things' that aren't actually there. To account for this, Bourget (2016) suggests different underlying structures for perceptual ascription of the form 'I see a car turning' that correspond to the supposedly different readings: in the case of a (usual) existential-import-reading, the existential quantifier introducing *a car* is outside the scope of the predicate *see*, whereas it is inside its scope in the case of the existence-neutral-reading. Therefore, w.r.t. 'I see a car turning', the existential-import-structure entails that there is a car I see turning, while the existence-neutral-structure doesn't license such an entailment.

The question whether proposing different structures is on the right track and related to that, whether this idea can possibly be expanded to declarative embedding VoPs and *erinnern* in non-factive uses is interesting as several questions arise – at a first glance it is for example not clear to me, why *wissen* and *erinnern*, which are both analysed as factive propositional attitude verbs, differ in that respect. However, this issue is not actually relevant for the current purpose. Thus, it suffices to extend the generalisation for distinguishing the know-type class such that it doesn't predict that non-factive uses of VoPs or *erinnern* with embedded declaratives allow knowledge-entailments. (15-a) provides a redefined version of the first condition stated in (5) and (7), constituting the final generalisation:

- (15) GENERALISATION (Final version)
A propositional verb Q is combinable with *genau* iff:
a. Every statement of the form 'x Q that p', given that Q presupposes the truth of p, entails that 'x knows that p' (at the time the sentence is evaluated and judged true).
b. 'x knows that p' is not presupposed. / Q can embed polar questions.

I leave the question open, whether the syntactic or the semantic condition should be chosen in (15-b) as I am for now not aware of possible advantages of one above the other.

Independent of the exact formulation, the main features of this generalisation will be relevant for the analysis presented in chapter 7, which will primarily be designed for *wissen*. Departing from that, an extension to other know-type predicates will be suggested subsequently. I believe that this is suitable, as – just as suggested by the generalisation in (15) – it seems that what makes know-type predicates combinable with *genau* is connected to the fact that all of them, intuitively speaking, are strongly related to knowledge. Thus, as argued above, from any sentence of the form 'x Q that p' where Q is a know-type predicate, roughly two things can be inferred: i) that 'x knows that p' and ii) additional information about how that knowledge was acquired. The only exception from this generalisation is of course *wissen* itself, as in this case no additional information regarding the knowledge acquisition is conveyed. Accordingly, it appears once again reasonable to assume that knowledge is the common thread that connects the class of know-type predicates.

After having shown that the class of verbs that are compatible with the modifier can be distinguished based on an independent property, which roughly boils down to the property of asserting knowledge, I will now turn to a discussion of different readings the modifier receives according to the type of embedding. This distinction is among others crucial because I will only make claims w.r.t. one of these readings.

5.2 Different readings of *genau*-modification in the context of propositional attitude verbs

In section 5.1.1 I pointed out that the set of verbs (which I named know-type predicates) that can be modified with *genau* shows an interesting pattern: while it includes verbs that usually – according to other properties as factivity, quantificational force as well as the kind of worlds they quantify over – don't fall into the same class, others, that are normally associated with each other based on these other properties, behave differently w.r.t. the compatibility with *genau*. Now, I will show that the modifier can receive two different readings when appearing in a position where it (apparently) modifies a proposition embedding know-type predicate.

5.2.1 Connection to the type of complement

This distinction between the two readings correlates with the type of complement clause the modified verb embeds. First, all know-type predicates can embed declaratives, wh-interrogatives as well as polar questions and can occur with the modifier in all of these configurations. For declaratives this was shown in (1) and (2) in the current chapter, repeated below in (16-a+b). (16-c+d) demonstrates the possibility to embed wh-interrogatives, (16-e+f) polar interrogatives:

- (16) a. Die Paula weiß / erinnert sich / merkt / versteht genau, dass der Hans die
 The Paula knows / remembers refl. / realises / understands GENAU that the Hans the
 Bank ausgeraubt hat.
 bank robbed AUX
 Paula knows / remembers / realises / understands GENAU that Hans robbed the bank
- b. Die Mona hört / sieht / riecht / erkennt / spürt / fühlt genau, dass ein Schwein im
 The Mona hears / sees / smells / realises / feels / feels GENAU that a pig in
 Zimmer ist.
 room AUX
 Mona hears / sees / smells / realises / feels / feels that there is a pig in the room.
- c. Der Karli weiß / erinnert sich / merkt / versteht genau, wo der Schatz
 The Karli knows / remembers refl. / realises / understands exactly where the treasure
 vergraben ist.
 buried AUX
 Karli knows / remembers refl. / realises / understands exactly where the treasure is buried.
- d. Die Mona hört / sieht / riecht / erkennt / spürt / fühlt genau, wo die Party ist.
 The Mona hears / sees / smells / realises / feels / feels exactly where the party is
 Mona hears / sees / smells / realises / feels / feels exactly here the party is taking place.

- e. Die Bella weiß / erinnert sich / merkt / versteht genau, ob sie jemand betrügt.
 The Bella knows / remembers refl. / realises / understands GENAU whether she someone betrays
 Bella knows / remembers refl. / realises / understands GENAU whether someone is betraying her.

Crucially, in the wh-interrogative embedding version, *genau* can be replaced by *ungefähr* (*approximately*), (17-b), which is in a way the counterpart of *genau* as it expresses imprecision. On the other hand, if the embedded proposition is a declarative as in (17-d), *ungefähr* is infelicitous just as it is the case of polar questions, (17-f):

- (17) a. Scenario: Karli has a treasure map that covers the city of Vienna. In this map, the location of the treasure is roughly marked with a circle that surrounds nearly an entire district. Anna reports:
- b. Der Karli weiß ungefähr, wo der Schatz vergraben ist.
 The Karli knows approximately where the treasure buried AUX
 Karli knows approximately where the treasure is buried.
- c. Scenario: Paula heard rumours that it was her friend Hans who is responsible for the bank robbery, she read about in the newspaper. Paula doesn't have proper evidence that proves these rumours but considers it very well possible that Hans actually robbed the bank as he is constantly broke. Anna reports:
- d. #Die Paula weiß ungefähr, dass der Hans die Bank ausgeraubt hat.
 The Paula knows UNGEFÄHR that the Hans the bank robbed has
 Paula knows UNGEFÄHR that Hans robbed the bank.
- e. Scenario: Bella thinks that Susi is cheating on her because Susi is constantly busy texting messages. However, she couldn't confirm her suspicion by now. Anna reports:
- f. #Die Bella weiß ungefähr, ob die Susi sie betrügt.
 The Bella knows UNGEFÄHR whether the Susi her betrays
 Bella knows UNGEFÄHR whether Susi is betraying her.

Embedding the modifier under negation is completely fine in the context of wh-interrogatives, (18-a), and polar questions, (18-c). In the case of declaratives on the other hand, negated *genau* is infelicitous, (18-b) (but see section 6.6 for further discussion):

- (18) a. Der Karli weiß nicht genau, wo der Schatz vergraben ist
 The Karli knows not exactly where the treasure buried AUX
 Karli doesn't know exactly where the treasure is buried.
- b. #Die Paula weiß nicht genau, dass der Hans die Bank ausgeraubt hat.
 The Paula knows not GENAU that the Hans the bank robbed AUX
 Paula doesn't know GENAU that Hans robbed the bank.
- c. Die Bella weiß nicht genau, ob sie jemand betrügt.
 The Bella knows not GENAU whether she someone betrays
 Bella doesn't know GENAU whether someone is betraying her.

Furthermore, in *wh*-interrogative embedding constructions, the modifier can also appear in the embedded clause, (20-a), which is not possible for embedded declaratives, (20-b), and polar questions, (20-c)¹:

- (20) a. Der Karli weiß, wo genau der Schatz vergraben ist.
The Karli knows where exactly the treasure buried AUX
Karli knows where exactly the treasure is buried.
- b. *Die Bella weiß, dass genau es regnet.
The Bella knows that GENAU it rains
Bella knows that GENAU it is raining.
- c. *Die Bella weiß, ob genau es regnet.
The Bella knows whether GENAU it rains
Bella knows whether GENAU it is raining.

What seems to be modified in (20-a) is the location of the treasure rather than the attitude towards the embedded proposition itself (henceforth 'downstairs-reading'). This reading is illustrated given the scenario-sentence pairs in (21). Whereas (21-b) is odd given Scenario A, the same sentence in (21-d) is absolutely fine given Scenario B. (21-e) shows that the version with the modifier in the matrix sentence is likewise fine given scenario B, thus, can also receive a downstairs-reading.

- (21) a. Scenario A: Karli has a treasure map that covers the city of Vienna. In this map, the location of the treasure is roughly marked with a circle that surrounds three streets. Anna reports:
- b. ??Der Karli weiß, wo genau der Schatz vergraben ist.
The Karli knows where GENAU the treasure buried AUX
Karli knows where GENAU the treasure is buried.
- c. Scenario B: Karli has a treasure map with high resolution that covers the eights district of Vienna. In this map, the location of the treasure is marked with a pin that unambiguously indicates that the treasure is buried below the slide on the playground in Schönborn-park. Anna reports:
- d. Der Karli weiß, wo genau der Schatz vergraben ist.
The Karli knows where GENAU the treasure buried AUX
Karli knows where GENAU the treasure is buried.
- e. Der Karli weiß genau, wo der Schatz vergraben ist.
The Karli knows GENAU where the treasure buried AUX
Karli knows GENAU where the treasure is buried.

So, in order to use *genau* here, it is insufficient if Karli knows that the treasure is hidden between some

¹However, sentences containing the modifier in the embedded declarative or polar question, don't yield an ungrammatical result in every case. (19-a) for example – given a specific intonation where the DP *der Hans* receives major stress – is fine. Nevertheless, *genau* has a completely different reading here: the modifier most naturally modifies the DP *der Hans* and is most appropriately paraphrased with 'of all people/things' (I illustrated this reading in section 3.1). The same holds for polar interrogatives, as shown in (19-b)

- (19) a. Die Paula weiß, dass genau der Hans die Bank ausgeraubt hat.
The Paula knows that GENAU the Hans the bank robbed AUX
Paula knows that, of all people, it was Hans who robbed the bank.
- b. Die Paula weiß, ob genau der Hans die Bank ausgeraubt hat.
The Paula knows whehter GENAU the Hans the bank robbed AUX
Paula knows whether, of all people, it was Hans who robbed the bank.

streets in the eight districts, rather, he has to have knowledge w.r.t. its exact position, i.e. the specific spot where it is buried.

Accordingly, based on the contrast presented in (20) I suggest that the modifier has two different readings when modifying know-type predicates. In examples as (20-a), where the modifier is shifted to the embedded wh-interrogative, only the downstairs-reading is available. However, if the modifier occurs in the matrix sentence of an embedded wh-interrogative, as in (16-c), both readings, the downstairs-reading as well as the high-certainty reading where the attitude itself is modified (henceforth upstairs-reading) are available. In declarative contexts on the other hand, only the upstairs-reading is available, which is the reading I am primarily interested in.

Based on the distinction between the upstairs-reading and the downstairs-reading, the pattern in (17) is intuitively explainable: *ungefähr* (*approximately*) is only possible in the downstairs-reading. This is because in the upstairs-reading, *genau* allegedly expresses high certainty or perfect evidence (even though not via a direct manipulation of these components as argued in chapter 4). Thus, *ungefähr*-modification, which is expected to have – on an intuitive level – the opposite effect, would yield knowledge that is based on low certainty or insufficient evidence. As according on the standard view (as well as my argumentation in chapter 4) such 'weak knowledge' doesn't exist, it is expected that *ungefähr*-modification targeting *wissen* is infelicitous. Putting it the other way around, *ungefähr* is only expected in constructions that can receive a downstairs reading, which is exactly what was observed in (17-b): *ungefähr* can occur in constructions with embedded wh-interrogatives, as in (17-b) where it receives a downstairs reading but not in those with embedded declaratives or polar questions, as in (17-d) and (17-f), where no downstairs-reading is available. In the case of negated *genau* which is exemplified in (18) it is slightly more complex – as the exact semantic contribution of the modifier needs to be determined in order to tackle the question what its negation might contribute, I will postpone this discussion to chapter 6.

The main point of this subsection is the differentiation of the two different readings. While I will only be concerned with the upstairs-reading in the later chapters of this thesis, I will now briefly discuss the downstairs-reading.

5.2.2 Downstairs-reading of *genau*

In contrast to the upstairs-reading, the downstairs-reading seems intuitively more closely related to the precision expressing use of *genau* in the context of scalar expressions. This is most obvious in examples containing embedded wh-interrogatives including *wie viele* (*how many*), exemplified in (22-a) with the modifier in the higher position as well as in (22-b) in a lower position:

- (22) a. Der Karli weiß genau, wieviele Schafe der Bauer hat.
The Karli knows exactly how-many sheep the farmer has
Karli knows exactly how many sheep the farmer owns.
- b. Der Karli weiß, wieviele Schafe der Bauer genau hat.
The Karli knows how-many sheep the farmer exactly has
Karli knows how many sheep the farmer owns exactly.

(22-b) as well as the downstairs-reading of (22-a) can thus be paraphrased as 'Karli knows the most exact answer to the following question: how many sheep does the farmer own?'; i.e. Karli knows the exact number of sheep owned by the farmer. Though, in the case of embedded wh-interrogatives including other wh-words, the question arises to what kind of scale they should refer. (23) shows examples for *wo* (*where*), *warum* (*why*) and *was* (*what*), though any wh-word works in this kind of configuration. Possible downstairs positions of the modifier are indicated in blue.

- (23) a. Die Bibi weiß genau, wo genau die Paula wohnt.
 The Bibi knows exactly where exactly the Paula lives
 Bibi knows exactly where exactly Paula lives.
- b. Der Tom weiß genau, warum genau die Maria gekündigt hat.
 The Tom knows exactly why exactly the Maria quit AUX
 Tom knows exactly why exactly Maria quit her Job.
- c. Die Paula weiß genau, was sich der Tom genau wünscht.
 The Paula knows exactly what refl. the Tom exactly wishes
 Paula knows exactly what Tom exactly wishes for.

So, as already addressed above, what seems to be modified under the downstairs-readings in (23) is indirectly the wh-word and thereby the answer set of the embedded interrogatives. This is demonstrated in (24). Whereas for the unmodified sentence in (24-a), the granularity of the answer set can be coarser, as illustrated by *A* in (24-b), the modified sentence in (24-c) requires a finer-grained answer, as illustrated by *A'* in (24-d):

- (24) a. Die Bibi weiß, wo die Paula wohnt.
 The Bibi knows where the Paula lives
 Bibi knows where Paula lives.
- b. $A = \{\text{Paula lives in Vienna, Paula lives in Marseille, Paula lives in Lisbon}\}$
- c. Die Bibi weiß genau, wo die Paula wohnt.
 The Bibi knows exactly where the Paula lives
 Bbi knows exactly where Paula lives.
- d. $A' = \{\text{Paula lives in Lange Gasse 5 in Vienna, Paula lives in Rue de la Republique 16 in Marseille, Paula lives in Campo the Santa Clara 33 in Lisbon}\}$

Thus, the paraphrase from (22) for the modification of *wie viele* (*how many*) can be adapted: the downstairs-reading of 'x weiß genau wh-interrogative' ('x knows exactly wh-interrogative') can be paraphrased as 'x knows the most exact answer to the embedded question'. Accordingly, I tentatively assume that in these cases the modifier manipulates the granularity of the answer set of the embedded question. This is supported by the intuition already brought up following which examples like (23) without the modifier in the downstairs-reading allow for coarser chunks of knowledge.

Exemplified based on (23-b) that means the following: to utter the sentence without the modifier, Tom could e.g. know the proposition 'a colleague slandered Maria'; in order to use *genau* on the other hand, Tom has to have more detailed knowledge, say, he knows the proposition 'Maria's colleague Peter slandered her by spreading the misinformation that she has an illegal bank account on the Bahamas'. Therefore, whereas in the modified case the granularity of the answer set denoted by the embedded question is finer – as Sauerland & Stateva (2007) claim for *exactly*-modified round numerals – it is coarser-grained

in the unmodified case – just as in the case of unmodified, round numbers. A further parallel becomes apparent in the context of *ungefähr*-modification (*approximately*), illustrated in (25):

- (25) a. Der Tom weiß ungefähr, warum die Maria gekündigt hat.
 The Tom knows approximately why the Maria quit AUX
 Tom knows approximately why Maria quit her Job.
- b. Der Bauer hat ungefähr 100 Schafe.
 The farmer has approximately 100 sheep
 The Farmer owns approximately 100 sheep.

Regarding (25-a), where due of the presence of *ungefähr* only the downstairs-reading is available, the granularity of the answer set denoted by the embedded question is even coarser than in the unmodified case, just as in (25-b), where, according to Sauerland & Stateva (2007) the granularity of the scale the numeral is associated with is set to the coarsest level available (thus, (25-b) might be even uttered felicitously if the farmer owns 110 sheep).

5.2.3 Distinguishing the two readings

As mentioned before, I will be concerned with in the upstairs-reading in the remainder of this thesis. Thus, I leave the exploration of the downstairs-reading at the intuition described above for now. One related question I will briefly tackle before turning to the semantic contribution of the modifier in the upstairs-reading is if and how it is possible to distinguish the two readings in examples like (23) with the modifier in the matrix clause. One problem in this context seems to be the fact that 'knowing the exact answer to a question' is often (or always?) connected to hold knowledge with high certainty or based on specifically good evidence (which was the paraphrase I provided for upstairs-*genau* in chapter 3). However, (26), where the contrasting modifiers are inserted simultaneously, seems – at least given a very specific context – acceptable, which wasn't expected given the two readings were in fact indistinguishable.

- (26) Scenario: Pezi and Hansi are discussing how many sheep the farmer around the corner approximately owns. They have no idea – the number of sheep might be 50 or 500. Thus, they consider whether they now anybody, who might know. Suddenly, Karli comes to Pezi's mind and she tells Hansi to call him. Hansi is skeptical and questions whether Karli really knows anything about the farmer's sheep. Pezi replies:
- a. Ganz sicher, der Karli weiß genau, wieviele Schafe der Bauer ungefähr
 Completely sure, the Karli knows exactly how-many sheep the farmer approximately
 hat, der war schließlich bis letzten Herbst sein Knecht.
 has, he was finally until last autumn his servant.
 I'm sure that Karli knows GENAU how many sheep the farmer owns approximately, after
 all he was his farm servant until last autumn.

