

KNOWLEDGE-*THE*
AND PROPOSITIONAL ATTITUDE ASCRIPTIONS

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Summary

Determiner phrases embedded under a propositional attitude verb have traditionally been taken to denote answers to implicit questions. For example, ‘the capital of Vermont’ as it occurs in ‘John knows the capital of Vermont’ has been thought to denote the proposition which answers the implicit question ‘what is the capital of Vermont?’ Thus, where ‘know’ is treated as a propositional attitude verb rather than an acquaintance verb, ‘John knows the capital of Vermont’ is true iff John knows that Montpelier is the capital of Vermont. The traditional view lost its popularity long ago, because it was thought to rest on the controversial assumption that determiner phrases embedded under a propositional attitude verb function semantically in the same way as the corresponding *wh*-clauses. Here we defend the traditional assumption against objections. We then argue that *wh*-clauses are not to be given a uniform treatment as indirect questions. When occurring under a propositional attitude verb, *wh*-clauses are better treated as having a predicate-type semantic value. We conclude by considering some possible objections to the predicate view.

The most frequently cited examples of knowledge sentences in the philosophical literature are sentences of the form ‘*s* knows that *p*’ (e.g., ‘Jessica knows that Montpelier is the capital of Vermont’). However, few of the sentences we actually use to make knowledge attributions take this standard form. As examples of sentences that do not, consider:

- (1)
 - (a) Jessica knows the capital of Vermont.
 - (b) John knows who knows the capital of Vermont.
 - (c) Tim knows a doctor who can treat your illness.
 - (d) Ralph knows where to find a clinic that specializes in orthopedic disorders.

- (e) Mary knows every capital in Europe.
- (f) Peter knows whether Mary knows every capital in Europe.

The use of sentences like those in (1) differs from the use of *that*-clause sentences. Unlike the corresponding *that*-clause sentences, the sentences in (1) can be used to attribute to a subject knowledge which the attributor does not possess. For example, a correct assertion of (1) a does not require that the speaker knows that Montpelier is the capital of Vermont. The use of such sentences to make knowledge attributions thus puts fewer demands on the speaker than the use of the corresponding *that*-clause sentences.

In this paper we offer an account of knowledge sentences of the non-standard form exemplified in (1) which reflects this difference. We argue that, unlike the more frequently discussed examples, sentences of the non-standard form attribute a special kind of *de re* knowledge. The structure of the paper is as follows. In the first section we show that determiner-phrase complement clauses embedded under propositional attitude verbs such as ‘know’ function semantically in the same way as the corresponding *wh*-clauses. We then offer reasons against previous analyses of *wh*- and determiner-phrase complement clauses embedded under propositional attitude verbs. In the subsequent sections we defend the view that uses of sentences containing either kind of complement clause embedded under ‘know’ attribute a form of *de re* knowledge. Finally, we reply to some possible objections to the proposed analysis.

1. *Knowledge-CQ vs. objectual knowledge*

Few would deny that there are knowledge attributions that do not attribute knowledge-*that*, for example, ‘Stephanie knows Kripke’.¹ An utterance of the latter sentence attributes objectual knowledge to Stephanie: it is true iff Kripke is one of Stephanie’s personal acquaintances. Objectual knowledge attributions uncontroversially attribute non-propositional knowledge to the denotation of the subject term. One mark of the objectual ‘know’ is that it does not translate into the same word as the non-objectual ‘know’ in languages such as French, German and Italian. In German, for example,

1. Exceptions include Quine (1955), Fodor (1979: 319–28), Larson, Ludlow and den Dikken (1996) and Parsons (1997).

the objectual ‘know’ translates as ‘kennen’, whereas the non-objectual ‘know’ translates as ‘wissen’.

If it could be argued that utterances of the sentences in (1) attributed objectual knowledge to the denotation of the subject term, there would be little controversy as to whether or not the sort of knowledge attributed is a form of knowledge-*that*. But, the sentences in (1) admit of readings that do not attribute objectual knowledge. 1(a), for example, does not state that Jessica is acquainted with the state of Vermont. This can be seen from the fact that the occurrence of ‘know’ in (1)a translates into a form of ‘wissen’ in German.