Thus, given the acceptability of (26), if the downstairs-position is filled with *ungefähr*, *genau* in the matrix sentence can only receive an upstairs-reading. That again supports the presence of such a reading. In chapter 6 I will turn to a detailed examination of the semantic contribution of the modifier in the upstairs-reading. Thus, in order to avoid confusion of the different readings, I will only consider declar-

ative embedding examples throughout this investigation.

5.3 Summary

Chapter 5 was dedicated to the distribution of *genau* in the context of propositional attitude verbs. The discussion in section 5.1 revealed that besides *wissen*, the modifier can occur with several other attitude verbs as well as all verbs of perception. Crucially, the verbs compatible with *genau* behave differently with respect to other properties, whereas other verbs, that are usually classified together with some of the *genau*-compatible verbs, have to be distinguished based on the compatibility with the modifier. Thus, I tried to classify this new set of verbs independently and suggested and discussed different conditions to characterize the class of verbs that can combine with *genau*, which I named know-type predicates. I ended up with the generalisation that for all members (Q) of this class it holds that i) every statement of the form 'x Q that p', given that Q presupposes the truth of p, entails that 'x knows that p' and ii) 'x knows that p' is not presupposed. The second condition, I suggested, could be replaced by 'Q can embed polar questions'; as I don't see any advantages of one of the second conditions above the other, I didn't decide on which is to be preferred yet.

After that, I investigated *genau* in the different embedding contexts in section 5.2. It turned out that the modifier can receive two different readings in the context of embedded wh-interrogatives, one of which – which I called downstairs-reading – has to be distinguished from the one at the heart of this thesis – the upstairs reading. In section 5.2.2 I briefly commented on the downstairs reading as it is puzzling itself but seems – at least on the surface – more obviously related to *genau* in the context of scalar expressions.

Chapter 6

Semantic contribution of *genau*

This section is dedicated to examine the semantic contribution of *genau* to know-type predicates (proceeding from *wissen*) in greater detail. In order to do so, I will briefly sum up below what we have seen so far:

- The German modifier *genau*, that usually expresses a high degree of precision, can attach to *wissen* and several other propositional attitude verbs as well as all verbs of perception ('know-type predicates) when they embed propositional complements.
- I classified know-type predicates via the generalisation that sentences containing them, entail, but don't presuppose, that the attitude/perception holder knows the proposition in question.
- *genau* in the context of know-type predicates with wh-complements gives rise to two different readings: i) the downstairs reading, where the granularity of the embedded clause is modified and ii) the upstairs reading, where the strength of the respective attitude is modified, which is the reading I am mainly interested in (see section 5.2).
- This modification associated with the upstairs reading of *genau* is incompatible with the classical Hintikka-style analysis of know-type predicates as universal quantifiers (chapter 2).
- Thus, I considered a degree analyses of *wissen* according to which it makes available a degree that is associated to the probabilistic scale $[0,1]$, but ruled it out based on the observation that it is not possible to refer to a degree below the maximum (section 3.4).
- I also considered but excluded the idea that *genau* modifies specific components of the semantics of *wissen* – certainty and evidence – based on the distribution of the modifier within the class of attitude verbs (chapter 4).

Thus, the question of what the modifier contributes to know-type predicates remains open, and so, accordingly, does the question how its meaning combines with the semantics of the verbs it attaches to. As will become clear again in the current section, examining contexts including *wissen* where *genau* is licensed reveal that the connection to evidence is undeniable. As I excluded the possibility that *genau* directly modifies the evidence component based on the compatibility of *genau* with *erinnern* which I argued doesn't contain this component (see section 4.1), this connection will be implemented in a more

abstract way.

I will proceed as follows: I start by determining licensing contexts of *genau wissen* in the upstairs reading in section 6.1 and differentiate two types of evidence involved in the formation of knowledge in section 6.2. Thereafter, I will turn to a detailed discussion of specific examples where the upstairs-reading of the modifier is licensed in section 6.3. Based on this, I will claim that the modifier indicates a specifically high persistence of the knowledge the attitude holder holds regarding *p*. Persistence is roughly defined as follows: even if the actual world was – w.r.t. to other properties than *p* – slightly deviant from how the attitude holder believes it to be, her attitude w.r.t. *p* would survive. Regarding the implementation of this idea, I will suggest that *x weiß genau dass p* holds if *p* holds in a specifically large set of worlds consisting of *x*'s belief worlds as well as worlds close to *x*'s belief worlds. This set is required to exceed the set of worlds where *p* has to be true in the context of unmodified *wissen*. Thus, I will argue that *genau* in the context of know-type predicates is connected to a widening of the domain of quantification such that additional worlds become available. As this idea leads to the need of considering not only belief worlds of an attitude holder, but also worlds outside of this set, it is incompatible with the Hintikka-semantics.

In this connection, I will also get back to Lewis (1996) who differentiates between three types of possibilities, as this will turn out to be a handy classification for making my idea more precise. Additionally, I will discuss two phenomena that seem reminiscent of my suggestion regarding the semantic contribution of *genau* to *wissen*: first, the domain widening function proposed for *any* (see Kadmon & Landman (1993), Krifka (1995), Lahiri (1998), Chierchia (2006)) and second, new data showing reduplication of individual and temporal universals that also seem to lead to a widening of the domain of quantification.

6.1 Licensing contexts for *genau wissen*

When looking at contexts where *genau wissen* is licensed, it becomes clear that they are restricted. This is for example illustrated in (1), where *genau wissen* is infelicitous. Whereas B can use the unmodified statement in (1-b) as an answer to the question in (1-a), (1-c), where *wissen* is modified, is odd without further context:

- (1) Scenario: Anna sees Peter crying and has no idea why, thus she asks his best friend Berta:
- a. A: Warum weint der Peter?
A: Why cries the Peter
A: Why is Peter crying?
 - b. B: Weil er weiß, dass der Hans ihn betrügt.
B: Because he knows that the Hans him cheats
B: Because he knows that Hans is cheating on him.
 - c. B': #Weil er genau weiß, dass der Hans ihn betrügt.
B: Because he knows GENAU that the Hans him cheats
B: Because he knows GENAU that Hans is cheating on him.

On the other hand, in (2-b) the modifier is licensed:

- (2) Scenario: Anna sees Peter crying. She thinks that the only reason for Peter to cry is his boyfriend

Hans. Anna knows that Hans is cheating on Peter, however she is convinced that Peter doesn't know about that. Thus, she wonders why he is crying and asks his best friend Berta:

- a. A: Warum weint der Peter, er weiß ja gar nicht dass der Hans ihn betrügt!?
 A: Why cries the Peter he knows prt. really not that the Hans him cheats
 A: Why is Peter crying, he doesn't know that Hans is cheating on him, right?!
- b. B: Doch, er weiß genau, dass der Hans ihn betrügt.
 B: Prt. he knows GENAU that the Hans him cheats
 B: In fact, he knows GENAU that Hans is cheating on him.

Based on this, I want to propose that for the licensing of *genau wissen* it is crucial that the question in (2-a) addresses Peter's knowledge. Thus, I argue that a licensing condition for sentences of the form 'x weiß genau dass p' (at least in the context of 3rd person subjects) is that x's attitude has to have been previously challenged. This can explain why (1-c) is ruled out.¹

6.2 Formation of knowledge: two types of evidence

As will become clear in section 6.3, evidence plays a crucial role when determining the contribution of *genau* to know-type predicates. Thus, it is important to briefly consider different types of evidence. In principle, there are two different logical options to acquire knowledge w.r.t. a proposition *p*: either by directly confirming the truth of the proposition, i.e. via direct, current evidence; or by excluding all of the salient alternatives to *p* such that the proposition can be inferred.² These different ways are illustrated in (4):

- (4) a. Scenario A: There are three little hats, a green one, a blue one and a red one. Fini saw Bob putting a ball under one of them, but she didn't see which one it was. Thus, she checks the blue and the green hat under which she doesn't find the ball and concludes that the ball is under the red hat. Bob says:
- b. Scenario B: There are three little hats, a green one, a blue one and a red one. Fini saw Bob putting a ball under one of it, but she didn't see which one it was. Thus, she starts by checking the red hat and immediately finds the ball under it. Bob says:
- c. Die Fini weiß, dass der Ball unter dem roten Hut ist.
 The Fini knows that the ball under the red hat is
 Fini knows that the ball is under the red hat.

¹Sentences with *genau wissen* including 1st person subjects are rather licensed in context where the proposition *p* itself is previously challenged (and thereby x's attitude towards *p*), as illustrated in (3). This is because it is obviously impossible to challenge someones knowledge w.r.t. a certain proposition while simultaneously committing to the truth of that proposition.

- (3) a. A: Warum weinst du? Du weißt ja noch gar nicht sicher, ob der Hans dich betrügt.
 A: Why cries you? You know prt. yet even not sure whether the Hans you cheats
 A: Why are you crying? You don't even know for sure whether Hans is cheating on you.
- b. Doch, ich weiß genau, dass er mich betrügt.
 prt. I know GENAU that he me cheats
 In fact, I know GENAU that he is cheating on me.

²In real life contexts knowledge built on mixed evidence is probably most plausible; i.e. in order to maintain a certain piece of knowledge for which one had direct evidence at some point, the attitude holder has to be in a position to exclude that relevant circumstances could have changed since that point.

Fini's knowledge in (4-c) can either be inferred from the exclusion of all other options, exemplified by Scenario A in (4-a), or it can be based on direct verification, as in Scenario B in (4-b). One crucial difference between those scenarios is that in a situation where the knowledge is inferred via exclusion of alternatives as in Scenario A above, the attitude holder has to be very much (and more or less exhaustively) aware of the alternatives – as one can only exclude what one is aware of. Thus, she doesn't only have to be able to exclude all relevant alternatives, but, in the first place be aware of any such alternative. This is illustrated in (5). Given Scenario C in (5-a), Fini might utter (5-b) as she is misled by her perception and believes to be aware of all relevant alternatives. Bob on the other hand, who is indeed aware of all relevant alternatives, wouldn't utter (5-c) given Scenario C as he knows that Fini didn't rule out all relevant alternatives to the proposition 'the ball is under the red hat'.

- (5) a. Scenario C: There are five little hats, a green one, a blue one, a yellow one, a purple one and a red one. Because of a reflection, Fini sees only four of the hats and misses the yellow one. She saw Bob putting a ball under one of the hats in, but she didn't see that it was the red one. She asks Bob to lift the blue, the green and the purple hat, where she sees no ball.
- b. Fini: Ich weiß, dass der Ball unter dem roten Hut ist.
 Fini: I know that the ball under the red hat is
 Fini: I know that the ball is under the red hat.
- c. Bob: #Die Fini weiß, dass der Ball unter dem roten Hut ist.
 Bob: The Fini knows that the ball under the red hat is
 Bob: Fini knows that the ball is under the red hat.

Now, if Bob points out to Fini that there is another relevant alternative that she might have overlooked, rational Fini would withdraw her attitude, as in (6):

- (6) a. Bob: You overlooked the yellow hat!
- b. Fini: Oh, dann weiß ich es doch nicht.
 Fini: Oh, then knows I it prt. not
 Fini: Oh, in this case I don't know it.

Crucially, in a direct verification context as Scenario B in (4), Fini does not have to be at all aware of each relevant alternative. If she directly perceives that the ball is currently under the red hat, there may be 1000 other options where it could have been, of which's existence Fini isn't even aware, that wouldn't change anything w.r.t. her knowledge. Thus, this way of knowledge acquisition leads to robust knowledge by least effort. The indirect procedure of forming knowledge on the other hand may likewise lead to robust knowledge, but the effort is much higher. The direct procedure is possibly generally more error-proof, as it is immune against scenarios as the one in (6) where the subject oversees an alternative.

Now, we have two components that will be relevant for the discussion in section 6.3: i) the licensing condition for sentences of the form *x weiß genau dass p* according to which the x's attitude towards p needs to have been under prior consideration, and ii) the distinction between (at least) two different ways of forming knowledge that lead to robustness of the relevant piece of knowledge through different steps. With this in mind, I will now turn to an examination of an example where *genau wissen* is licensed.

6.3 Dismantling an example

The over-all context for the examples discussed in this section is given in (7):

- (7) Context: Pepi and Otti are living in a house on the hill together with their three cats Pi, Pa and Po. The cats are allowed to go outside during the day, but as Pepi is very strict, she collects them on the dot of 6:30 p.m. and locks them into the house where they get dinner. Sometimes, Pepi doesn't even have to search for them as the hungry cats often come back by themselves and miaow in front of their bowls in the kitchen starting at 6. Pepi and Otti have a neighbour, Karli, who is living nearby with his dog.

One day at 6:20 Pepi is outside in the garden beginning her hunt. As she and Otti had a fight this afternoon, she doesn't talk to him and thus doesn't want to ask him whether he has seen the cats. During her search she encounters Karli who just had Gin and Tonics with Otti. Karli tells her:

- (8) Du kannst aufhören zu suchen, der Otti weiß, dass die Katzen in der Küche sind.
You can stop to search the Otti knows that the cats in the kitchen are.
You can stop looking for the cats, Otti knows that they are in the kitchen.

Pepi, who is already tired of searching but generally skeptical w.r.t. any information originating from Otti, decides to ask him despite their fight. Otti is sitting on the terrace in front of their house looking at his laptop.

- (9) a. P: Du weißt angeblich wo die Katzen sind?
P: You know reportedly where the cats are
P: You know reportedly where the cats are ?
- b. O: Ja, in der Küche, ich habe die Türe hinter ihnen zu gemacht.
O: Yes in the kitchen, I have the door behind them close made
O: Yes, they are in the kitchen, I closed the door behind them.
- c. P: Aber was, wenn das Fenster offen ist? Dann können sie schon wieder überall
P: But what if the window open is? Then can they already again everywhere
sein!
be
P: But what if there is an open window? They may be everywhere again!
- d. O: Ist es nicht, sie sind in der Küche.
O: Is EXPL. not they are in the kitchen
There is no open window, they are in the kitchen.
- e. P: Aber du kannst nicht ausschließen, dass sie durch einen Geheimgang im Kamin
P: But you can not exclude that they through a secret-passage in chimney
auf das Dach geklettert und dann wieder in den Garten gelaufen sind. Oder durch ein
on the roof climbed and then again in the garden ran AUX. Or through a
Loch in der Türe.
hole in the door
P: But you can't exclude the possibility that they escaped through a secret passage in the
chimney, climbed on the roof and got back into the garden. Or through a hole in the door.
- f. O: Doch, ich weiß genau, dass sie in der Küche sind.
O: Prt. I know GENAU that they in the kitchen are

- O: Prt., I know GENAU that they are in the kitchen.
- g. #/??O: Doch, ich weiß, dass sie in der Küche sind.
- O: prt. I know that they in the kitchen are
- O: I can, I know that they are in the kitchen.

The licensing of *genau wissen* in (9-f) is in line with the discussion in section 6.1, as the requirement that Otti's knowledge (as well as the relevant proposition itself) has been questioned, is fulfilled. The unmodified version in (9-g) on the other hand is bad or at least strongly dispreferred.³ In (9-b) Otti confirms that he knows where the cats are, namely in the kitchen. Pepi in (9-c) starts to challenge Otti's knowledge by bringing up circumstances that might be the case, which Otti may not have considered and that could undermine his knowledge. In (9-d), Otti rejects the possibility suggested by Pepi in (9-c) that there is an open window. Thus, apparently he knows that the windows are closed. However, Pepi goes on with suggesting circumstances that may undermine Pepi's knowledge. Thus, she brings up the rather implausible scenarios in (9-e), which Otti again rejects by using *genau wissen* in (9-f). So why would Otti be in the position to reject such far-fetched possibilities? Picking up the two ways of forming knowledge illustrated in section 6.2 there are (at least) two options: either Otti is aware of each relevant alternative scenario that could make 'the cats are in the kitchen' wrong and can rule out all of them; or he is in the possession of direct and current evidence in favour of 'the cats are in the kitchen'. In a real life scenario like this, it is highly unlikely (maybe even impossible) to be aware of every relevant alternative scenario like secret-passages or holes in doors. Thus, it seems more plausible to assume that Otti in (9-f) can reject such scenarios without hesitation, because he is in possession of direct and current evidence in favour of the proposition 'the cats are in the kitchen' (e.g. because he has seen them there).

On the other hand, if Otti weren't in a position to rule out that these scenarios may change anything w.r.t. his knowledge of the cats whereabouts, he would probably react with something like (10-b) to the possibilities brought up by Pepi in (9-d), repeated in (10-a) (given the same previous discussion as in (9)):

- (10) a. P: Aber du kannst nicht ausschließen, dass sie durch einen Geheimgang im
 P: But you can not exclude that they through a secret-passage in
 Kamin auf das Dach geklettert und dann wieder in den Garten gelaufen sind. Oder
 chimney on the roof climbed and then again in the garden ran AUX. Or
 durch ein Loch in der Türe.
 through a hole in the door
 P: But you can't exclude the possibility that they escaped through a secret passage in the
 chimney, climbed on the roof and got back into the garden. Or through a hole in the door.
- b. O: Ok, das kann ich nicht ausschließen, aber ich halte es für höchst
 O: Alright, that can I not exclude, but I hold it for highly
 unwahrscheinlich.
 implausible
 O: Alright, I can't exclude that, though I consider it highly implausible.

Thus, based on the contrast between (9) and (10) I suggest that there is a connection between the li-

³Interestingly, the modifier can be omitted when putting major stress on *weiß* (I will get back to this connection in section 8.4)

censing of *genau wissen p* and a specific kind of certainty regarding the truth of *p* (on the part of the attitude holder). This certainty can be rephrased as follows: if a knowledge ascription of the form *x weiß genau p* is licensed, the attitude holder is in a position to exclude that certain far-fetched scenarios (as secret-passages or holes in doors) could undermine his knowledge w.r.t. the proposition in question. Additionally, this specific certainty is obviously connected to the piece of evidence the subject is building his attitude on. However, as I excluded in chapter 4 that the modifier directly manipulates the evidence or certainty component, this intuition has to be implemented in a more abstract way.