Some knowledge sentences are ambiguous between a “kennen” (or objectual) reading and a “wissen” (or non-objectual) reading. Consider, for instance:

- (2)
- (a) Stephanie knows the author of *Naming and Necessity*.
- (b) Tim knows a doctor who can treat your illness (= 1c).
- (c) Claire knows Jill’s favorite actress.

(2)a can be read as saying that the author of *Naming and Necessity* is one of Stephanie’s personal acquaintances but it also has a reading that requires for its truth that Stephanie know that Kripke is the author of *Naming and Necessity*. Likewise, 2(b) can be read as saying that one of Tim’s personal acquaintances is a doctor who can treat the addressee’s illness, but 2(b) also has a reading that requires for its truth that Tim can identify a doctor who can treat the addressee’s illness. Finally, 2(c) can be read as saying that Jill’s favorite actress is one of Claire’s personal acquaintances but it also has a reading that requires for its truth that Claire have a way of picking out Jill’s favorite actress (e.g. by naming her). When knowledge sentences exhibit an ambiguity of this sort, the ‘know’ translates as ‘kennen’ (objectual), on the first reading, and as ‘wissen’, on the second reading. Here we shall be concerned only with knowledge sentences that translate using ‘wissen’, that is, we shall set aside objectual knowledge attributions.

If we set aside objectual knowledge attributions we are left with two sorts of knowledge sentences which are not explicitly a form of knowledge-*that*, viz. knowledge sentences which contain a *wh*-complement clause (e.g., ‘what the capital of Vermont is’) and knowledge sentences which contain a determiner-phrase complement (e.g. ‘the capital of Vermont’).

Following the literature, let us call determiner-phrase complements, on their non-objectual readings, ‘concealed questions’ (CQ). There are then two kinds of knowledge attributions which do not exhibit a *that*-clause structure: knowledge-*wh* and knowledge-CQ. There is a third kind of knowledge attribution which is not explicitly a form of knowledge-*that*, viz. knowledge-*how*, and we shall have something to say about it below. At this point, it will suffice to note that ‘how’ does not differ syntactically from words philosophers do not hesitate to call ‘*wh*-words’.

It has been argued that concealed questions function semantically in the same way as the corresponding *wh*-clauses (Baker 1968). The main evidence for this thesis comes from the fact that for any knowledge-CQ sentence, it is possible to find a knowledge-*wh* sentence with the same meaning. Here are some examples:

- (3)
- (a) Jessica knows the capital of Vermont (= 1a).
 Jessica knows *what* the capital of Vermont *is*.
 - (b) Tim knows the author of *Naming and Necessity*.
 Tim knows *who* the author of *Naming and Necessity* *is*.
 - (c) Jacob knows the price of milk.
 Jacob knows *what* the price of milk *is*.

If concealed questions function semantically in the same way as the corresponding *wh*-clauses (and ‘how’ is a *wh*-word), then there is just one kind of non-objectual knowledge sentence which is not explicitly a form of knowledge-*that*.

There are several objections to this simple proposal. However, as we will see, none of them turns out to be fully successful. One common objection is directed against the proposal that concealed questions are constituents of *wh*-clauses at the level of *logical form*. If the syntactical version of the disguised knowledge-*wh* approach is correct, then the surface forms given in 3(a)-(c) are the result of deleting the underlined material in the paraphrases. But this proposal allegedly runs into difficulties. For, what holds for knowledge-*wh* sentences should hold for other sentences containing attitude or speech act verbs and a *wh*-complement clause. But the result of deleting the *wh*-word and the main verb in sentences containing verbs that take *wh*-clauses is sometimes infelicitous. Consider, for instance:

- (4)
- (a) John wondered who Smith's murderer was.
 - (b) Mary inquired what the capital of Vermont was.

The sentences in (4) are perfectly acceptable but the result of deleting the *wh*-word and the main verb phrase of the complement clause is infelicitous:

- (5)
- (a) #John wondered Smith's murderer.
 - (b) #Mary inquired the capital of Vermont.

This suggests that concealed questions are not *wh*-clauses that have undergone deletion. In response to this sort of worry Jane Grimshaw (1979) suggests that concealed questions are not constituents of *wh*-clauses at the level of logical form but determiner phrases that occur in 'legitimate NP-positions' (1979: 303). Grimshaw's suggestion receives support from the fact that concealed questions occur as the subject terms in the following sort of construction:

- (6) The number of moons of Jupiter is four.

It is arguable that the definite description in (6) occurs in a legitimate NP-position *and* has a concealed question interpretation just like the complement clause in 'John knows the number of moons of Jupiter'.²

If Grimshaw's proposal is right, then we have a straightforward explanation of why 'wonder' and 'inquire' do not take concealed questions as complements. If concealed questions occur in legitimate noun-phrase positions, we should not expect them to be selected by verbs that do not combine with *that*-clauses (e.g. 'wonder' and 'inquire'). Hence, we should expect 4(c) and 4(d) to be infelicitous.

On Grimshaw's proposal, concealed questions are not constituents of *wh*-clauses at the level of logical form. Nonetheless, concealed questions embedded under verbs that select for interrogative complements (e.g. 'know') are semantically interpreted as *wh*-clauses. The hypothesis that concealed questions are interpreted as *wh*-clauses explains why 'believe' and 'deny', which do not take *wh*-clauses as complements, do not ordinar-

2. See Schlenker (2003) for a defense of this proposal and Brogaard (2007b) for a reply.

ily combine with concealed questions (witness ‘#John believes the capital of Vermont’).

However, Grimshaw’s proposal has come under recent attack. As Lance Nathan (2006) has argued, if concealed questions function semantically in the same way as the corresponding *wh*-clauses, then we should expect a wide range of interpretations to be available for concealed questions embedded under a complement-taking verb-phrase. But concealed questions embedded under such verb phrases admit of a rather narrow range of interpretations. For example, as (7) illustrates, ‘I told him the capital of Vermont’ cannot be interpreted as ‘I told him where the capital of Vermont is’ but can only be interpreted as ‘I told him what the capital of Vermont is’:

- (7)
- (a) Jacob was wondering what the capital of Vermont is. I told him the capital of Vermont.
 - (b) Jacob was wondering where the capital of Vermont is. I told him where the capital of Vermont is.
 - (c) Jacob was wondering where the capital of Vermont is. #I told him the capital of Vermont.

In (7)c the preceding linguistic context makes it salient that the information John was asking for is information about the location of the capital. So, if concealed questions were interpreted as *wh*-clauses, then a *where*-clause interpretation should be available for (7)c. But the discourse fragment in (7)c is infelicitous.

There is, however, a straightforward reply to this line of argument. Suppose concealed questions and *wh*-complement clauses function semantically as predicates when embedded under propositional attitude verbs like ‘know’. Predicates denote sets in truth-functional contexts and properties in attitude contexts. So ‘the capital of Vermont’ and ‘what the capital of Vermont is’ both denote the property of being (what) the capital of Vermont (is). Since they co-denote, they are intersubstitutable. But ‘the capital of Vermont’ and ‘where the capital of Vermont is’ do not co-denote. The former denotes the property of being *what* the capital of Vermont is; the latter denotes the property of being *where* the capital of Vermont is. Since the two complement clauses do not co-denote, they are not intersubstitutable. Hence, definite concealed questions are not interpretable as *where*-clauses. We will develop the hypothesis that concealed questions

and *wh*-complement clauses embedded under propositional attitude verbs function as predicates in further detail below. Before developing this proposal, however, let us offer a more detailed explanation of why not all verbs that select *wh*-complements take concealed questions.

It will be noted that verbs that take only interrogative clauses like ‘wonder’ and ‘inquire’ and verbs that take both declarative and interrogative clauses combine differently with interrogative clauses. ‘Wonder’ and ‘inquire’ combine with direct reports of questions, as in ‘John wondered, “Who is the murderer of Smith?”’ and ‘Mary inquired, “what is the capital of Vermont?”’. ‘Know’, on the other hand, does not combine with direct reports of questions, as can be seen from the infelicity of ‘Mary knew, “what is the capital of Vermont?”’.

Moreover, interrogative clauses that occur as the complements of ‘know’ are interpreted differently from interrogative clauses that occur as complements of ‘wonder’ and ‘inquire’. ‘Mary knew what the capital of Vermont is’ is true only if Mary knows that Montpelier is the capital of Vermont. ‘Mary wonders what the capital of Vermont is’, on the other hand, is false if Mary knows that Montpelier is the capital of Vermont. This difference in interpretation of *wh*-clauses calls for an explanation.