6.3.1 Illustration of the modifier's contribution based on a model

In order to illustrate the contribution of *genau* more clearly, let's assume that Otti builds his attitude in (9), repeated in (11-a), on the evidence in (11-b) and additionally believes the proposition in (11-c):

- (11)
- a. Otti stands in a *genau wissen*-relation to the following proposition: the cats are in the kitchen (*p*)
 - b. Otti's evidence: he is monitoring the cats in the kitchen via a CCTV camera on his laptop while discussing with Pepi
 - c. Otti believes: the CCTV cameras are properly working

On the other hand, let's assume that Otti in the scenario in (10), where he can't use *genau wissen*, builds his attitude on the evidence in (12-b) and additionally believes the propositions in (12-c):

- (12)
- a. Otti stands in a *wissen*-relation to the following proposition: the cats are in the kitchen (*p*)
 - b. Otti's evidence: he saw the cats entering the kitchen 10 minutes ago and closed the door as well as all windows
 - c. Otti believes: the cats can't open doors or windows; neither Pepi nor Karli was in the house within the last 15 minutes

In the context of (11) Otti has direct and current evidence for *p*. On the other hand, in the context of (12), he infers *p* from the fact that every relevant alternative to *p* is implausible. That means, according to what Otti believes in (12), there is no plausible way of how the cats could have gotten out of the kitchen within the last ten minutes. I argue that Otti's knowledge in (11) is in a certain respect stronger than his knowledge in (12). The knowledge in (11) is stronger, as given his evidence and what he believes, there are fewer scenarios in which Otti's conclusion that the cats are in the kitchen is no longer warranted compared to (12). In order to illustrate that, consider the scenarios below:

<p>Secret-passageway-scenario: The cats entered the kitchen 10 minutes ago Otti closed the door behind the cats There is a secret exit in the kitchen that leads through the chimney</p>
<p>Dog-opens-door-scenario: The cats entered the kitchen 10 minutes ago Otti closed the door behind the cats Karli's dog opened the kitchen-door 3 minutes ago</p>
<p>Hole-in-the-door-scenario: The cats entered the kitchen 10 minutes ago Otti closed the door behind the cats There is a hole in the door that suddenly emerged</p>
<p>Eagle-smashes-window-scenario: The cats entered the kitchen 10 minutes ago Otti closed the door behind the cats A giant eagle smashed a kitchen window 7 minutes ago</p>
<p>Hacker-scenario: The cats entered the kitchen 10 minutes ago Otti closed the door behind the cats Hackers from the Anonymous collective, who mistake Otti with a Russian spy are controlling his laptop</p>

Now, we can evaluate the five scenarios above relative to the evidence and beliefs in the context of (11) and (12), respectively. The evaluation concerns the question whether and why (not) Otti's conclusion that the cats are in the kitchen is still warranted in light of the respective scenario. I start by evaluating the scenarios relative to (11), where Otti has direct, current CCTV-evidence:

- Secret-passageway-scenario: Otti can maintain his conclusion that the cats are in the kitchen because even if there is a secret exit, the cat's can't have used it as he sees them on CCTV. ✓
- Dog-opens-door-scenario: Otti can maintain his conclusion that the cats are in the kitchen because even if Karli's dog opened the kitchen-door 3 minutes ago, the cat's can't have escaped through it, as he sees them on CCTV. ✓
- Hole-in-the-door-scenario: Otti can maintain his conclusion that the cats are in the kitchen because even if there is a hole in the door that suddenly emerged, the cat's can't have escaped through it, as he sees them on CCTV. ✓
- Eagle-smashes-window-scenario: Otti can maintain his conclusion that the cats are in the kitchen because even if an eagle smashed a kitchen window 7 minutes ago, the cat's can't have escaped through it, as he sees them on CCTV. ✓
- Hacker-scenario: Otti cannot maintain his conclusion that the cats are in the kitchen because if hackers are indeed controlling his laptop, the CCTV footage he sees may be fake and the cats may have gotten out of the kitchen within the last ten minutes. ✗

Below, the five scenarios are evaluated relative to (12), where Otti infers p from the fact that every relevant alternative to p is implausible according to his beliefs:

- Secret-passageway-scenario: Otti cannot maintain his conclusion that the cats are in the kitchen because if there was a secret exit, the cat's could have escaped within the last ten minutes. ✗
- Dog-opens-door-scenario: Otti cannot maintain his conclusion that the cats are in the kitchen because if the dog opened the door, the cat's could have escaped within the last ten minutes. ✗
- Hole-in-the-door-scenario: Otti cannot maintain his conclusion that the cats are in the kitchen because if there was a hole in the door, the cat's could have escaped within the last ten minutes. ✗
- Eagle-smashes-window-scenario: Otti cannot maintain his conclusion that the cats are in the kitchen because if an eagle smashed the window, the cat's could have escaped within the last ten minutes. ✗
- Hacker-scenario: Otti can maintain his conclusion that the cats are in the kitchen because whether hackers are controlling his laptop doesn't play a role w.r.t. his beliefs regarding the cats whereabouts. ✓

Accordingly, given the CCTV-evidence in (11), Otti's conclusion that the cats are in the kitchen is warranted in four out of five of the scenarios. On the other hand, given the partially inferred evidence in (12), Otti's conclusion is only warranted in one out of five scenarios. If a conclusion is warranted in a certain scenario, I will henceforth say that the knowledge that is represented by that conclusion *persists in this scenario*. Persistence of a certain piece of knowledge is defined in (13):

- (13) An agent *a*'s knowledge of a certain proposition *p* persists in a scenario *s* if not-*p* is no valid conclusion in *s* according to *a*'s beliefs.

Importantly, the scenarios given above are rather far-fetched or possibly implausible. Given (11), Otti's knowledge persists in several such far-fetched, implausible scenarios. The crucial point is that Otti doesn't have to be able to rule out those scenarios themselves, but – based on his evidence in (11) – he is in a position to exclude the consequence that the cat's escaped because of such a scenario. On the other hand, the knowledge in the context of (12) doesn't persist in most of the far-fetched scenarios.

Accordingly, I suggest that the use of *genau* in the context of *wissen* is connected to such far-fetched scenarios that may potentially undermine the knowledge: if a statement of the form 'x weiß genau dass p' is licensed, it indicates that a) *x*'s knowledge persists in a great number of such scenarios, or b) in the less usual case, that the attitude holder can rule out a great number of such scenarios. (14) illustrates such an unusual scenario where *genau wissen* is caused by indirectly inferred – though specifically exhaustive – evidence:

- (14) a. Otti stands in a *genau wissen*-relation to the following proposition: the cats are in the kitchen (*p*)
- b. Otti's evidence: he saw the cats entering the kitchen 10 minutes ago and closed the door as well as all windows; he checked whether there is a secret exit in the kitchen and can exclude it; he can exclude that anyone – person or animal – was in the house within the last 15 minutes

- c. Otti believes: the cats can't open doors or windows

Given the evidence in (14-b) Otti has strong knowledge w.r.t. p because he can exclude an exceptional great number of scenarios that could potentially make p wrong and can thus infer p . Regarding the five scenarios above, this leads to a comparable result as in the case of the CCTV-evidence in (11). Given Otti's evidence in (14), he can exclude four out of five scenarios as candidates for the actual world – i.e. only the eagle-smashes-window-scenario is unexcludable based on Otti's evidence as his conclusion that the cats are in the kitchen does not persist in this scenario. On the other hand, besides excluding various scenarios, Otti's knowledge according to (14) likewise persists in a large number of far-fetched scenarios. An example is given in (15):

- (15) a. P: Du weißt angeblich wo die Katzen sind?
 P: You know reportedly where the cats are
 P: You know reportedly where the cats are ?
- b. O: Ja, in der Küche, ich habe die Türe vor zehn Minuten hinter ihnen zu gemacht.
 O: Yes in the kitchen, I have the door before ten minutes behind them close made
 O: Yes, they are in the kitchen, I closed the door behind them ten minutes ago.
- c. P: Aber der Karli hat gesagt, er hat vor fünf Minuten drei Katzen im Wald gesehen,
 P: But the Karli AUX said he has before five minutes three cats in forest seen die genau ausgesehen haben wie Pi, Pa und Po!
 who exactly looked AUX like Pi, Pa and Po
 P: But Karli said that he has just seen three cats in the forest that looked exactly like Pi, Pa and Po!
- d. O: Kann sein, ich weiß aber genau, dass sie in der Küche sind.
 O: Can be, I know but GENAU that they in the kitchen are
 O: That's possible, but I know GENAU that they are in the kitchen.

Here, Pepi challenges Otti's knowledge by uttering (15-c). Though, Otti's utterance in (15-d) including *genau wissen* indicates that his knowledge persists in this scenario, i.e. it suggests that even if it is really the case that the unlikely situation pertains that there are three identical looking cats in the neighbourhood that are straying in the forest, Otti can exclude that these cats are Pi, Pa and Po. Thus, he can maintain his knowledge. Again, I believe that the scenarios where *genau wissen* is licensed are in the vast majority connected rather to direct, current evidence as illustrated in (11). Nevertheless, a proper analysis has to cover this other logically option illustrated in (14) likewise. Eventually, knowledge-formation-scenarios most commonly consist of a mix of direct evidence in favour of p and inferring p from the exclusion of alternatives. This is actually the case in (14), that involves direct evidence, i.e. seeing the cats entering the kitchen, and inference-based evidence, i.e. excluding any escape option.

In any case, the licensing of *genau wissen* seems to be related to specifically good evidence: either to direct, current evidence an attitude holder builds his knowledge regarding a proposition p on; or to merely indirect, but exhaustive evidence, i.e. gapless exclusion of any alternative to p ; most probably to a mix of both. Importantly, this relation to evidence will have to be implemented on an abstract level, as I excluded the possibility that *genau* directly modifies the evidence component.

6.3.2 Is unmodified *wissen* (too) weak?

The above discussion leads to the question whether Otti in the context of (12) – where his evidence is basically seeing the cats entering the kitchen and closing the door behind them – actually has proper knowledge. After all, there are several scenarios that may undermine his knowledge that he can neither exclude, nor is he in the possession of evidence that would allow such scenarios while his knowledge wouldn't be impaired. Actually, not even in (11) and (14) can Otti exclude every far-fetched scenario that could make *p* wrong. But be that as it may, the dialogue in (10) suggests that – even if there are several far-fetched scenarios that may impair his knowledge – Otti still can felicitously utter 'Ich weiß dass *p*'. Thus, I submit that such far-fetched scenarios as described above usually don't play a role, i.e. can be ignored, while nevertheless ascribing/holding knowledge. Accordingly, I suggest that *wissen* in the light of (12) on the one hand, and (11) as well as (14) on the other hand, is connected to a different domain of quantification, which allows us to ignore certain scenarios in a context as (12). Therefore, I claim that in contexts where *genau wissen* is licensed, the verb's domain of quantification exceeds the domain connected to unmodified *wissen* such that it is quantified over more worlds. Crucially, this bigger domain contains additional worlds that are close to the subject's doxastic alternatives, though slightly deviant (i.e. counterfactual w.r.t. the subject's beliefs).

I will claim that a certain amount of such non-belief worlds is also part of the domain of quantification of *wissen* in its unmodified use, i.e. it has to be referred to such worlds in the basic lexical entry of the attitude verb. Via the introduction of such counterfactual worlds, the semantic components of *wissen* that were established to play a role in *genau*-modification of know-type predicates, namely evidence and, connected to that, certainty, become indirectly accessible and thereby available for manipulation. Thus, I claim that the contribution of *genau* in the context of know-type predicates is to induce a widening on the attitude verb's domain of quantification, such that the widened domain includes a greater amount of non-belief worlds. This, I will suggest, reflects the seemingly greater strength of the knowledge in *genau wissen*-contexts.

This idea – starting with the contrast between the scenarios in (11) and (12) – traces back to the context sensitivity of *wissen* illustrated based on the contrast between (19) and (20) in section 2.3.1, repeated below:

- (16) Scenario A: it's Friday and A and B want to deposit their pay checks at the bank as they do every Friday. From outside they notice long lines in the bank. A suggests to deposit the checks tomorrow, but B is worried that the bank will be closed on Saturdays. A is convinced that the bank will be open the next day because she was just there two weeks ago on a Saturday and replies:
- a. A: No, I know it will be open, I was just there two weeks ago on Saturday. DeRose (1992)[p.913]
- (17) Scenario B: It's Friday and A and B want to deposit a large and very important check. From outside they notice long lines in the bank. A suggests to deposit the checks tomorrow, but B is worried that the bank will be closed on Saturdays. A tells B that she is convinced that the bank will be open the next day because she was just there two weeks ago on a Saturday. B reminds

A that the paycheck bounces if it wasn't deposited by Monday which would leave A and B in a very bad situation. B also remarks that banks can change their opening hours and asks A whether she really knows that it will be opened tomorrow. A replies:

- a. A: Well no, I'd go better in and make sure. DeRose (1992)[p.913]

The conclusion that was drawn from these examples was basically that what counts as strong enough knowledge differs with context. More specifically, we saw that the minimal threshold is higher, the more severe the consequences are in case that the purported knowledge turned out to be erroneous. It seems that *genau* can be used in such examples to reassure the interlocutor of the stability of the knowledge, i.e. that it even holds in view of severe consequences. This intuition is illustrated in the modified version of (17) below:

(18) Scenario C: It's Friday September the 12th and A and B want to deposit a large and very important check. From outside they notice long lines in the bank. A suggests to deposit the checks tomorrow, but B is worried that the bank will be closed on Saturdays. A tells B that she is convinced that the bank will be open the next day because she sees a huge sign saying 'open on Saturdays, starting from September 13th'. B reminds A that the paycheck bounces if it wasn't deposited by Monday which would leave A and B in a very bad situation. B asks A whether she really knows that it will be opened tomorrow. A replies:

- a. A: Ja, ich weiß genau, dass sie morgen offen hat.
A: Yes, I know GENAU that she tomorrow open has.
A: Yes, I know GENAU that it's open tomorrow.

In Scenario C in (18), A has more current and direct evidence than in (17): while in (17) she is building her knowledge on possibly obsolete evidence – she was at the bank two weeks ago on a Saturday; in (18), she sees an up-to-date sign saying that the bank will be opened on Saturday. This piece of evidence allows her to stick to her knowledge, even if B reminds her of the severe consequences that would arise if A was wrong. Thus, it seems that *genau* indicates that the minimal knowledge-threshold is widely exceeded, i.e. that the knowledge is specifically strong and thus can be maintained even if the consequences of an error were severe.

To sum up, there seems to be an interaction between the context sensitivity of knowledge ascriptions and the licensing of *genau*: the modifier suggests that the respective knowledge is good enough for contexts that require a specifically high robustness of the knowledge. This indicates again that *genau* can be taken to induce a widening on the set of scenarios (or possible worlds) that can be taken into account without bringing the attitude holder in the position to withdraw her knowledge. Before implementing this idea in section 7.3 and in order to intuitively describe the type of scenarios that are affected by this widening, I will get back to Lewis (1996) in section 6.4 who provides rules for ignoring possibilities that appear to be a handy classification in support of my idea. Additionally, I will discuss other expressions that are connected to a widening reminiscent of what I suggest for *genau* in section 6.5 and section 6.6.

6.4 Relation to far-fetchedness

In section 6.3 I put forward the claim that the contribution of *genau* in the context of *wissen* is connected to the consideration of a set of worlds apart from the attitude holder's belief worlds. I suggested that, *genau* in such contexts indicates that the knowledge is specifically persistent. Persistence of a certain piece of knowledge was defined in so far, as even if the actual world slightly deviated from the world that the attitude holder believes to be in, her attitude w.r.t. the relevant circumstance still holds. I furthermore suggested that this property is in most cases connected to a certain type of evidence, whereas in principal there are two different procedures of knowledge acquisition that I differentiated. The difference between bare *wissen* and *genau wissen* was accordingly defined with respect to the size of the set of such non-belief worlds towards which the piece of knowledge is persistent. Thus, the modifier's contribution can be described as inducing a widening on that set.

In light of this, the question arises, how these worlds or circumstances that slightly deviate from the attitude holder's belief worlds, can be characterised. Crucially, these worlds have to be somehow divided in those w.r.t. which the knowledge needs to be persistent in order to use the bare form of the know-type predicate, from those that are added in the case of *genau*-modification. Therefore, I will now discuss an idea put forward in Lewis (1996) that might shed light to this distinction.

As briefly touched upon in section 2.3.4, Lewis (1996) argues that one knows that *p* if one can exclude every not-*p* possibility apart from those possibilities that can be properly ignored. Thus, whatever may be ignored, according to Lewis, doesn't have to be excluded. A crucial property of such possibilities that may be ignored is that we don't think of them. On the other hand, Lewis claims, as soon as a possibility is under consideration, it can not be ignored anymore.

To generally distinguish between possibilities that may be ignored and such that have to be considered, Lewis introduces several Rules (two of which I already discussed in the light of Gettier-examples in section 2.3.4). Based on this discussion, Lewis (1996) distinguishes three different classes of possibilities:

- (19) a. Type 1: Possibilities that have to be excluded.
 b. Type 2: Possibilities that can not be excluded thus can only be ignored.
 c. Type 3: Possibilities that can either be ignored or excluded.

He illustrates these types based on the question, under what circumstances the sentence in (20) can be uttered felicitously:

- (20) I know that Possum the cat is not in the office. Lewis (1996)[p.562]

In the context of this example, Lewis suggests possibilities of different types exemplified in (21). Type 1 possibilities illustrated in (21-a) – roughly, such possibilities that can be eliminated by looking around in the office – have to be excluded and can never be ignored. Type 2 possibilities illustrated in (21-b) on the other hand can never be excluded but always have to be ignored. Type 3 possibilities illustrated in (21-c) are borderline cases: they may be ignored while (20) can still be uttered felicitously, though, they can of course be excluded as well: e.g. by checking the drawer.