Here is a tentative hypothesis which we will test below. We hypothesize that *wh*-clauses function either as restrictors of quantifiers or as indirect questions. Verbs like ‘wonder’ and ‘inquire’ select complements that function as indirect questions, whereas verbs like ‘know’ select complements that function as restrictors of quantifiers (a similar hypothesis is set forth by Berman 1991).

If the hypothesis just offered is correct, then it may well be that concealed questions function semantically in the same way as *wh*-clauses, which is to say, they function as restrictors of quantifiers at the level of logical form. As a result, concealed questions combine only with verbs that select *wh*-complements which function as restrictors of quantifiers. Since ‘wonder’ and ‘inquire’ do not select *wh*-complements that function as restrictors of quantifiers, they do not select concealed questions as their complements.

But a problem remains. As Nathan (2006: chap. 2) points out, the verb ‘ask’ seems to cause trouble for theories which take concealed question to be interpretable as *wh*-clauses (Nathan 2006). In the ‘unsure that’ sense rather than in the ‘request’ sense ‘ask’ behaves like ‘wonder’ with respect to *that*-clauses and *wh*-clauses, that is, it selects *wh*-clauses but does not select *that*-clauses. Yet, as Nathan notes, unlike ‘wonder’, ‘ask’ selects concealed questions:

- (8)
- (a) Councilmember Brown asked what the time frame for implementing these goals is.
 - (b) Councilmember Brown asked the time frame for implementing these goals
 - (c) #Brown asked that the time frame for implementing these goals is 2 years³

However, there is no cause for concern. Concealed questions are not widely allowed in the scope of ‘ask’,⁴ and when they are, they are somewhat idiomatic. We agree with Nathan (2006: 5.3.1) that concealed questions embedded under ‘ask’ do not have the same meaning as concealed questions embedded under verbs that select *that*-clause complements. Concealed questions embedded under ‘ask’ are indeed still interpretable as *what*- and *who*-clauses but unlike other concealed questions their meaning is a question (where a question is a set of possible propositional answers).

Further, as a simple Google search will show [search terms: “* wondered the *”], even ‘wonder’ occasionally combine with concealed questions with a question meaning, as in:⁵

- (9)
- (a) Ever wondered the answer to any of these questions?
 - (b) Ever wondered the “right” way to describe swordfights?
 - (c) Stratford wondered the time line.
 - (d) If you’ve ever wondered the value of partner programs from software/hardware companies, let me give you my perspective from the front lines.
 - (e) Geisenberger wondered the price range.
 - (f) Hopkinson wondered the height of the tallest building in this neighborhood.

3. With the subjunctive mode ‘be’ this is acceptable, but with the subjunctive mode, ‘ask’ means ‘request’, which is not the meaning we are interested in here.

4. Compare ‘John knows the student who knows the capital of Vermont’ vs. ‘John asked the student who knows the capital of Vermont’. The noun-phrase complement may function as a concealed question only in the fist case.

5. ‘I’ve often wondered the same thing’ seems to be a further example. However, as Lance Nathan has pointed out to me, ‘the same thing’ is probably not a concealed question but an anaphoric determiner phrase (<http://lemmingsblog.blogspot.com/2007/07/i-have-often-wondered-same-thing.html>). Nathan also points out that the examples in (9) might not be genuinely acceptable.

As both ‘wonder’ and ‘ask’ take concealed questions with a question meaning in ordinary language (even if the result is somewhat idiomatic), I would hesitate to discard the position that concealed questions function semantically in the same way as the corresponding *wh*-clauses on the grounds that ‘ask’ differs from ‘wonder’.⁶

There is, however, a further objection to the proposal that concealed questions function in the same way as the corresponding *wh*-clauses. The objection is due to Irene Heim (1979), who attributes it to Greenberg, and it runs as follows. ‘Found out’ is a verb phrase that takes concealed questions as complement clauses. So if concealed questions function in the same way as the corresponding *wh*-clauses, we should expect concealed question embedded under ‘found out’ to be interpretable as *wh*-clauses. But consider now the following two sentences:

- (10)
(a) John found out the murderer of Smith.
(b) John found out who the murderer of Smith is.

If (10)a and (10)b were interpretable in the same way, then we shouldn’t expect there to be a difference in meaning. But there is an obvious difference in meaning. Heim explains:

[(10)b] cannot only be used to express that John solved the question who murdered Smith, but has a further reading which is perfectly compatible with John’s being entirely ignorant of Smith’s murder, and which only amounts to the claim that John found out some essential fact or other (e.g. that he was his brother) about the person referred to as ‘the murderer of Smith’, but this is not an available reading for [(10)a], which can only be used in the first-mentioned way. (1979: 53)

Heim’s point is this. If John found out James is his brother, and the speaker and hearer know that James is the murderer of Smith, then (10)b is acceptable but (10)a is not. John didn’t find out the murderer of Smith but he found out who the murderer of Smith is. Since (10)a and (10)b differ in

6. ‘Care’ seems to be another counterexample to our hypothesis, as it selects propositional and *wh*-complements but not CQ-complements. However, as Nathan (2006: chap. 5) observes, arguments such as ‘Mary cares who left. It is the case that John left. Hence, Mary cares that John left’ are invalid. This seems to suggest that there are indeed two distinct predicates, one that selects *wh*-clauses and one that selects *that*-clauses. If he is right about this, then ‘care’ is not a counterexample to our hypothesis.

meaning, the concealed question in (10)a cannot be interpreted as ‘who the murderer of Smith is’.

The argument is forceful. But it doesn’t prove what it claims to prove. Heim is certainly right that (10)a and (10)b do not have the same meaning. But there is no reason to think that that undermines the position that concealed questions function in the same way as the corresponding *wh*-clauses. For, it is arguable that the copula and the definite description in (10)b are inverted:

10(c) John found out *who* is the murderer of Smith.

Like (10)a, but unlike (10)b, (10)c is true only if there is some *x* such that John found out *x* is the murderer of Smith. Thus, (10)c is false if John found out that James (who happens to be the murderer of Smith) is his brother.

Indefinite concealed questions may also seem to cause trouble for the view that concealed questions function in the same way as the corresponding *wh*-clauses. If indefinite concealed question were interpretable as *wh*-clauses, it might seem that we should expect the following two sentences to have the same meaning (see Frana 2006).

(11)

(a) John knows a doctor who can treat your illness.

(b) John knows who is a doctor who can treat your illness.

But (11)a and (11)b clearly do not have the same meaning. (11)b requires for its truth that John know of everyone in the domain whether or not he or she is a doctor who can treat your illness. But (11)a requires only that you know of a certain person that he or she is a doctor who can treat your illness.

However, the argument does not undermine the view that concealed questions function semantically in the same way as the corresponding *wh*-clauses. All it shows is that indefinite concealed questions do not *always* function in the same way as *who*- or *what*-clauses. But we already knew that. Consider the following discourse fragment:

(12)

A: I haven’t been able to find any Belgian chocolate. Do you know where I can get it?

B: No, I don’t. But you should ask John. He knows a store that sells it.

B's last remark can be read as 'John knows where there is a store that sells Belgian chocolate'. That is, concealed questions of the form 'an *F* sometimes have the same meaning as 'where an *F* is' or the equivalent but less idiosyncratic 'where there is an *F*'.⁷ Thus, it is reasonable to suppose that (11)a has the same meaning as 'John knows where there is a doctor who can treat your illness', and so differs semantically from (11)b.⁸

It seems, then, that there are no serious objections to the proposal that concealed questions function in the same way as the corresponding *wh*-clauses.

2. Previous approaches

Before offering an account of *wh*-clauses embedded under propositional attitude verbs, it will be fruitful to look at previous accounts of concealed questions. As we will see, none of the previous approaches is entirely successful.

2.1 The complements-as-questions approach

On the standard account, *wh*-clauses that occur as the complements of verbs that take both *that*-clauses and *wh*-clauses are indirect questions, and concealed question are literally concealed questions.⁹ Following Higginbotham (1996: 381), knowledge-*wh* sentences may be assigned the following *meta-linguistic* truth-conditions:¹⁰ there is a proposition *p* such that *s* knows that *p*, and *p* answers the indirect question of the *wh*-clause.