- (21) a. Type 1: Possum is sitting on the desk, sleeps on the carpet, cleans himself on the sofa
 b. Type 2: Possum has been made invisible by a deceiving demon and sits on the desk.
 c. Type 3: Possum secretly crawled into a drawer that was closed without noticing him

The optionality that is associated with the exclusion of Type 3 possibilities to a certain degree introduces gradability to the notion of knowledge. In light of this, Lewis actually argues that the more potentially excludable possibilities are excluded, the better the knowledge. Thus, the knowledge that the cat is not in the office is better when the possibility that he secretly crawled into the drawer is excluded than when it is ignored.

I suggest that *genau* in the context of *wissen* is connected to this type of possibilities. To illustrate this, I adapted Lewis' example in the dialog in (22) where *genau* is licensed:

- (22) a. A: Oh no, someone left the office door open! I'm sure Possum went in.
 b. B: Nein, ich weiß, dass er nicht im Büro ist.
 B: No, I know that he not in office is
 B: No, I know that he is not in the office.
 c. A: But what if Possum is able to open the drawer with his paws? He might have climbed in and is hiding there!
 d. B: Nein, ich weiß genau, dass er nicht im Büro ist.
 B: No, I know GENAU that he not in office is
 B: No, I know GENAU that he is not in the office.

B's utterance in (22-b) allows A to challenge B's knowledge by bringing up a Type 3 possibility in (22-c) – or a scenario that might lead to such a possibility – that might have been not considered by B. According to (22-d), the doubts brought up by A don't change anything w.r.t. B's knowledge. Again, this may be due to one of the two options in (23):

- (23) a. Evidence 1: B infers her knowledge from her evidence; she has looked in every corner, under and in any object in the office and didn't find Possum there. She can exclude that anyone – cat or person – entered the office via the door since she checked it. Furthermore, she has checked whether there is any other exit/entrance to the office that Possum might have used. Thus, she concludes that he is not in the office.
 b. Evidence 2: B has direct and current evidence w.r.t. Possum's whereabouts, actually he is sitting in her lap in the hall at the moment of the conversation. Thus, she can exclude that he is in the office.

In both cases, B can exclude that Possum is in the drawer – even if he is in fact able to open and close the drawer with his paws. Thus, A's knowledge persists even in this rather unlikely possibility.

On the other hand, if we assume that B has the evidence in (24), her knowledge is not persistent w.r.t. such a possibility.

- (24) Evidence 3: B infers her knowledge from her evidence: she checked the office by looking around; she can exclude that anyone – person or cat – entered the office since she checked it.

Thus, if the interlocutor suggests this possibility as repeated in (25-c), A is not in a position to reject it, illustrated in (25-d).

- (25)
- a. A: Oh no, someone left the office door open! I'm sure Possum went in.
 - b. B: Nein, ich weiß, dass er nicht im Büro ist.
B: No, I know that he not in office is
B: No, I know that he is not in the office.
 - c. A: But what if Possum is able to open the drawer with his paws? He might have climbed in and is hiding there!
 - d. B: Ok, das kann ich nicht ausschließen, aber ich halte es für höchst
B: Alright, that can I not exclude, but I hold it for highly
unwahrscheinlich.
implausible
B: Alright, I can't exclude that, though I consider it highly implausible.

Now, let's compare this with bringing up Type 1 possibilities. As illustrated in (26), challenging A's knowledge by suggesting Type 1 possibilities – such possibilities that have to be excluded anyway according to Lewis in order to speak of knowledge – is odd. The most natural way for A to reply to A's objection in (26-c) is something like (26-d):

- (26)
- a. A: Oh no, someone left the office door open! I'm sure Possum went in.
 - b. B: Nein, ich weiß, dass er nicht im Büro ist.
B: No, I know that he not in office is
B: No, I know that he is not in the office.
 - c. A: ??But maybe he is sitting on the desk or on the sofa?
 - d. Didn't you hear what I said?

This contrast between (22-c) and (26-c) is in line with Lewis' claim that while Type 1 possibilities need to be excluded anyway in order to have knowledge, Type 3 possibilities may be ignored and thus can be brought up in order to challenge knowledge. The fact that such Type 3 objections can be neutralised with an utterance of the form 'Ich weiß genau dass p ', suggests that the widening that I claimed to be associated with *genau* concerns such possibilities.

In order to adapt Lewis' distinction to the idea pursued here, a further division between possibilities is needed: A) possibilities that are in fact incompatible with a certain proposition p that is known, and B) possibilities that challenge the knowledge w.r.t. p because if they pertained, not- p may not be reliably excluded anymore. This difference is illustrated in (27) relative to the examples in (27-a+b):

- (27)
- a. Die Max weiß, dass die Katze nicht im Büro ist.
The Max knows that the cat not in office is
Max knows that the cat is not in the office.
 - b. Die Max weiß genau, dass die Katze nicht im Büro ist.
The Max knows GENAU that the cat not in office is
Max knows GENAU that the cat is not in the office.
 - c. Possum is sitting on the office-table (Type 1-A)

- ⇒ Has to be excluded to utter (27-a) or (27-b).
- d. Possum is hiding in the office-drawer (Type 3-A)
 - ⇒ Has to be excluded to utter (27-b).
- e. The office door is open (Type 1-B)
 - ⇒ Even if this is the case in the actual world, it cannot conflict with 'the cate is not in the office' to utter (27-a) or (27-b).
- f. Possum is able to open drawers with his paws (Type 3-B)
 - ⇒ Even if this is the case in the actual world, it cannot conflict with 'the cate is not in the office' to utter (27-b).

While Lewis talks about actual not- p possibilities, i.e. the A-kind exemplified in (27-c+d), for the idea pursued here, B-kind possibilities such as in (27-e+f), are likewise relevant: I will end up suggesting that in most cases where 'x weiß genau dass p ', x 's knowledge persists in a specifically great number of Type-3-B possibilities; i.e. even if these scenarios pertained, x still knows that p . On the other hand, cases where 'x weiß genau dass p ' because based on x 's evidence a great number of Type-3-A possibilities can be excluded – as well as mixed cases – will also be compatible with my analysis.

The relevant point of Lewis' classification is the differentiation between different levels of far-fetchedness, i.e. the basic intuition w.r.t. the difference between Type 1 and Type 3 possibilities. Accordingly, I suggest that whereas in order to utter the unmodified construction in (27-a), only Type 1 possibilities have to be considered while Type 3 possibilities can be ignored. On the other hand, in order to utter (27-b) additional possibilities that are more far-fetched or unobvious and correspond to Type 3 have to be considered as well.

Widening in the context of *genau wissen* can therefore be understood as being in the position to hold or ascribe knowledge while considering a larger set of possibilities than in the context of bare *wissen*. The relation between being in such a position and the type of evidence should be obvious: if a sentence as in (27-b) is uttered based on the evidence that Possum sits on the speaker's lap in the hall or the speaker has checked the office meticulously, several Type 3 can be considered while maintaining the knowledge. On the other hand, if the speaker's knowledge is based on her checking the room without opening or looking into anything, such possibilities cannot be considered while maintaining the knowledge and *genau wissen* is not licensed.

What is additionally crucial is the connection between the widening induced by *genau* and the far-fetchedness of the possibilities that become available thereby: it delimits the set of worlds that are affected by the widening. This will be encoded in the analysis in chapter 7 in terms of an ordering on worlds along the line of Lewis (1973) that orders worlds relative to what the subject considers plausible.

I will now briefly discuss the domain widening function of *any* (Kadmon & Landman (1993), Krifka (1995), Lahiri (1998), Chierchia (2006) and point out parallels to my idea regarding the widening seen with *genau* in the context of know-type predicates.

6.5 Domain widening with *any*

One phenomenon that is intuitively reminiscent of the idea that *genau* in the context of *wissen* somehow induces a widening on the set of objects that have to be considered without impairing the knowledge as suggested above in section 6.3, is the widening function that has been proposed for *any* (Kadmon & Landman (1993), Krifka (1995), Lahiri (1998), Chierchia (2006)). Kadmon & Landman (1993) provide a uniform analysis for polarity sensitive *any*, (28-a), as well as free choice *any*, (28-c), by arguing that all types of *any* NPs have the same semantic properties as the corresponding indefinite NPs, (28-b+d), in the case of the latter interpreted generically:

- (28) a. I don't have any potatoes. Kadmon & Landman (1993)[p.353]
b. I don't have potatoes.
c. Any lawyer could tell you that. Kadmon & Landman (1993)[p.354]
d. A lawyer could tell you that.

Apart from the basic semantics, Kadmon & Landman (1993) suggest that *any* has 'two additional semantic/pragmatic characteristics', differentiating it from indefinites: widening and strengthening. Widening is demonstrated with dialogues as in (29) for polarity sensitive *any*:

- (29) Context: cooking for a dinner party of 50 people.
a. A: Will there be Frenchfries tonight?
b. B: No, I don't have potatoes.
c. A: Maybe you have just a couple of potatoes that I could take and fry in my room?
d. B: Sorry, I don't have ANY potatoes. Kadmon & Landman (1993)[p.360]

The claim is that *any* in (29-d) widens the previously given domain of quantification, introduced in (29-b) by the bare plural *potatoes*, such that even potatoes that might have been earlier excluded from that domain are not ignorable anymore; ignorable in that, as in the context of a dinner for 50 people, B might very well and felicitously utter (29-b) as a reply to (29-a) even if she has, say, three potatoes, as only large amounts of potatoes are relevant. Crucially, by the use of *any* in (29-d) it is then emphasised that even small amounts of potatoes count, thus are in the domain of quantification.

For free choice *any* illustrated in (30-b), they suggest that both (30-a) and (30-b) are interpreted generically:

- (30) a. An owl hunts mice.
b. Any owl hunts mice. (Kadmon & Landman 1993:p.362)

However, Kadmon & Landman (1993) claim that (30-b) differs from (30-a) in that it conveys a reduced tolerance w.r.t. exceptions, which is illustrated with the dialogs below:

- (31) a. A: A sick owl doesn't hunt mice.
B: Right. Of course. Still, it's true that an owl hunts mice.
b. A: A sick owl doesn't hunt mice.
B: Wrong. ANY owl hunts mice. (It's just that if an owl is very sick it doesn't do very well

Here, the widening refers to what the difference between *an owl* and *any owl*: whereas the former might only quantify over the set of healthy owls, the latter extends what counts as an owl – in this case to sick owls. Therefore, they claim that the widening doesn't have to be total as for example baby owls might still be excluded when uttering (30-b).

Kadmon & Landman (1993) argue that widening is the semantic operation associated with *any*, strengthening is a semantic constraint lexically associated with the expression. This constraint requires that *any* must strengthen the sentence it occurs in. Thus, *any* is licensed only if the widening that it induces leads to a stronger statement compared to the same statement without widening. What counts as stronger is for assertions defined by means of entailment; i.e. if the statement on the wide interpretation generated by the insertion of *any* asymmetrically entails the statement on the interpretation of the same sentence without *any*, *any* is licensed. Thereby, its distribution is determined by a combination of the widening effect and the strengthening constraint. They illustrate this by the examples in (32). In the sentence in (32-a), *any* is licensed as the wide context it induces entails the narrow context, (32-b). In (32-c) on the other hand, *any* is not licensed, as the wide context that is induced by *any* in this case wouldn't entail the narrow context, (32-d):

- (32) a. I don't have any potatoes.
 b. wide context: I don't have potatoes, cooking or other \Rightarrow
 narrow context: I don't have cooking potatoes.
 c. *I have any potatoes.
 d. wide context: I have potatoes of some kind, cooking or other. \nRightarrow
 narrow context: I have cooking potatoes

Intuitively, I think that what *genau* does to *wissen* is similar to what *any* does to the indefinite NP; it widens the domain of quantification – in the case of *wissen* the domain of possibilities – and thereby strengthens the statement it occurs in compared to the unmodified version. Strength, as illustrated in section 6.3, refers according to my idea to the amount of worlds apart from the attitude holder's belief worlds that can be considered while the knowledge survives. Thus, strength can be defined as a subset-superset relation between sets of worlds, requiring that the set of worlds that can be considered while the knowledge survives associated with a sentence of the form 'x weiß genau dass p', is a proper superset of the set of worlds that can be considered while the knowledge survives associated with the unmodified version 'x weiß dass p'.

To make the intuitive parallel to the widening function of *any* more explicit, (33) repeats the example presented above in (30-b) for which Kadmon & Landman (1993) claim that (33-b) differs from (33-a) as it conveys a reduced tolerance w.r.t. exceptions

- (33) a. An owl hunts mice.
 b. Any owl hunts mice. Kadmon & Landman (1993)[p.362]

This is exactly what I suggest for the difference between (34-a) and (34-b). Whereas the unmodified

sentence in (34-a) permits more possible worlds outside the belief worlds of Pepi that impair the knowledge to be ignored (if they were brought under consideration, the knowledge wouldn't survive), (34-b) reduces this tolerance by conveying that the evidence the knowledge is based on is such that a greater amount of these worlds can be considered without impairing the knowledge.

- (34) a. Der Otti weiß, dass die Katze im Haus ist.
The Otti knows that the cat in house is
Otti knows that the cat is in the house.
- b. Der Otti weiß genau, dass die Katze im Haus ist.
The Otti knows GENAU that the cat in house is
Otti knows GENAU that the cat is in the house.

Before turning to an implementation of my idea, I will discuss new data revealing a further related phenomenon, namely domain widening occurring with quantifiers ranging over individuals and possibly also times.

6.6 Domain widening with individual/temporal universals

I will now discuss new data that show apparent domain widening with universal quantifiers in the individual and temporal domain, induced via reduplication of the universal. This instance of domain widening is specifically interesting in light of the phenomenon discussed in this thesis as it appears to be another instance of an element that has itself universal force (that is, conveys full strength) that is somehow further strengthened.

Domains of quantifiers are known to be restricted by the discourse context. Fintel (1994) illustrates this with the example in (35) uttered in the context of a dinner that took place last night:

- (35) Everyone had a great time. (Fintel 1994:p.28)

In (35), the domain of the quantifier is the group of people that had dinner yesterday and thus it says that every member of this group had a great time, not everyone in the whole world. This restriction can of course also be realised via linguistic content, as in (36):

- (36) Everyone who was at the dinner yesterday had a great time.

Whereas sentence intern domain restriction as in (36) is less prone to ambiguity, restrictions coming from the context might not always be evident to the same extent to every interlocutor. This is illustrated in (37). The sentence uttered by Bob in (37-b) contains the universal quantifier *alle* (*all*). As suggested by the Scenario-Part 2 in (37-c), the children have a different domain of quantification in mind (only table 4) as the teacher (table 1, 2, 3 and 4). Realising this misunderstanding, Bob can widen the domain the children had in mind by uttering (37-d) including reduplicated *alle*:

- (37) a. Scenario Part-1: Teacher Bob shows his students in geography class several fossils that he brought to school in four suitcases. The children unpacked the suitcases and put the content of each suitcase on a separate table. Table four attracts the most attention as it

presents fossilized dinosaur eggs. Thus, Bob as well as all children are standing around this table, while the other three faded from their minds. As the bell rings, Bob says:

- b. Die Stunde ist aus, räumt bitte alle schnell wieder ein.
The lesson is over put please all quickly again in
The lesson is over, please put all of the fossils back quickly.
- c. Scenario-Part 2: The lazy pupils, who forgot about the other tables, put the fossils from table 4 back in the suitcase and are about to leave the classroom. Bob, who notices that, calls them back:
- d. Hiergeblieben, ich meine alle alle!
Stay-here, I mean all all
Stay here! I mean really all of the fossils!

The same works, according to my intuition, with adverbial *immer* (*always*) quantifying over times, illustrated in (38):

- (38) Scenario: Carl and Beth are friends, Carl is also Beth' hairdresser. Beth calls Carl and wants an appointment in his hairs salon that is open between 12 and 5 pm and is connected to his apartment.
- a. C: Du brauchst keinen Termin, du kannst immer vorbei kommen.
C: You need no appointment you can always by come
C: You need to make an appointment, just come whenever you want.
 - b. B: Das heißt zwischen 12 und 17 Uhr?
B: That means between 12 and 17 o'clock
B: That means between 12 and 5 pm, right?
 - c. C: Nein, immer immer, ich bin eh die ganze Zeit zuhause.
C: No, always always, I am prt. the whole time home
C: No, really always, I am at home anyway.

Just as in (37), the interlocutors in (38) have a different interpretation in mind regarding the times the universal quantifier quantifies over. Whereas Beth interprets *immer* as restricted to the opening hours of the hair salon, Carl has a broader domain in mind which at least covers some times out of the office hours and can clarify this by using reduplicated *immer*.

I think that the reduplication of the universal quantifiers in (37) and (38) conveys that the speaker intends the strongest interpretation the quantifier allows in the context, i.e. the biggest domain of quantification available. However, the domain is of course still restricted: teacher Bob in (37) is talking about any fossil in the classroom and still not about any in the world; *immer*, uttered by Carl in (38), is neither meant to refer to eternity, nor, probably to the middle of the night, but, for example, to the next days between morning and evening. The point is not the actual 'size' of the domain, but the widening that occurs, in that the domains referred to by the reduplicated quantifiers exceed the ones suggested by the interlocutors.

The parallel to the domain shift with *wissen* is straightforward: when uttering a sentence of the form 'x weiß dass p' containing the universal quantifier *wissen*, a domain of quantification (containing possi-

ble worlds) is set. If then this knowledge ascription is challenged by the suggestion of possibilities that might not have been considered by the attitude holder and thus may challenge her knowledge, *genau wissen* can be used convey that such further possibilities actually don't change anything regarding *x*'s attitude towards *p*. Thus, *genau wissen* indicates that the quantifier's domain of quantification is relatively large, i.e. exceeds the set of worlds that minimally have to be considered to use bare *wissen*.