7. Indefinite concealed questions do not always have the same meaning as *where*-clauses. For example, it seems that 'John knows a hotel that permits guests to keep pets' may be true if John can *name* a relevant hotel (e.g., 'Holiday Inn #767') but doesn't know where it is.

8. It is arguable that (11)a could be true even if John could only *name* a relevant doctor (see the previous note). But the difference in meaning between (11)a and 11(b) can then be explained on the assumption that (11)a has the same meaning as the slightly more idiosyncratic sentence 'John knows who a doctor who can treat your illness is'.

9. For a defense of the disguised-questions approach to *wh*-complement clauses, see e.g. Hintikka (1975), Boër and Lycan (1986), Higginbotham (1996), Bach (2005), Braun (2006, manuscript), Kallestrup (forthcoming and manuscript). For a variation on this view, see Schaffer (forthcoming).

10. The meta-linguistic truth-conditions are also sometimes called the 'truth-maker truth-conditions'. They specify what the world (or logical space) must be like for the sentence in question to be true. But they do not specify which proposition is expressed by the sentence. For example, 'it is possible that there are blue swans' can be given the following meta-linguistic

Knowledge-*wh*: *s* knows-*wh* iff there is a proposition *p* such that *s* knows *p*, and *p* answers the indirect question of the *wh*-clause.

Meta-linguistic truth-conditions may be assigned to knowledge-CQ in a parallel fashion:

Knowledge-CQ: *s* knows-CQ iff there is a proposition *p* such that *s* knows *p*, and *p* answers the concealed question of the noun phrase complement.

‘John knows (who) the author of *Naming and Necessity* (is)’, for example, is true iff there is a proposition *p* such that John knows that *p*, and *p* answers the question ‘who is the author of *Naming and Necessity*?’ So, if John knows that Kripke is the author of *Naming and Necessity*, then he knows the author of *Naming and Necessity*, in the relevant sense of ‘knows’. On this approach, *wh*-clauses and concealed questions function in the same way semantically: they denote true answers to the questions to which they correspond.

Unfortunately, the disguised-questions approach is not empirically adequate. First, it is unable to distinguish semantically between inverted and non-inverted *wh*-clauses. Consider:

(13)

- (a) John found out who (exactly) is the murderer of Smith.
- (b) John found out who (exactly) the murderer of Smith is (= 10b).

The disguised-question approach predicts that (13)a and (13)b are true under the same circumstances. (13)a and (13)b are true iff there is some *p* such that John found out that *p*, and *p* answers the question ‘who (exactly) is the murderer of Smith?’ But, as we have seen, (13)a and (13)b do not have the same meaning. Unlike (13)a, (13)b may be true if John found out that James (who happens to be the murderer of Smith) is his brother.

Second, the disguised-questions approach will deliver the wrong verdict in cases of the following sort. Suppose John mistakenly believes that Mary is leaving because she dislikes her department, and suppose John knows

truth-conditions: ‘it is possible that there are blue swans’ is true iff there is a world in which there are blue swans. But if ‘it is possible that’ functions as a sentential operator rather than as an object-language quantifier over worlds, ‘it is possible that there are blue swans’ does not express the proposition that there is a world in which there are blue swans.

that Mary has accepted a job in California. If ‘Mary has accepted a job in California’ answers the question ‘what is Mary’s reason for leaving?’, then John knows Mary’s reason for leaving, in spite of the fact that he mistakenly believes she is leaving because she dislikes her department.

Or to take another case: suppose Alice knows that her student Mary left at 1 AM. Alice doesn’t know whether her students Bob and Carl also left at 1 AM. So, Alice doesn’t know which ones of her students left at 1 AM. Yet if ‘Mary left at 1 AM’ answers the question ‘which ones of Alice’s students left at 1 AM?’, then the standard approach predicts that Alice knows which ones of her students left at 1 AM, despite the fact that she doesn’t know whether Bob and Carl also left at 1 AM.