Interestingly, concerning *alle* and *immer* such a domain shift can also occur in the opposite direction by negating the reduplicated universal quantifier, illustrated in (40)⁴ :

- (40) a. Scenario Part 1: Lisa made sandwiches for her three roommates and arranged three piles of 5 sandwiches each. Otto, one of her roommates enters the kitchen, spots the sandwiches and greedily takes one from the pile next to his seat at the kitchen table. Lisa says:
 b. Nimm ruhig alle!
 Take prt. all
 You can take all of them!
 c. Scenario Part 2: Otto grins broadly and extremely speedy stuffs all the 15 sandwiches in his bag. Lisa shouts:
 d. Stop! Nicht alle alle, nur die auf deinem Platz.
 Stop! not all all only those on your seat
 Stop it! Not actually all of them, only those that are next to your seat.

Here, the domain that Lisa had in mind when uttering (40-b) included the staple of sandwiches next to Otto's seat. Otto on the other hand interpreted it differently, such that the domain he had in mind included all sandwiches on the table. In (40-d) Lisa clarifies what domain she had in mind by using the negated form of the reduplicated universal.

For *genau wissen* on the other hand, I argued that examples as (18) from section 5.2, where *genau wissen* is embedded under negation, are unacceptable (given the embedded complement is a declarative):

- (41) #Die Paula weiß nicht genau, dass der Hans die Bank ausgeraubt hat.
 The Paula knows not GENAU that the Hans the bank robbed has
 Paula doesn't know GENAU that Hans robbed the bank.

⁴Interestingly, the reduplication only works with the positive universal quantifiers *alle* and *immer*, but not with *keine* and *nie*, illustrated in (39-c). A possible explanation for this might be the fact the intended shift in the case of *keine* and *nie* can be expressed via the modifier *gar* or *überhaupt*, shown in (39-d):

- (39) a. A: Ich habe kein Geld.
 A: I have no money
 A: I don't have any money.
 b. B: Dann geh zum Bankomaten!
 B: Then go to cash-machine
 B: Then go to a cash-machine!
 c. A: #Nein, ich habe kein kein Geld, nicht nur keines im Gledbörse.
 A: No I have no no money not only no in wallet
 A: No, don't have any any money, not only not any money in my wallet.
 d. A': Nein, ich habe gar / überhaupt kein Geld, nicht nur keines im Gledbörse.
 A': No I have very / absolutely no money not only no in wallet
 A': No, I have absolutely no money, not only not any money in my wallet.

Considering the idea of Lewis (1996) combined with what I claimed regarding the function of *genau* in the context of *wissen*, this restriction is actually predicted. Lewis (1996) argues that whenever a certain possibility is under consideration, it cannot be ignored anymore, thus it has to be excluded in order to felicitously utter a knowledge ascription. Under my story, uttering *genau wissen* indicates that there is an additional set of far-fetched possibilities that don't harm the respective knowledge. Negated *genau wissen* on the other hand would convey the opposite: that there is an additional set of far-fetched possibilities that do harm the respective knowledge. Thus, *nicht genau wissen* i) brings additional possibilities into consideration but ii) at the same time states that they are incompatible with the knowledge in question and the attitude holder cannot exclude/accept them. I argue, with Lewis, that this is not possible, as the result of considering but not excluding/accepting such possibilities leads to not having knowledge anymore.⁵

Interestingly, it is to a certain extent possible to negate *ganz genau wissen*, which is an intensification of *genau wissen* and has the same distribution. However, this is only possible given a very specific context as illustrated in (42):

- (42) Scenario: Bert and Gina are talking on the phone about their friend Fritz who was planning to come to Vienna today.
- a. B: Weißt du, ob der Fritz heute Abend in Wien ist?
 B: knows you whether the Fritz today evening in Vienna is
 B: Do you know whether Fritz will be in Vienna this evening?
 - b. G: Ja, wird er.
 G: Yes will he
 G: Yes, he will.
 - c. B: Aber kann es nicht sein, dass er den Flieger verpasst hat?
 B: But can EXPL. not be that he the plane missed AUX
 B: But isn't it possible that he missed the plane?
 - d. G: Nein, ich weiß genau, dass er heute da sein wird, er sitzt schon im Taxi am Weg
 G: No I know GENAU that he today here be well he sits already in Taxi on way
 zu meiner Wohnung.
 to my flat
 G: No, I know GENAU that he will be here today, he is already in the Taxi on his way to my flat.
 - e. B: Aber was wenn er vor deiner Türe von russischen Spionen entführt wird?
 B: But what if he in-front your door by Russian spies kidnapped will
 B: But what if he gets kidnapped by Russian spies in front of your apartment door?
 - f. G: Ja ok, ganz genau weiß ich nicht dass er hier sein wird.
 G: Yes alright GANZ GENAU knows I not that he here be will
 G: Yes alright, I don't know GANZ GENAU that he will be here.

In (42), Bert keeps challenging Gina's knowledge by suggesting more and more circumstances that might falsify the proposition 'der Fritz ist heute in Wien' ('Fritz will be in Vienna today'). Whereas the first challenge in (42-c) is rejected by Gina in (42-d) by using *genau wissen*, the second challenge in (42-e)

⁵In order to pin this intuition down, a strengthening constraint for *genau wissen* similar to the one suggested by Kadmon & Landman (1993) for the licensing of *any* may be stated for *genau* – and possible reduplication of universals – in future work.

suggests possibilities that Gina indeed can not exclude. Therefore, she can use negated *ganz genau wissen* as in (42-f), in order to distinguish between different layers of far-fetchedness: while she can exclude possibilities like 'Fritz missed the plane', possibilities like 'Fritz gets kidnapped by Russian spies in front of her apartment' is still compatible with her evidence.

However, negating *ganz genau wissen* really only works in such inquisition-contexts. Thus, the example in (43) is just as odd as negated *genau wissen*, even given a scenario according to which Gina has a similar knowledge state as in the example above.

- (43) Scenario: Gina just talked to her friend Fritz on the phone. He told her that he just arrived in Vienna and is already in a taxi on his way to her. Gina cannot exclude the possibility that Fritz will be kidnapped by Russian spies in front of her apartment and brought back to another country.
- a. ??/#Die Gina weiß nicht ganz genau, dass der Fritz heute Abend in Wien ist.
 The Gina knows not GANZ GENAU that the Fritz toady evening in Vienna is
 Gina doesn't know GANZ GENAU that Fritz is in Vienna this evening.

Thus, it seems that if it is forced, it is to a certain extent possible to utter 'x weiß nicht ganz genau, dass p'. I suggest that this only works if the scenarios that would make *p* wrong brought up by the interlocutor, are far-fetched to a specifically high degree. Namely to such a high degree that it is compatible to consider them, while the knowledge doesn't persist in them and though still remain to claim to have knowledge to a sufficient extent. Thus, Gina's last reply in (42-f) could be continued with something like 'aber eigentlich weiß ich es schon' ('but actually I do know it'). Under this assumption, the idea stated above that negating *genau wissen* is infelicitous because it equals *nicht wissen* can be maintained.

6.6.1 Licensing contexts shared by reduplicated universal quantifiers and *genau*

On final remark on the connection between reduplicated universal quantifiers and *genau* modifying know-type predicates concerns their licensing, as both cannot occur 'out of the blue', but only if the weaker statement – i.e. bare *wissen* or *alle/immer* – is already under consideration.

I illustrated this for *genau wissen* in section 6.1 where I concluded that at statement of the form 'x weiß genau dass p' is licensed if: i) either the relevant proposition and thereby the attitude of x towards the proposition in question is previously challenged by an interlocutor, or ii) only x's attitude towards the proposition in question is previously challenged by an interlocutor. The same can be shown to hold for *genau*-modification of the other know-type predicates, illustrated below for the VoP *riechen* (*smell*). (44) shows that B can only use the unmodified statement in (44-b) as an answer to the question in (44-a), whereas (44-c), where *riechen* is modified, is odd:

- (44) Scenario: Martha called the fire brigade because she thinks that there is something wrong with her gas boiler. Anna who heard that Martha called the fire brigade but doesn't know the reason, asks Berta, who lives with Martha:
- a. A: Warum hat die Martha die Feuerwehr gerufen?
 A: Why has the Martha the fire-brigade called
 A: Why did Martha call the fire brigade?

- b. B: Weil sie riecht, dass aus der Therme Gas austritt.
B: Because she smells that from the gas-boiler gas leaks
B: Because she smells that there is a gas leak in her boiler.
- c. B': #Weil sie genau riecht, dass aus der Therme Gas austritt
B': Because she smells GENAU that from the gas-boiler gas leaks
B': Because she smells GENAU that there is a gas leak in her boiler.

However, in light of a question that challenges Martha's perception, here by questioning the truth of the proposition that can be concluded from her perception in (45-a), the modified statement in (45-b) is fine:

- (45) Scenario: Martha called the fire brigade because she thinks that there is something wrong with her gas boiler. Anna heard that Martha has troubles with her gas boiler and that she smelled gas. Anna asks Berta, who lives next to Martha:
- a. A: Warum hat die Martha die Feuerwehr gerufen, ihre Therme ist doch ganz neu, da
A: Why has the Martha the fire-brigade called her gas-boiler is prt. very new there
kann gar nichts austreten.
can really nothing leak
A: Why did Martha call the fire brigade, her gas boiler is brand new, it can't leak.
 - b. B: Doch, sie riecht genau, dass aus der Therme Gas austritt
B: Prt. she smells GENAU that from the gas-boiler gas leaks
B: In fact, she smells GENAU that there is a gas leak in her boiler.

Turning to the case of reduplicated universals, a similar constraint can be observed. This is illustrated for *alle alle* in (46), where the reduplicated form in (46-c) is odd, given the – in a certain respect unspecific – question in (46-a):

- (46) a. A: Ich habe durst, hast du ein Bier?
A: I have thirst have you a beer
A: I am thirtsy, do you have a beer?
- b. B: Ja, du kannst alle Biere aus dem Kühlschrank und dem Keller trinken.
B: yes you can all beers out the fridge and the cellar drink
B: Yes, you can have all the beers from the fridge and the cellar.
- c. B': #Ja, du kannst alle alle Biere aus dem Kühlschrank und dem Keller trinken.
B: yes you can all all beers out the fridge and the cellar drink
B: Yes, you can have really all the beers from the fridge and the cellar.

On the other hand, given the question in (47-a) that includes the universal quantifier *alle* and explicitly determines the intended domain, reduplicated *alle* in (47-b) is fine and induces a widening on the domain (which is in this case stated explicitly and not supplied by the context):

- (47) a. A: Kann ich alle Biere, die im Kühlschrank sind, trinken?
A: Can I all beers the in fridge are drink
A: Can I drink all the beers from the fridge?
- b. B: Du kannst alle alle trinken, auch die aus dem Keller.
B: You can all all drink also the out the cellar
B: You can drink really all of the beers, even those from the cellar.

Therefore, just as in the case of *genau*-modified know-type predicates, reduplicated universals seem

to be licensed only if the weaker statement has been under consideration previously. In the case of (45) where *genau riechen* is licensed, this is realised via the question of A that negates/questions the perception of Martha. In the case of reduplicated *alle* in (47), a domain of quantification is determined explicitly via the question of A. The shift associated with *genau wissen* and reduplicated *alle* can thus be interpreted relative to the domain of quantification determined by the weaker statement. Therefore, intuitively speaking, I conclude that the domain shift that I suggest to be induced by *genau* is only possible if a reference domain of quantification is present in the context to start with.

6.7 Summary

I started this section by determining licensing contexts for *genau wissen* in section 6.1 and differentiated two different procedures of acquisition of knowledge in section 6.2. Based on this, I examined an example where *genau wissen* in the relevant reading is licensed in section 6.3 in detail in order to shed light on the semantic contribution of *genau* to know-type predicates.

Accordingly, I argued that the modifier indicates that a particularly large set of worlds including ones that slightly deviate from the attitude holder's belief worlds can be considered without impairing the knowledge of a certain proposition *p*. Arguably, because the attitude holder's evidence is such that it makes the knowledge especially robust, indicating that even if an unexpected, far fetched possibility indeed pertains, the knowledge regarding *p* persists in that possibility. I claimed that this set is large, in that it is a proper subset of the minimal set containing alternatives that a certain piece of knowledge has to persist in in order to use bare *wissen*. I argued that also in the case of bare *wissen*, the domain of quantification includes non-belief worlds as thereby evidence and certainty can be encoded without referring directly to them. This enlarged set, I suggested, becomes available via a widening of the attitude verb's domain of quantification induced by *genau*. Thereafter, I pointed to a connection between the licensing of the modifier and context sensitivity of knowledge ascriptions and again highlighted the connection between *genau wissen* and evidence.

Thereafter, I turned back to Lewis (1996) who distinguishes three types of possibilities that play a role in light of knowledge ascriptions: first, alternatives that necessarily have to be excluded in order to use *wissen*, second, alternatives that are not excludable and thus always have to be ignored and third, borderline cases, i.e. alternatives that can be either excluded or ignored. I showed that the intuition behind this gradation of different levels of far-fetchedness is relevant for characterising the possibilities that become available through the domain widening induced by *genau*.

In section 6.5 I discussed other instances of domain widening. On the one hand, domain widening with *any*, for which Kadmon & Landman (1993) suggest that it induces a widening on the denotation of the NP it attaches to. On the other hand, I argued that a domain widening that is reminiscent of what I suggested for *genau* modifying know-type predicates can occur in the context of *alle* and *immer* in the individual and temporal domain, respectively. Here, I also discussed parallels between the contextual conditions under which *genau* in the use of interest and reduplicated quantifiers are licensed. I argued that in both cases a crucial licensing requirement is that there is an appropriate domain of quantification

present in the context prior to the occurrence of the expression that – according to my claim – induces a widening on that domain.

The semantic contribution of *genau* in the context of *wissen* that I suggested in this section is incompatible with the standard semantics for *wissen* based on Hintikka (1969) presented in section 2.2. This is roughly because the classical lexical entry only refers to worlds that are compatible with the attitude holder's beliefs, i.e. her doxastic alternatives, but not to worlds that are incompatible with what is believed. Accordingly, I will suggest a revised semantics for *wissen* in chapter 7 that makes such alternatives explicit. As a consequence, the suggested impact of *genau*, i.e. making available more alternatives, namely such alternatives that are close to the attitude holder's belief worlds though slightly deviant w.r.t. other properties than the relevant proposition p , can be implemented.

Chapter 7

A revised semantics for *wissen*

The idea put forward in chapter 6 that *genau* in the context of *wissen* induces a widening on the set of worlds that have to be considered, is incompatible with the standard semantics for *wissen* presented in section 2.2. Thus, in this section, I will suggest a revised semantics for *wissen* which allows the implementation of the suggested semantic contribution of *genau* to know-type predicates. I will start by summing up what properties this altered semantics has to have and show what the Hintikka-style semantics lacks in that respect. Based on this, I will suggest an altered version of the lexical entry for *wissen* that makes a degree argument available via which the size of the set of worlds that is under consideration can be set. After that, I will define the contribution of *genau* as inducing an increase of that degree which corresponds to an enlargement of that set of worlds. As will become clear, one important aspect of this analysis is that it covers the relation to certainty and evidence in an indirect way. This is also crucial in light of an expansion of this analysis to other know-type predicates, which I will discuss at the end of this section.

7.1 What it has to account for

I will start by spelling out intuitively how the semantics of *wissen* has to be designed in order to be modifiable by *genau* given its semantic contribution suggested in chapter 6. I will proceed from the idea that *genau wissen* is connected to direct, current evidence the attitude holder has in favour of *p*, but show in section 7.3 that the analysis suggested is likewise compatible with scenarios where the strength of the evidence is a result of an exclusion of all alternatives (see section 6.2). Accordingly, as illustrated in section 6.3, a statement of the form 'x weiß genau dass p' can be uttered if *p* holds in a specifically large set of worlds. As i) the requirement contained in the existing analysis of *wissen* that *p* holds in all of *x*'s doxastic alternatives is already the strongest statement possible w.r.t. that set and ii) according to my intuition, the worlds that become available in association with *genau* don't necessarily have to be belief worlds of *x*, I suggest that this set contains not only belief worlds but also worlds slightly deviant from *x*'s beliefs. Thus, in order to utter 'x weiß genau dass p' the attitude holder has to be in a position, possibly based on her evidence, to accept a relatively large set of worlds that slightly deviate from her belief worlds while maintaining her knowledge w.r.t. *p*. (1) paraphrases this intuition:

- (1) 'x weiß genau dass p' \approx even if some of *x*'s assumptions about the world she is in, apart from *p*,

are wrong – i.e. if x 's doxastic alternatives differed – each of x 's doxastic alternatives remains a p -world.

The set of worlds where p is required to be true if ' x weiß genau dass p ' has to exceed the size of the set of worlds where p has to hold in order to use the unmodified statement ' x weiß dass p ' in the same situation. Thus, the contribution of *genau* to know-type predicates must by some means or other be the enlargement of the set of worlds where p is true.

Crucially, as argued before, this enlarged set of worlds doesn't include just *any* possible world that deviates from how the attitude holder believes the world to be, but should consist of such worlds that are – according to other properties – close to x 's belief worlds. Hence, this set needs to be ordered according to what the attitude holder believes to be plausible. Via this, a gradation of far-fetchedness can be achieved. This is crucial, as we need to delimit this enlarged set of worlds in such a way that a certain level of far-fetchedness cannot be exceeded. The reason for this can be illustrated based on the difference between Type 3 and Type 2 possibilities suggested by Lewis (1996). According to that, there are certain possibilities that can never be excluded, as for example the possibility of hallucinating. Similarly, as shown in the examples in chapter 6 and made explicit in section 6.4, knowledge in the context of an utterance containing *genau wissen* obviously isn't persistent w.r.t. any far-fetched world. Hence, no piece of knowledge can ever persist in every imaginable possibility. Therefore, the worlds that become available via the widening have to be ordered so that worlds that are less plausible according to the subject are further away from her belief worlds than more plausible worlds. As a consequence, the enlarged set of worlds considered in the context of *genau wissen* can be limited such that it only includes worlds up to a certain level of far-fetchedness.

Accordingly, (2) is a paraphrase of the conditions under which a knowledge ascription of the form ' x weiß genau dass p ' is true:

- (2) x weiß genau dass p in w iff
- a. p holds in all of x 's belief worlds (DOX)
 - b. there is relatively large set of worlds A' slightly deviant from DOX
 - c. the worlds in A' are close to x 's belief worlds, i.e. plausible for x in w
 - d. p holds in all worlds in A'
 - e. p is true in w

Crucially, to determine the size of the set A' suggested in (2-b) relative to unmodified *wissen*, similar worlds have to be explicit also in the paraphrase of the unmodified statement ' x weiß dass p '. Thus, I suggest that the following has to hold in order to utter unmodified knowledge ascriptions:

- (3) x weiß dass p in w iff
- a. p holds in all of x 's belief worlds (DOX)
 - b. there is a minimal set of worlds A slightly deviant from DOX
 - c. the worlds in A are close to x 's belief worlds, i.e. plausible for x in w
 - d. p holds in all worlds in A

- e. p is true in w

Including non-belief worlds (i.e. worlds that are counterfactual relative to x 's beliefs) into the semantics of *wissen* – i.e. claiming that even in the case of unmodified *wissen* it needs to be quantified over a certain amount of such worlds – is a way to encode evidence, and thereby certainty, without referring directly to these components. This accessibility is crucial, as I suggested that it is the evidence component that *genau* manipulates, but excluded that this manipulation directly affects this component. Thus, this idea is incompatible with the standard semantics for *wissen* as the classical lexical entry only makes reference to evidence in the metalanguage.

Additionally, the way of establishing this accessibility covers the intuition that for *wissen dass p* – e.g. possibly compared to *glauben dass p* – the attitude holder's belief that the actual world is a p -world has to be especially rigid. Thus, *wissen* requires a certain amount of stability. Referring to non-belief worlds, as illustrated above, can be understood as bringing up certain what-if scenarios and show that the attitude holder's belief regarding p remains in view of such scenarios. Thereby, this is a way of expressing that the attitude *wissen* is particularly stable and even resists a certain variation.

The difference between A in (3) and A' in (2) is the amount as well as the level of far-fetchedness of the possibilities they contain. Crucially, these possibilities are what I labelled Type B possibilities above in section 6.4; i.e. possibilities that may challenge the knowledge regarding p , and not those that directly conflict with p (Type A). Thus, they deviate from the subject's belief worlds w.r.t. certain aspects but crucially don't conflict with the proposition in question.

Regarding the licensing of *genau*, intuitively, the following has to hold:

- (4) A statement containing *genau* modifying a know-type predicate is licensed iff
- a. the attitude/perception expressed by the know-type predicate has been already under consideration
 - b. thereby, a specific domain of quantification of the predicate has become salient
 - c. the speaker wants to correct/widen the domain of quantification associated with the unmodified know-type predicate

Thus, the contribution of *genau* to know-type predicates can consequently be paraphrased as follows:

- (5) A statement containing *genau* modifying a know-type predicate indicates:
- a. that the previously salient domain of quantification D of the unmodified know-type predicate is enlarged
 - b. the result of this is the larger domain of quantification D'
 - c. thereby, more worlds that are outside of the set of the attitude holder's belief worlds are in D'

Before turning to the implementation of this idea, I will briefly discuss why the Hintikka-semantics for *wissen* (and other know-type predicates) cannot account for this idea.

7.2 Why the classical analysis can't account for this

In order to show what the classical lexical entry for *wissen* provided in section 2.2 in (13) lacks in order to be modifiable by *genau* in the way suggested above, it is repeated in (6):

$$(6) \quad \llbracket \textit{wissen}_{DECL} \rrbracket^w = \lambda p. \lambda x : p(w) = 1 \cdot \forall w' \in \text{Dox}_{x,w} (p(w') = 1) \ \& \ x \text{ has enough evidence for } p \text{ in } w$$

(7-b), repeated from (14) in section 2.2, illustrates the semantics of *wissen*_{DECL} based on the example in (7-a):

- (7) a. Die Pina weiß dass es schneit.
The Pina knows that EXPL. snows
Pina knows that it is snowing.
- b. Pina weiß dass es schneit in $w = 1$ iff
- 1) it is snowing in w ,
 - 2) for all worlds w' that are compatible with what Pina believes in w it is the case that it snows in them,
 - 3) Pina has enough evidence for the proposition 'it is snowing' in w

The lexical entry in (6), as spelled out by the application of the semantics on the example in (7), only refers to worlds that are compatible with what the attitude holder believes. This is, given the semantic contribution of *genau* to *wissen* that I suggested, insufficient: if uttering 'x weiß genau dass p' requires that p holds in a larger set of worlds than when uttering 'x weiß dass p', a set of worlds that is accessible for this kind of manipulation has to be available in the semantics of *wissen*. Regarding (6), the only set of worlds that the lexical entry of *wissen* refers to is the set of x 's belief worlds. However, w.r.t. this set, the semantics already contains a universal statement, as (6) requires that all of x 's doxastic alternatives are p -worlds. Thus, if the set of x 's belief worlds is the only set of worlds available, the requirement that p is true in more worlds in the case of *genau wissen* than in the context of unmodified *wissen* is impossible to implement. The only imaginable way to still get this requirement fulfilled is by arguing that in the case of unmodified *wissen*, p holds in fewer than all of x 's belief worlds. However, this is ruled out: if there is a not- p world in the attitude holder's belief worlds, it follows that she doesn't know p , which is reflected by the infelicitous example in (9) from section 2.2, repeated below:

- (8) a. #Die Martha weiß, dass der Ralf einen Welpen hat, sie hält es aber auch für
The Martha knows that the Ralf a puppy has she considers EXPL. but also for
möglich, dass er keinen Welpen hat.
possible that he no puppy has
Martha knows that Ralf owns a puppy, but she considers it also possibly that he doesn't have
a puppy.

Therefore, the condition that p has to be true in any belief world of a subject in order for that subject to have knowledge w.r.t. p is fixed. On the other hand, it is the strongest statement concerning the relation of the relevant proposition and the belief worlds that is available. Thus, *genau* cannot do anything to this set that could possibly reflect greater strength.

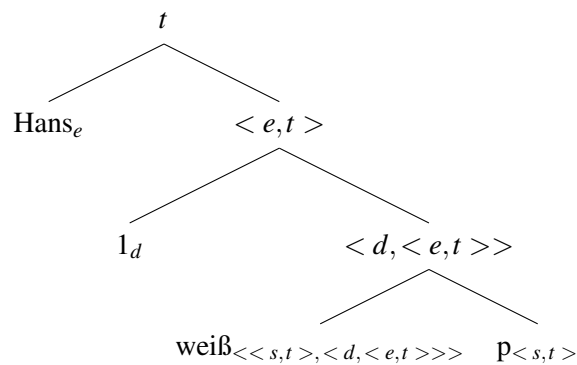
Introducing the explicit notion of worlds that are incompatible with the belief worlds of the attitude holder, certainly opens new possibilities. Thereby, a set of worlds available for manipulation becomes accessible, which is exactly what I need to implement my idea. Given a semantics of *wissen* that refers to worlds outside of the set of belief worlds, i.e. to additional worlds, the condition that *p* is true in more worlds in the case of *genau wissen* can be implemented. Additionally, as just argued, referring to non-belief worlds in the semantics of *wissen* is a way of making the evidence component indirectly accessible, which is what the idea that *genau* indirectly manipulates this component requires. Accordingly, I will now suggest an altered semantics for *wissen* that makes reference to worlds apart from the attitude holder's belief worlds.

7.3 Implementation of the revised semantics

In order to implement my idea, I suggest that *wissen* takes a degree argument that receives its value from the context, ranges – as defined in (11) and (12) – over cardinal numbers and determines the size of the set of worlds that has to be compatible with what is known.

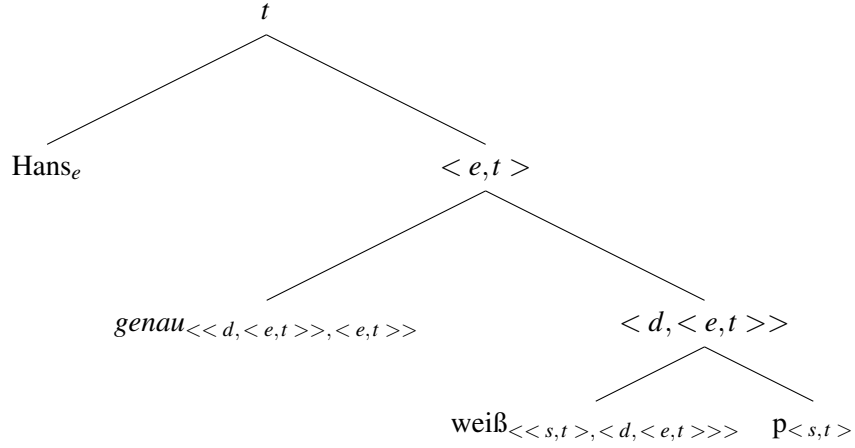
This yields the LF for 'Hans weiß dass p' is illustrated in (9):

(9) LF for the matrix, unmodified (extensional types)



In the modified version, I suggest that *genau* takes the slot of the contextually determined degree argument, leading to the LF of 'Hans weiß genau dass p' in (10):

(10) LF for the matrix, *genau*-modified (extensional types)



In order to implement the idea that *genau* in these contexts makes available a greater set of worlds that are slightly deviant though plausible according to a subject, a partial ordering on worlds along the lines of Lewis (1973) is needed, defined in (11-a). (11-b) defines a further ingredient needed for the revised lexical entry of *wissen*, namely a homogenous set of worlds containing x 's belief worlds and worlds outside of this set that are though to some extent plausible according to x in w .

- (11) relative to a subject x and a world w
- $\leq_{x,w}$: more plausible for x in w **partial ordering on worlds relative to what x believes to be plausible in w**
 - $HOM(S)_{\leq_{x,w}} = DOX_{x,w} \subseteq S \wedge \forall w' (w' \in S \rightarrow \forall w'' (w'' \leq w' \rightarrow w'' \in S))$ **homogenous set of worlds containing x 's belief worlds and worlds outside of this set that are plausible according to x in w such that for any world w' that is in HOM , if there is a world w'' that is more plausible for x in w than w' , this world w'' is also in HOM**

Based on this, the revised lexical entry for *wissen* is given in (12):

$$(12) \quad [[wissen]]^{w,g} = \lambda p_{\langle s,t \rangle} . \lambda i_d . \lambda x_e . \exists S [HOM(S)_{\leq_{x,w}} \wedge |S| > i \wedge \forall w \in S \rightarrow p(w)]$$

According to (12), *wissen* takes a proposition, a degree and an individual as arguments. Via the degree i – which receives a value from the context – the size of the set of worlds for which it is required that p is true is determined. Thus, the cardinality of this set (HOM) is contextually determined. HOM always contains x 's belief worlds and additionally – depending on the context – worlds that are slightly deviant, though plausible according to x and that become available via the partial ordering defined in (11).

The lexical entry for *genau* modifying know-type predicates in the upstairs reading is given in (13):

$$(13) \quad [[genau]]^{w,g} = \lambda P_{\langle d, \langle e,t \rangle \rangle} . \lambda x_e . [\exists d' (d' \text{ significantly exceeds the standard} \wedge P(d')(x)]$$

Accordingly, *genau* takes a predicate and an individual as arguments. It requires that there is a degree d' that is significantly higher than the standard; i.e. that the number of worlds in HOM is specifically high. Thus, given that this set of worlds is via the semantics of the know-type predicate required to be consistent with p , this is exactly what I suggested in chapter 6: *genau* in this use requires that a certain

piece of knowledge (and likewise other attitudes) is specifically robust, such that it holds in a relatively large set of worlds, even if these worlds slightly deviate from how the attitude holder believes the world she is in to be.

In my argumentation I mostly referred to scenarios where *x weiß genau dass p* is licensed because *x* has direct, current evidence (see the distinction in section 6.2). Nevertheless, a scenario where *x weiß genau dass p* is uttered because *x* can exclude any relevant alternative to *p* and can thus infer *p* is also compatible with this analysis. What differs between the former and the latter scenario are the worlds that are in *HOM*. To illustrate this, let's go back to the type of examples discussed in section 6.3. Therefore, let's consider (14-a) uttered relative to the circumstances in (14-b+c), respectively:

- (14) a. Der Otti weiß genau, dass die Katzen in der Küche sind.
The Otti knows GENAU that the cats in the kitchen are
Otti knows GENAU that the cats are in the kitchen.
- b. Scenario 1: Otti sees the cats via live CCTV playing in the kitchen. (direct, current evidence)
- c. Scenario 2: Otti knows that the cats entered the kitchen a while ago and can exclude that since then there was any possibility for them to escape (direct as well as indirect evidence)

Given scenario 1 in (14-b), *HOM* may contain worlds where there is a secret exit via which the cats could escape. As Otti is having direct, current evidence of them being in the kitchen, his knowledge persists in such possibilities. Again, this is because even if there actually is such a secret exit of which Otti isn't aware of, based on his evidence, he is still in a position to maintain his attitude regarding the proposition 'the cats are in the kitchen'. Thus, he doesn't have to exclude, or even be aware of all the exit options. What is crucial in this context is that he can exclude the possibility that the cats made use of these options, i.e. escaped.

On the other hand, given scenario 2 in (14-c), no such world containing secret exits is in *HOM* as such a world is too far away from Otti's belief worlds according to his beliefs in (14-c) – in this case Otti can exclude that there *is* any possibility for the cats to escape, not only that they made use of such an escape option. Thus, worlds where escape options exist are ruled out via the plausibility ordering defined in (11). On the other hand, given scenario 2, other worlds are in *HOM*, for example such worlds where unbeknownst to Otti, three cats that look exactly like his cats are straying in the garden, as such worlds are ranked higher based on the ordering. They are ranked higher, because Otti doesn't hold any belief that is relevant for the evaluation of the proposition 'the cats are in the kitchen' that conflicts with such a world where identical looking cats exist. That means that even if such similar looking cats really existed and strayed through the neighbourhood, Otti could exclude that those are his cats and accordingly his knowledge survives.

To sum up, I believe that this implementation covers the intuition laid out in chapter 6. Nevertheless, it is only a first, rudimentary implementation that is an (incorrect) approximation, raises several technical issues and thus needs to be revised in future work. One problem is that there are many different ways of widening this set of worlds that have to be compatible with the proposition that is known. Thus, for

example reducing the set of propositions believed by a subject also leads to a greater set of worlds compatible with what is believed; as the fewer one believes, the more worlds are compatible with the belief. On the other hand, this analysis nicely covers the intuitive relation to certainty and evidence, while encoding it indirectly: extra high certainty or specifically reliable evidence is reflected by the number of worlds that are in *HOM*. In the case of bare *wissen* it contains at least the subject's belief worlds, and possibly – depending on the context – further worlds that are outside of the subject's belief worlds, though acceptable while maintaining the knowledge w.r.t. *p*. In the case of *genau wissen*, the requirement that *HOM* is specifically big, is added. This indirect relation to evidence is crucial in light of other know-type predicates as *erinnern* (*remember*), for which I argued in section 4.1 that it doesn't obligatorily involve evidence. I will now turn to an expansion of this idea to the other know-type predicates and show how this indirect connection to evidence allows us to apply this idea to the entire class.

7.4 Other know-type predicates

In order to motivate the expansion of the idea illustrated in section 7.3 for *wissen* to other know-type predicates, I will first show that *genau* makes a similar contribution to the other verbs belonging to this class. To illustrate this, (15) gives an example for *hören* (*hear*) and *merken* (*notice*).

- (15) Scenario: Karl wants to sell his violin to Berta and believes that it is a real Stradivarius. There is nothing written on the surface of the violin. Berta, who is a famous violin player, starts to play the violin. She constantly plays the A string, as she knows how the sound of the A string played on a real Stradivarius differs from A string sounds on other violins. After 30 seconds she utters:
- a. B: Ich höre / merke, dass das keine echte Stradivari ist.
 B: I hear / notice that this no real Stradivarius is
 B: I hear / notice hat this is no real Stradivarius.
 - b. K: An der Innenseite ist aber 'Antonius Stradivarius Cremonensis faciebat Anno 1730'
 K: on the inside is but Antonius Stradivarius Cremonensis faciebat Anno 1730
 eingraviert.
 engraved
 K: But 'Antonius Stradivarius Cremonensis faciebat Anno 1730' is engraved on the inside.
 - c. B: Egal, ich höre / merke genau, dass das keine echte ist.
 B: Whatever I hear / notice GENAU that this no real Stradivarius is
 B: Whatever, I hear / notice GENAU that this is no real Stradivarius.

The dialogue in (15) is similar to what was shown in section 6.3 for *wissen*. Berta in (15-a) utters a sentence of the form 'Ich höre/merke dass *p*' ('I hear/realise that *p*') which is challenged by Karl in (15-b) by bringing up new information. In (15-c) Berta rejects Karl's challenge by uttering a statement of the form 'Ich höre/merke genau dass *p*' ('I hear/realise GENAU that *p*'). Thus, similar as argued for *wissen*, what is conveyed by (15-c) is that Berta is certain that *p* holds, whatever else may be the case; e.g. even if 'Antonius Stradivarius Cremonensis faciebat Anno 1730' is engraved in the violin, she is still certain that it is no Stradivarius violin. Hence, just as in the case of *wissen*, the set of worlds that are compatible with what is perceived/observed can be taken to be enlarged by the modifier and a similar analysis as laid

out for *wissen* in section 7.3 can be applied.

Accordingly, it has to be assumed that all verbs that belong to the know-type class likewise take such a degree argument. As a consequence, this predicts that know-type predicates differ w.r.t. their LF from other propositional attitude verbs that are not captured by the generalisation put forward in section 5.1.1, as *glauben* (*believe*). When looking for independent evidence in favour of that claim, the distribution of the modifier *besser* (*better*) – discussed in section 2.3.1 based on Schmitt & Sode (2018) – may be worth considering. Interestingly, *besser* in the context of propositional attitude verbs has an almost identical distribution as *genau* in these contexts. Thus, whereas almost all know-type predicates are compatible with *besser* (*better*) as well as the respective positive form *gut* (*good*), other propositional attitude verbs cannot combine with either of them. (16-a+b) illustrate *besser*- and *gut*-modification of *wissen*, *verstehen* (*understand*) and *sehen* (*see*), adapted from Schmitt & Sode (2018)[p.1106]; (16-c+d) show that verbs not belonging to the know-type class, exemplified by *glauben*, are on the other hand incompatible with *besser* or *gut*. (16-d) illustrates the only exception that I am aware of by now, i.e. *merken* (*realise*) that belongs to the know-type class, though isn't compatible with *besser*.