To avoid this problem, defenders of the disguised-questions approach are required to place restrictions on answers that may serve as the denotation of concealed questions. For example, they are required to say that the only admissible answers to ‘what is Mary’s reason for leaving?’ are answers of the form ‘*r* is Mary’s reason for leaving’. Since John does not know that her acceptance of a job in California is her reason for leaving, John doesn’t know Mary’s reason for leaving. Likewise, they are required to say that the only admissible answers to ‘which ones of Alice’s students left at 1 AM?’ are answers of the form ‘*X* are the only ones among Alice’s students who left at 1 AM’.

We might reformulate the disguised-questions approach as follows:

S knows *wh/CQ* iff there is a *p* such that *s* knows that *p*, and *p* is an *admissible* true answer to the indirect/concealed question of the complement clause.

However, without independent motivation, this account is ad hoc. To back up the account, it may perhaps be said that only full and exhaustive answers are answers in a technical sense. But this hypothesis is highly questionable. Except in the case of multiple choice questions, it is not clear that there is such a thing as a full and exhaustive answer (Groenendijk and Stokhof 1997). John knows that he can buy a can of cranberry sauce in Family Delight. So, he knows where he can buy a can of cranberry sauce. But ‘John can buy a can of cranberry sauce in Family Delight, Country Farm, Stop One, and ...’ (listing all the contextually relevant places) is clearly more exhaustive than ‘John can buy a can of cranberry sauce in Family delight’. Precisely the same point can be made with respect to so-called open questions. John knows what natural-language semantics is but

there is no exhaustive answer to the question ‘what is natural-language semantics?’

It remains a substantial question whether any motivation could possibly be given for imposing admissibility constraints on questions except that it yields the correct verdict in the cases just considered.

A third problem for the disguised-questions approach concerns iterated knowledge ascriptions.¹¹ Consider, for instance:

(14) John knows that Mary knows the capital of Vermont.

(14) can be true even if John doesn’t know that Montpelier is the capital of Vermont. Yet this is not the result delivered by the disguised-questions approach. On the disguised-questions approach, ‘the capital of Vermont’ denotes the proposition *Montpelier is the capital of Vermont*. So, (14) is true iff (15) is true:

(15) John knows that Mary knows that Montpelier is the capital of Vermont.

If John is a fairly competent speaker of English, it is plausible that he knows whether certain basic inferences hold in English, for instance, the inference from ‘Mary knows that Montpelier is the capital of Vermont’ to ‘Montpelier is the capital of Vermont’. The following is then true:

(16) John knows that ‘Mary knows that Montpelier is the capital of Vermont’ entails ‘Montpelier is the capital of Vermont’.

By Closure (if s knows p , and s knows that p entails q , then s knows q), (15) and (16) entail:¹²

(17) John knows that Montpelier is the capital of Vermont.

But, ex hypothesi, John doesn’t know this.

11. Brogaard (forthcoming b) and Kallestrup (manuscript) raise related objections for what Kent Bach (2005) calls the ‘stupid view’.

12. Some prefer the following version of Closure: if s knows p , and s competently deduces q from p and thereby comes to believe q while retaining knowledge of p , then s knows q . If this is the preferred version, let us add that John competently deduces q from p and thereby comes to believe q while retaining (implicit) knowledge of p .

It may be objected that as Closure has been questioned on several occasions, defenders of the disguised-questions approach can simply reject it. This move has a considerable degree of initial plausibility. Fred Dretske and Robert Nozick familiarly disallow corollaries of Closure where p is an ordinary light-weight proposition, and q is the negation of a heavy-weight skeptical hypothesis (Dretske 1970 and Nozick 1981).¹³ For example, they disallow the inference from ‘I know I have hands’ to ‘I know I am not a disembodied brain in a vat’. Someone sympathetic to Dretske/Nozick considerations might thus suggest that we reject the instance of Closure utilized in the above argument. However, Dretske/Nozick considerations do not lend support to a rejection of the instance of Closure utilized in the above argument. For that instance does not license inferences from light-weight propositions to the negation of heavy-weight skeptical hypotheses. It licenses inferences from ‘ s knows that r knows that p ’ to ‘ s knows that p ’.