- (16) a. Der Frank versteht/weiß/sieht, dass der Hedde gefährlich ist, aber die arme Viola versteht/weiß/sieht es noch viel besser.
The Frank understands/knows/sees that the Hedde dangerous is but the poor Viola understands/knows/sees it PRT much better
Frank understands/knows/sees that Hedde is dangerous, but poor Viola understands/knows/sees it even better.
- b. Der Frank versteht/weiß/sieht gut, dass der Hedde gefährlich ist.
The Frank understands/knows/sees well that the Hedde dangerous is
Frank understands/knows/sees well that Hedde is dangerous.
- c. *Der Frank glaubt, dass der Hedde gefährlich ist, aber die arme Viola glaubt es noch viel besser.
The Frank believes that the Hedde dangerous is but the poor Viola believes it PRT much better
Frank believes that Hedde is dangerous, but poor Viola believes it even better.
- d. *Der Frank glaubt gut, dass der Hedde gefährlich ist.
The Frank believes well that the Hedde dangerous is
Frank believes well that Hedde is dangerous.
- e. *Der Frank merkt, dass der Hedde gefährlich ist, aber die arme Viola merkt es noch viel besser.
The Frank realises that the Hedde dangerous is but the poor Viola realises it PRT much better
Frank realises that Hedde is dangerous, but poor Viola realises it even better.

As illustrated by the intuitive paraphrase of (17-a) in (17-b), *besser* is usually, in other contexts, associated with referring to a specifically high degree:

- (17) a. Der rote Apfel schmeckt mir besser als der gelbe.
The red apple tastes refl. better than the yellow
I like the red apple better than the yellow one.
- b. ≈ The degree to which I like the red apple exceeds the degree to which I like the yellow

apple.

Accordingly, the distribution of *besser* in the context of propositional attitude verbs may be taken as support for the distinction between know-type predicates and other propositional attitude verbs, while the exception in the case of *merken* remains a puzzle and has to be investigated in future work.¹

The prediction of my analysis that there is a difference between certain kinds of propositional attitude verbs obviously needs further investigation. One possibility may be to assume that while know-type predicates take a degree argument, other propositional attitude verbs – like *glauben* – do not. However, we have seen in section 2.3.2 that for example *believe* also seems to appear in certain degree constructions, illustrated in section 2.3.2 in (33) and repeated below:

- (19) a. What do you believe more, that the CIA killed JFK or that the government did 9/11?
b. I consider myself a feminist and believe very much that many women, like me, excel at entrepreneurship. Lassiter (2017)[p.18]

Hence, if one assumes that *believe* takes a degree argument as well, according to my analysis, this degree argument has to differ from the one associated with know-type predicates. This difference may lie in a different kind of scale that the degree argument refers to, or possibly in the position of that element.

Before summing up and turning to a broader discussion of open questions, I will briefly point to a crucial trait of my analysis, namely the indirect encoding of evidence.

7.4.1 Indirect reference to evidence

What is crucial and thus has to be pointed out again, is the fact that the analysis suggested in section 7.3 encodes evidence indirectly: in the scenario on (15) the connection to evidence is made explicit; Berta builds her attitude on a specific sound that she perceives and based on which she is able to distinguish real Stradivarius violins. However, she may likewise build her attitude solely on her perception without further explanation; i.e. Berta doesn't have to be aware of why she hears a difference, unless she hears it. This is actually similar to what I argued for *erinnern*, also a member of the know-type class, in section 4.1. Based on the observation that it is odd to ask for someone's reasons for remembering something,

¹Crucially, in (16-a) *noch viel besser (even better)* is used. What this configuration implies is that even the lower degree that the sentence refers to, is high, as illustrated by the intuitive paraphrase of (18-a) in (18-b):

- (18) a. Der rote Apfel schmeckt mir noch viel besser als der gelbe.
The red apple tastes refl. even much better than the yellow
I like the red apple even better than the yellow one.
b. ≈ The degree to which I like the yellow apple is high, but the degree to which I like the red apple is even higher.

Thus, the lower degree referred to in (18-a) already exceeds a certain high standard, which matches the intuitions in the case of (16-a). In section 3.4 where I argued against a degree analysis of *wissen* along the lines of Koev (2019) who assumes that *wissen* is associated with a probabilistic scale [0,1], I suggested that comparative-like constructions as in (16-a) don't actually compare degrees of knowledge or other attitudes/perception along the lines of Koev (2019), but rather compare something like 'amounts or kinds of experiences exemplifying the embedded proposition'. Hence, what (16-a) may express is that Viola made more or more direct experience that prove that Hedde is dangerous compared with Frank, who certainly also made enough experience to conclude that Hedde is dangerous. This intuition on the other hand, seems actually compatible with the analysis suggested in section 7.3, as 'more experience' possibly corresponds to more or better evidence, which is exactly what my analysis captures.

while such a question is reasonable in the case of knowledge, I suggested that in the case of *erinnern* as opposed to *wissen* the piece of evidence is already revealed along with the utterance – it’s a memory. I further argued that while memories may be based on some kind of pictures in front of the mind’s eye – i.e. in the case of remembering a visual experience – they might as well just be related to internal states that can’t be decomposed further. Thus, I submitted that *erinnern* doesn’t require justification and therefore that the licensing of *genau* can not be dependent on extra reliable and thereby transparent evidence. On the other hand, I emphasised exactly this connection in section 6.3.

However, as the analysis suggested in section 7.3 doesn’t determine the reasons for the increased degree associated with *genau* both of these scenarios are compatible: the expansion of the set of worlds in which *p* is required to hold that I connected to the licensing of *genau* can, but doesn’t have to be related to transparent and conscious evidence. Whereas in the most cases this connection is present, it can also be connected to the conviction that the attitude one holds was built – at some point – on sufficient evidence, whereas this evidence isn’t accessible anymore. In section 5.1.1 in (11) I showed that this inaccessibility of the underlying evidence does not only occur with *erinnern*, but even with *wissen*, repeated in (20-a). (20-b+c) show that *genau*-modified *wissen* as well as *erinnern* is likewise possible in the given scenario, i.e. if the attitude holder doesn’t have access to the evidence.

- (20) Scenario: Hansi and Karli are giving a dinner party tonight. They are discussing the menu. Mara, of the expected guests, has announced to bring a new friend, who neither Hansi nor Karli know. Hansi says that she is not aware that any vegetarian will come, but Karli disagrees:
- a. Ich weiß nicht wieso, aber ich weiß, dass Maras neue Freundin kein Fleisch isst.
I know not why but I know that Maras new friend no meat eats
I don’t know why, but I know that Mara’s new friend doesn’t eat meat.
 - b. Ich weiß nicht wieso, aber ich weiß genau, dass Maras neue Freundin kein Fleisch isst.
I know not why but I know GENAU that Maras new friend no meat eats
I don’t know why, but know GENAU that Mara’s new friend doesn’t eat meat.
 - c. Ich weiß nicht wieso, aber ich erinnere mich genau, dass Maras neue Freundin kein
I know not why but I remember refl. GENAU that Maras new friend no
Fleisch isst.
meat eats
I don’t know why, but I remember GENAU that Mara’s new friend doesn’t eat meat.

According to (20-a-c) Karli has no idea why he remembers/knows that Mara is a vegetarian; i.e. he doesn’t know who told him, where he might heard of it etc. Still, he can be specifically certain w.r.t. that fact and convey his conviction by using *genau*. However, this certainty has to be connected to the conviction that the memory/knowledge was built on proper evidence at some point and isn’t obsolete at the time of the utterance, which differentiates these instances of *wissen* and *erinnern* from *sicher sein*.

Again, the implementation of the expansion of the set of worlds that I connected to *genau* in section 7.3 doesn’t determine whether it is caused by transparent evidence or something else. Thus, the analysis in section 7.3 can be expanded to any know-type predicate: in the case of e.g. *x sieht genau dass p* (*x sees GENAU dass p*), *genau* adds worlds to the domain of quantification that slightly differ from how the actual world is according to *x*’s perception. This is once more illustrated in (21):

- (21) Scenario: Anton and Berta are waiting for Paula. Suddenly, a person that is wearing the specifi-

cally fancy shoes of another friend of them, Lisa, appears in the background. Anton doesn't pay attention to the shoes and says:

- a. A: Da kommt die Paula ja schon!
A: There comes the Paula prt. already
A: Look! Paula is already coming!
- b. B: Das muss die Lisa sein, schau dir die Schuhe an.
B: That must the Lisa be look refl. the shoes on
B: That must be Lisa, look at her shoes!
- c. A: Achja, das sind Lisas Schuhe, ich sehe aber genau, dass es die Paula ist.
A: Right this are Lisa's shoes I see but GENAU that EXPL. the Paula is
A: Right, those are Lisa's shoes, nevertheless I see GENAU that it's Lisa.

After briefly summing up what has been claimed in this section, I will turn to a summary of the main points of this master's thesis and a subsequent discussion of open questions for future investigation.

7.5 Summary

In this section I suggested a rudimentary implementation of the intuitions laid out in chapter 6. I started by intuitively describing what an analysis that can capture the contribution of *genau* to know-type predicates that I suggested, needs to look like. The insight gained by that was roughly that the semantics of know-type predicates can not only refer to belief worlds of a certain subject, but rather has to make a larger set of worlds accessible, namely a set consisting of worlds close, though slightly deviant from the subject's belief worlds. After that, I illustrated why an analysis based on Hintikka (1969) is insufficient in that respect and suggested a revised semantics for know-type predicates, spelled out for *wissen*. In this connection, I suggested that *wissen* takes a degree argument that receives its value from the context and determines the size of the set of worlds that have to be compatible with what is known. Accordingly, I argued that *genau* takes the slot of this degree argument and requires that the size of the set of worlds compatible with the proposition in question is specifically big. Additionally, I suggested that this set of worlds that contains a subject's belief worlds as well as worlds slightly deviant from what the subject believes, is ordered via a partial ordering on worlds along the lines of Lewis (1973) that orders worlds relative to what the subject considers plausible. After laying out the basic traits of my analysis, I illustrated how it can be expanded to other know-type predicates. Whereas this is in principle possible, several questions regarding the distinction between know-type predicates and other propositional attitude verbs arise, which I briefly pointed out and discussed w.r.t. to future work. Finally, I pointed to a crucial aspect of my implementation, namely its indirect reference to evidence.

Chapter 8

Discussion and outlook: questions for future work

The aim of this master's thesis was to account for the compatibility of certain propositional attitude verbs (including verbs of perception), as *wissen*, with the modifier *genau* that is usually associated with modifying precision. However, I showed that in the context of propositional attitude verbs *genau* intuitively conveys that the attitude is specifically strong. Such a modification is puzzling in light of the standard analysis of such verbs based on Hintikka (1969). According to that, *wissen* and several other propositional attitude verbs are analysed as universal quantifiers over a subject's belief worlds and thus, according to their semantics, should be incompatible with a modifier conveying precision or high strength. In order to examine this problem, I started by discussing underlying assumptions of the Hintikka approach in chapter 2 and furthermore discussed existing problems w.r.t. them. In this connection, I discussed context sensitivity of knowledge as well as alternative accounts that aim to explain the occurrence of *wissen* in apparent degree-constructions (Schmitt & Sode (2018), Koev (2019)). Furthermore, I discussed certain issues regarding the propositional attitude verb *believe*, which is traditionally also analysed as universal quantifier over belief worlds, though isn't compatible with *genau*. I specifically considered an alternative account of *believe* according to which it is analysed as degree denoting expression (Koev (2019)). Finally, I discussed two accounts that both, by one means or another, address context sensitivity in light of knowledge, namely Kratzer (2001) and Lewis (1996), and thereby try to explain certain Gettier-examples. The conclusion that I roughly drew from chapter 2 is that none of the alternative accounts of certain propositional attitude verbs discussed can be directly adopted to explain *genau*-modification of such verbs. Nevertheless, the accounts discussed revealed interesting data points and insights that played a role throughout this thesis.

Therefore, I discussed the semantics of *genau* in detail in chapter 3. I first provided an overview about its distribution, that roughly revealed a distinction between occurrences of the modifier as focus/discourse particle, and occurrences where it – even if only intuitively – can be related to modifying precision. The only use that couldn't be assigned to one of these two groups was *genau* in the context of propositional attitude verbs. Thereafter, I discussed existing analyses of the English counterpart of *genau*, *exactly*, in the context of scalar expressions and concluded that they can not be adapted to explain the modifier's contribution in the use of interest, taking the Hintikka-semantics of *wissen* for granted. Thus, I tried to

pursue the idea that *wissen* may be likewise analysed as degree denoting expression along the lines of Koev (2019), according to which it contains a degree argument that is associated with a probabilistic scale [0,1]. However, I excluded this based on the fact that there seems to be no modifier targeting a point on that scale that is below the maximum.

In chapter 4 I pursued the hypothesis that *genau* directly manipulates a specific component included in the classical lexical entry of *wissen* and decided on evidence and certainty as possible candidates. However, both of them were ruled out based on the distribution of *genau* within the class of propositional attitude verbs.

Accordingly, in chapter 5 I discussed the distribution of *genau* in the context of propositional attitude verbs in greater detail. Two crucial conclusions were drawn from this section. First, I classified the set of verbs compatible with *genau* (know-type predicates from there on) independently of this property, which roughly lead to the generalisation that for all members of this class it holds that i) every statement of the form 'x Q that p' – where Q is a know-type predicate – entails that 'x knows that p' and ii) 'x knows that p' is not presupposed. Second, I showed that the modifier can receive two different readings in the context of embedded wh-interrogatives, one of which – that I called downstairs-reading – has to be distinguished from the one at the heart of this thesis – the upstairs reading.

In chapter 6 I turned to a detailed discussion of examples where *genau*-modification of know-type predicates is licensed. Based on this, I argued that the modifier indicates that a particularly large set of worlds that slightly deviate from the attitude holder's belief worlds can be considered without challenging the knowledge of a certain proposition *p*. An idea that is obviously incompatible with the Hintikka-semantics of propositional attitude verbs. I suggested that this larger set – which exceeds the size of the set of worlds considered in contexts of unmodified know-type predicates – becomes available via a shift of the domain of quantification of the verb. Furthermore, I showed that these additional worlds may contain rather far-fetched circumstances and connected this to the idea of different types of possibilities suggested by Lewis (1996). After that, I considered two other phenomena where a similar domain shift seems to arise: i) in the context of *any* (Kadmon & Landman (1993)), ii) in the context of certain instances of reduplicated universals.

Based on the discussion in chapter 6, I suggested an implementation of my idea by providing an altered semantics for know-type predicates in chapter 7, which I spelled out for *wissen*. In this connection, I suggested that *wissen* takes a degree argument that receives its value from the context and determines the size of the set of worlds that have to be compatible with what is known. I further argued that *genau* takes the slot of this degree argument and requires that the size of the set of worlds compatible with the proposition in question is specifically large. Additionally, I suggested that this set of worlds that contains a subject's belief worlds as well as worlds slightly deviant from what the subject believes, is ordered via a partial ordering on worlds along the lines of Lewis (1973) that orders worlds relative to what the subject considers plausible. This implementation is a first approximation that clearly needs to be refined in future work and gives rise to several problems. Also, many different questions remain unanswered,

some of which I will briefly introduce in this last section.

8.1 Property of entailing knowledge

One open issue that is related to the distinction between know-type predicates and other propositional attitude verbs – briefly discussed in section 7.4 – is the connection between the analysis suggested in section 7.3 and the generalisation via which I classified know-type predicates in chapter 5. The final generalisation presented in section 5.1.1 in (15) is repeated below:

(1) GENERALISATION (Final version)

A propositional verb Q is combinable with *genau* iff:

- a. Every statement of the form 'x Q that p', given that Q presupposes the truth of p, entails that 'x knows that p' (at the time the sentence is evaluated and judged true).
- b. 'x knows that p' is not presupposed. / Q can embed polar questions.

One very vague idea, is that this connection could be established via the type of scale the degree argument that I argued to be present in know-type predicates makes reference to. The generalisation in (1) says that all verbs that 'contain' the *wissen*-component in a certain way (i.e. it cannot be presupposed) are also compatible with *genau*. The propositional attitude verbs excluded from the know-type class can be divided into two groups: on the one hand, the non-factives, where e.g. *believe* belongs to, and, on the other hand, factive verbs as *bereuen* (*regret*), that intuitively differ from know-type predicates in that they seem to primarily convey an emotive relation to a certain proposition and not an attitude suggesting its truth. However, in the case of know-type predicates it is foremost information regarding the way the knowledge w.r.t. a proposition is acquired that is conveyed (except for *wissen* that doesn't provide information regarding the acquisition process). In order to exclude both groups of non-know-type predicates, the unique feature of know-type predicates may be described as directly or first of all conveying certainty w.r.t. the truth of a proposition, such that this certainty can be ascribed or evaluated from a perspective external to the subject. Based on this, the degree argument that I argue to be present in know-type predicates may possibly be connected to a scale referring to external certainty. However, this is obviously only a very rough and intuitive idea of how a connection between the generalisation in (1) and the analysis in section 7.3 may be established. Thus, the examination of that relation is a crucial aspect in light of future investigation.

8.2 Relation to other instances of *genau*

The occurrence of *genau* which is possibly most likely to be relatable to the upstairs reading in the context of know-type predicates is the downstairs reading in the contexts discussed in section 5.2.2. I illustrated this reading in section 5.2.2 in (24), repeated in (2):

- (2) a. Die Bibi weiß, wo die Paula wohnt.
The Bibi knows where the Paula lives
Bibi knows where Paula lives.
- b. A = {Bibi lives in Vienna, Bibi lives in Marseille, Bibi lives in Lisbon}

- c. Die Bibi weiß genau, wo die Paula wohnt.
The Bibi knows exactly where the Paula lives
Bbi knows exactly where Paula lives.
- d. A' = {Bibi lives in Lange Gasse 5 in Vienna, Bibi lives in Rue de la Republique 16 in
Marseille, Bibi lives in Campo the Santa Clara 33 in Lisbon}

I argued that in the downstairs-reading of *genau* in (2-b), the modifier indirectly modifies the wh-word and thereby the answer set of the embedded interrogative: whereas for the unmodified sentence in (2-a), the granularity of the answer set can be coarser, as illustrated by A in (2-b), the modified sentence in (2-c) requires a finer-grained answer, as illustrated by A' in (2-d).

Intuitively, an expansion of the analysis suggested in section 7.3 is imaginable by claiming that the set of worlds that gets expanded via *genau* is the set of possible answers to the embedded question; just as illustrated by the contrast of (2-b) and (2-d). I think that this idea regarding an expansion of the analysis in section 7.3 to downstairs readings of *genau* is promising, but leave a more detailed exploration for future work.

A further challenge is to establish a connection of the analysis in section 7.3 to *genau* modifying scalar expressions. Crucially, as argued in section 7.4 in (18), there is a puzzle arising in light of *genau* in the context of scalar expressions that I related to *genau*-modification of know-type predicates. What I showed is that *genau* modifying scalar expressions that receive an imprecise interpretation is just as felicitous as *genau*-modification of scalar expressions that are itself precise. This was illustrated in section 7.4 in (25), repeated below:

- (3) a. Der Bauer Bob hat 100 Schafe.
The Farmer Bob has 100 sheep
Farmer Bob owns 100 sheep.
- b. Der Bauer Bob hat genau 100 Schafe.
The Farmer Bob has exactly 100 sheep
Farmer Bob owns exactly 100 Schafe.
- c. Der Bauer Bob hat 98 Schafe.
The Farmer Bob has 98 sheep
Farmer Bob owns 98 sheep.
- d. Der Bauer Bob hat genau 98 Schafe.
The Farmer Bob has exactly 98 sheep
Farmer Bob owns exactly 98 sheep.

Accordingly, (3-d) is just as fine as (3-b). To establish what *genau* may contribute to scalar expressions that – most naturally – receive a precise interpretation themselves, let's look at concrete scenarios, where it may occur, as in (4). *genau* in (4-d) seems to underline not only the exactness with which the scalar expression has to be interpreted, but also Pepi's conviction that she didn't miscalculate, which is relevant in the context of (4) as one worm less would change the outcome of their competition.

- (4) Scenario: Lisa and Pepi are collecting earthworms for their terrarium. They turn their activity into a competition: the person who has more worms after one hour, wins. After one hour, they count and compare.

- a. L: Ich habe 56, und du?
L: I have 56 and you
L: I have 56 worms, how many do you have?
- b. B: 57!
B: 57
B: 57!
- c. L: Sicher?
L: sure
L: Are you sure?
- d. P: Ja, genau 57!
P: Yes exactly 57
P: Yes, exactly 57!

In (5) there is no apparent reason that it explicitly matters whether Lisa miscalculated and has one worm less or more. Nevertheless, *genau* in (5-a) is completely fine.

- (5) Scenario: Lisa and Pepi are collecting earthworms for their terrarium. After one hour, Pepi asks Lisa how many worms she has in her bucket. Lisa counts and replies:
- a. Genau 78!
Exactly 78
Exactly 78!

Again, I think that what (5-a) intuitively conveys is that Lisa believes she collected 78 worms and additionally that she is specifically sure that 78 is actually the exact number of worms she has in her bucket. According to this intuition, a connection of the analysis for *genau wissen* suggested in section 7.3 is imaginable as well: basically, what I argued is that $x \text{ weiß genau dass } p$ indicates that x is specifically sure that p holds – likewise, (at least a part) of the contribution of *genau* in (5) may be paraphrased in a similar fashion: if Lisa utters that she has *genau 78* worms, she is specifically sure that the number of worms she collected corresponds to 78.

8.3 Different flavours in the context of third person subjects

In examples with third person subject *genau* seems to receive two slightly different interpretations. The usual interpretation is exemplified in (6). If Tina utters (6-b) given Scenario A in (6-a), her utterance is roughly interpreted as (6-c)

- (6) a. Scenario A: Paula just told Tina that she knows that Karli will come to the party, as she has just met him in the hallway where he is currently locking his bike. Tina hears that Tom and Pezi, who heard from someone else that Karli is coming, are doubting that Karli is indeed coming tonight. Tina interrupts them:
- b. Die Paula weiß genau, dass der Karli zur Party kommt.
The Paula knows GENAU that the Karli to party comes
Paula knows GENAU that Karli is coming to the party.
 - c. \approx Tina reports that Paula knows that Karli is coming and that Paula's knowledge is specifically robust.

On the other hand, if Tina utters (7-b) given Scenario B in (7-a), we can roughly conclude (7-c) from her utterance:

- (7) a. Scenario B: Tom and Tina are talking about tonight's party tonight. As Karli has announced that he will come, Tom tells Tina to forewarn Paula as she hates Karli. Tina, who knows that Paula is in good contact with Karli's sister, is convinced that Paula already knows that Karli is coming, thus, she says:
- b. Die Paula weiß *genau*, dass der Karli zur Party kommt.
The Paula knows *GENAU* that the Karli to party comes
Paula knows *GENAU* that Karli is coming to the party.
- c. \approx Tina is convinced that Paula knows that Karli is coming and that Paula's knowledge is specifically robust.

Thus, in (7), the strength contributed by *genau* seems to modify not only the attitude of the subject of the knowledge ascription, but also somehow the attitude of the speaker. Insofar, as *genau* in (7-b) seems to contribute that Tina is convinced that the knowledge ascription she utters, holds.

At a first glance, these different flavours seem to be similar to those diagnosed for other modifiers as *hundertprozentig* (*one-hundred percent*) that can occur with *wissen*. However, in the case of *hundertprozentig* the most prominent reading is the one that (8-b) receives in a scenario as (8-a), roughly paraphrased in (8-c):

- (8) a. Scenario A: Tom and Tina are talking about tonight's party. As Karli has announced that he will come, Tom tells Tina to forewarn Paula because she hates Karli. Tina, who knows that Paula is in good contact with Karli's sister, is convinced that Paula already knows that Karli is coming, thus, she says:
- b. Die Paula weiß *hundertprozentig*, dass der Karli zur Party kommt.
The Paula knows one-hundred-percent that the Karli to party comes
Paula knows one-hundred-percent that Karli is coming to the party.
- c. \approx Tina is one-hundred-percent sure that Paula knows that Karli is coming.

Thus, in the utterance in (8-b) given the scenario (8-a), only the attitude of the speaker seems to be modified. However, *hundertprozentig* in such a configuration can yield a further reading reminiscent of the reading received for *genau* in (6). This is illustrated in (9):

- (9) a. Scenario A: Paula just told Tina that she knows that Karli will come to the party, as she has just met him in the hallway where he is currently locking his bike. Tina hears that Tom and Pezi, who heard from someone else that Karli is coming, are doubting that Karli is indeed coming tonight. Tina interrupts them:
- b. Die Paula weiß *hundertprozentig*, dass der Karli zur Party kommt.
The Paula knows one-hundred-percent that the Karli to party comes
Paula knows one-hundred-percent that Karli is coming to the party.
- c. \approx Tina reports that Paula knows that Karli is coming and that Paula's knowledge is specifi-

cally robust.¹

Given the scenario in (9-a), the utterance in (9-b) can roughly be paraphrased as (9-c), according to which *hundertprozentig* modifies the attitude of the subject of the knowledge ascription uttered by Tina. Thus, whereas under both interpretations *hundertprozentig* somehow expresses certainty, it is in one case the speaker's attitude, in the other case the attitude holder's attitude that is modified. This suggests that *hundertprozentig* can receive two readings that are based on different scopal relations: whereas under the interpretation in (8) *hundertprozentig* seems to scope above the matrix sentence, under the interpretation in (9), it scopes lower.

Regarding both modifiers, in the case of a first person subject, as illustrated in (10), obviously only one interpretation is available. Thus, both (10-a) and (10-b) convey that the speaker who is simultaneously the attitude holder is specifically certain about or has specifically robust knowledge w.r.t. the embedded proposition:

- (10) a. Ich weiß genau, dass der Karli zur Party kommt.
I know GENAU that the Karli to party comes
I know GENAU that Karli is coming to the party.
- b. Ich weiß hundertprozentig, dass der Karli zur Party kommt.
I know one-hundred-percent that the Karli to party comes
I know one-hundred-percent that Karli is coming to the party.

However, I think that whereas in the case of *hundertprozentig* a real scope ambiguity is present in examples with third person subject, the additional flavour that *genau* receives in (7) is no independent reading, but must be somehow connected to the regular reading received in (7).

This difference is illustrated based on the contrast in (11).

- (11) a. Die Paula glaubt hundertprozentig, dass der Karli zur Party kommt.
The Paula believes one-hundred-percent that the Karli to party comes
Paula knows one-hundred-percent that Karli is coming to the party.
- b. *Die Paula glaubt genau, dass der Karli zur Party kommt.
The Paula believes GENAU that the Karli to party comes
Paula believes GENAU that Karli is coming to the party.
- c. *???Ich glaube hundertprozentig, dass der Karli zur Party kommt.
I believe one-hundred-percent that the Karli to party comes
I believe one-hundred-percent that Karli is coming to the party.

Whereas *hundertprozentig* is felicitous in (11-a) where it modifies *glauben*, (11-b), where *glauben* is modified by *genau* is – as shown at several points – infelicitous. I argue that this is because (11-a) can receive the reading connected to *hundertprozentig* taking wide scope, in which the attitude of the speaker, and not the attitude of the subject of the belief ascription is modified. On the other hand, such a reading – namely one where the modifier modifies only the speaker's attitude towards the whole utterance – apparently isn't available in (11-b) as it is ungrammatical. In (11-c) *hundertprozentig* cannot modify *glauben*,

¹This paraphrase treats *hundertprozentig* analogous to *genau*, which is a simplification for the purpose of illustration and without commitment to its precise semantics.

as the wide-scope reading is unavailable because of the first person subject that causes the readings to coincide.

Therefore, the different flavour connected to *genau* that arises in the context of (7), has to be explained differently. I leave a detailed discussion of this question – that is connected to the general licensing contexts of knowledge ascriptions – for future work. Roughly, I think that it is a consequence of the basic reading: if a speaker is in the position – for whatever reason – to utter a *genau*-modified knowledge ascription, this speaker is automatically specifically sure that the attitude holder indeed holds knowledge w.r.t. the proposition in question.

8.4 Connection to stress

As briefly noted in section 6.3, *genau* in the upstairs reading modifying know-type predicates can be omitted by putting major stress on the verb. This is illustrated in (12):

- (12) a. A: Weißt du ob der Franz kommt?
A: Knows you whether the Franz comes
A: Do you know whether Franz is coming?
- b. B: Ja, er kommt!
B: yes he comes
B: yes, he is!
- c. A: Aber was, wenn er den Zug verpasst hat?
A: but what if he the train missed has
A: But what if he missed train?
- d. B: Ich weiß genau, dass er kommt.
B: I know GENAU that he comes
B: I know GENAU that he is coming.
- e. B': Ich **weiß**, dass er kommt.
B': I **know** that he comes
B': I **know** that he is coming.
- f. B'': ??Ich weiß, dass er kommt.
B'': ??I know that he comes
B'': ??I know that he is coming.

As usual, B can reject A's doubts concerning her knowledge w.r.t. the proposition 'that Franz is coming' as well as the truth of *p* itself, indicated by (12-c), by using *genau wissen* in (12-d). However, (12-e) – where boldface indicates major stress – is likewise felicitous and seems to convey something very similar to (12-d), namely that B knows *p* with high certainty. On the other hand, using the unmodified statement in (12-f) with neutral intonation is given the foregoing discourse rather odd. Thus, there seems to be a connection between stressing the embedding know-type predicate – here *wissen* – and *genau*-modification. Crucially, those two modifications cannot occur simultaneously – if *genau* is added, it receives major stress itself and the preceding know-type predicate is thus unstressed.

A similar connection can be detected in the case of reduplicated quantifiers discussed in section 6.6. In (37) (section 6.6) I illustrated a scenario where such a reduplication is licensed, which is repeated

in (13). As indicated by the boldface letters in (13-e), instead of using *alle alle* as in (13-d), the universal quantifier can instead of being reduplicated also receive major stress in order to yield a similar interpretation that is connected to an enlargement of the domain of quantification.

- (13) a. Scenario Part-1: Teacher Bob shows his students in geography class several fossils that he brought to school in four suitcases. The children unpacked the suitcases and put the content of each suitcase on a separate table. Table four attracts the most attention as it presents fossilized dinosaur eggs. Thus, Bob as well as all children are standing around this table, while the other three faded from their minds. As the bell rings, Bob says:
- b. Die Stunde ist aus, räumt bitte alle schnell wieder ein.
The lesson is over put please all quickly again in
The lesson is over, please put all of the fossils back quickly.
- c. Scenario-Part 2: The lazy pupils, who forgot about the other tables, put the fossils from table 4 back in the suitcase and are about to leave the classroom. Bob, who notices that, calls them back:
- d. Hiergeblieben, ich meine alle alle!
Stay-here, I mean all all
Stay here! I mean really all of the fossils!
- e. Hiergeblieben, ich meine **alle**!
Stay-here, I mean **all**
Stay here! I mean **all** of the fossils!

I suggest that this connection is according to the following effect: putting stress on *wissen* as in (12) or *alle* as in (13) indicates that the interpretation that *wissen* and *alle*, respectively, should receive, is the strongest interpretation that is available in the context. Intuitively, by stressing the know-type predicate or universal quantifier it seems to be conveyed that the respective expression is to be interpreted literally, i.e. without any further restriction than absolutely necessary, which corresponds to the largest domain of quantification available. This strongest possible interpretation is actually exactly what I suggested to be conveyed by *genau*-modification of know-type predicates; therefore, the interchangeability of these two types of modification might be expectable. I will leave it at this intuitive description of that connection and plan a detailed investigation of this issue in future work.

8.5 Zusammenfassung: Modifikation deutscher Einstellungsverben

Die vorliegende Arbeit beschäftigt sich mit der Semantik von propositionalen Einstellungsverben (wie *wissen*, *glauben*, *erinnern*, *hoffen*, *bereuen* etc.) und Perzeptionsverben (wie *sehen*, *riechen*, *schmecken*, *spüren* etc.) – hier als Einstellungsverben zusammengefasst. Im Fokus stehen neue Daten, die die Modifizierbarkeit einiger Verben dieser Klassen durch den Präzisionsmodifizierer *genau* zeigen. (14-a) illustriert den Gebrauch von *genau* als Modifizierer von skalaren Ausdrücken, (14-b) zeigt die Kompatibilität von *wissen* und *riechen* damit, (14-c) zeigt, dass *genau*-Modifikation manch anderer Einstellungsverben – wie etwa *glauben* – ungrammatisch ist:

- (14) a. Der Max hat genau 20 Kühe.
b. Die Paula weiß/riecht genau, dass der Kuchen verbrannt ist.
c. *Die Paula glaubt genau, dass der Kuchen verbrannt ist.

Intuitiv beschrieben drückt (14-b) aus, dass Paulas Einstellung/Perzeption gegenüber dem Inhalt des eingebetteten Satzes besonders stark oder gut fundiert ist. Eine Modifikation, die in Anbetracht der semantischen Annahme bzgl. der Verben in (14) unerwartet ist: seit Hintikka (1969) werden propositionale Einstellungsverben gemeinhin als Relationen zwischen den Glaubenswelten eines Einstellungssubjekts – in (14-b) Paula – und dem Inhalt der eingebetteten Proposition – in (14-b) 'der Kuchen ist verbrannt' – beschrieben. Die Relation *wissen* hält demzufolge zwischen einem Subjekt x und einer Proposition p , sofern p in allen Glaubenswelten von x wahr ist. Zusätzlich enthält *wissen* eine Faktitivitätspräsupposition, die fordert, dass das eingebettete Komplement in der Auswertungswelt wahr ist (Kiparsky & Kiparsky (1970)). Einstellungsverben, die ihrer Semantik zufolge etwas über die Gesamtheit der Glaubenswelten eines Subjekts aussagen – wie *wissen* – werden dementsprechend als Universalquantoren analysiert. Da Einstellungsverben dieser Analyse entsprechend keine impräzisen Ausdrücke sind, stellt sich die Frage nach dem semantischen Beitrags des Modifiziers in Sätzen wie (14-b), der in anderen Vorkommen Präzision ausdrückt, (14-a). Um dieser Frage auf den Grund zu gehen, werden in Kapitel 2 relevante Ansätze zur Semantik von Einstellungsverben diskutiert (u.a. Koev (2019), Schmitt & Sode (2018), Kratzer (2001), Lewis (1996)) sowie in Kapitel 3 semantische Analysen des Modifizierers im Kontext von skalaren Ausdrücken zusammengefasst (u.a. Sauerland & Stateva (2007), Geurts (2006)). Da sich eine in Kapitel 4 aufgestellte Hypothese, um die Kompatibilität der Verben mit *genau* innerhalb der Hintikka-Analyse zu erklären als nicht haltbar herausstellt, werde ich in Kapitel 5 die Distribution von *genau* im Kontext von Einstellungsverben im Detail beleuchten. Basierend auf der Diskussion der Lizenzierungskontexte sowie des semantischen Beitrags des Modifizierers im Rahmen von Einstellungsverben, motiviere ich in Kapitel 6 eine Revision der Hintikka-Analyse von *wissen* und weiteren Verben, die sich auf eine Vergrößerung der Quantifizierungsdomäne bezieht, sodass diese nicht nur über Glaubenswelten eines Subjekts, sondern auch über Welten außerhalb dieser Menge quantifizieren. Dieser Vorschlag beruht auf der Intuition, dass die Relation zwischen dem Subjekt und der Proposition in (14-b) hält, selbst wenn sich die Welt in der sich das Subjekt befindet bzgl. bestimmter Aspekte von dessen Glauben unterscheidet. In Kapitel 7 wird diese Analyse implementiert, Kapitel 8 gibt einen Überblick über offene Fragen für zukünftige Forschung.

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