It may also be objected that that the substitution of ‘that Montpelier is the capital of Vermont’ for ‘the capital of Vermont’ is illegitimate. Following the standard account, ‘the capital of Vermont’ denotes the proposition that Montpelier is the capital of Vermont but, it may be said, ‘that Montpelier is the capital of Vermont’ does not denote a proposition; following Frege, it denotes a truth-value.

However, this reply is amiss. As ‘that Montpelier is the capital of Vermont’ occurs in an attitude context, it does not denote a truth-value. If it denoted a truth-value, its truth-value would matter to the truth-value of the whole. But the truth-values of sentences embedded under an attitude verb do not matter to the truth-value of the whole (except when the attitude verb is factive).¹⁴ ‘Fermat’s last theorem is true’ cannot be substituted for ‘ $2 + 2 = 4$ ’ in ‘almost everyone believes that $2 + 2 = 4$ ’. When embedded under an attitude verb, ‘ $2 + 2 = 4$ ’ denotes the proposition that $2 + 2 = 4$. Likewise, when embedded under an attitude verb ‘that Montpelier is the capital of Vermont’ denotes the proposition that Montpelier is the capital of Vermont. So, when embedded under ‘know’, the *that*-clause ‘that Montpelier is the capital of Vermont’ and the concealed question ‘the capital of Vermont’ denote the same proposition.

13. The terms ‘light-weight proposition’ and ‘heavy-weight skeptical hypothesis’ are borrowed from Hawthorne (2005).

14. Of course, the truth-value of the *that*-clause matters when the attitude verb is factive but the point still stands that the truth-value of the whole is not determined by the truth-value of the *that*-clause. Factivity is a property of the attitude verb.

As they denote the same proposition, they are intersubstitutable *salva veritate*.

It may also be urged that the substitution of ‘that Mary knows that Montpelier is the capital of Vermont’ for ‘that Mary knows the capital of Vermont’ is illegitimate. However, it is difficult to see what could possibly be the cause of this sort of substitution failure. As we have just seen, when embedded under ‘know’, the *that*-clause ‘that Montpelier is the capital of Vermont’ and the concealed question ‘the capital of Vermont’ denote the same proposition. Moreover, blocking substitution is unlikely to help. For, if the standard account does not generalize to iterated knowledge ascriptions, then it does not offer a fully general account of concealed questions.

Finally, the defender of the standard account may grant that the standard account is mistaken but insist that there is a modified and more plausible form of it which treats the meta-linguistic truth-conditions for knowledge-*the* provided by the standard account as object-language truth-conditions. Given this suggestion, ‘*s* knows the *F*’ is to be treated as expressing the proposition that there is a *p* such that *s* knows *p*, and *p* (correctly) answers the concealed question of the complement clause.

This move avoids the problems presented by iterated knowledge ascriptions. ‘Mary knows the capital of Vermont’ expresses the proposition that there is a *p* such that Mary knows that *p*, and *p* answers the question ‘what is the capital of Vermont?’ Similarly, ‘John knows that Mary knows the capital of Vermont’ expresses the proposition that John knows that there is a *p* such that Mary knows *p*, and *p* answers the question ‘what is the capital of Vermont?’ From this we cannot infer that John knows the capital of Vermont.

Though I have no knockdown objection to this proposal I believe that there is some reason to resist it. The reason is that it violates compositionality. If we take ‘logical form’ to mean ‘underlying syntactical structure’ or ‘LF’ (in linguistic jargon), ‘*s* knows the *F*’ simply does not have the logical form ‘there is a *p* such that *s* knows *p*, and *p* answers the question “what is the *F*?”’ But if not, then the (propositional) meaning of occurrences of ‘*s* knows the *F*’ is not the result of assigning semantic values to the syntactic constituents of the sentence. Of course, someone sympathetic to unarticulated constituent theories of propositional attitude ascriptions might find appeals to strict compositionality principles rather insipid. But it is one thing to posit unarticulated constituents in the sentence structure of attitude ascriptions and quite another to say that ‘*s* knows the *F*’ reduces

to ‘there is a p such that s knows p , and p answers the question “what is the F ?”’. Unarticulated constituent theories posit a limited number of additional constituents. The proposal under consideration, on the other hand, takes knowledge-CQ sentences to be reducible to sentences whose grammatical structure does not even remotely resemble that of the original.

We conclude that the disguised-questions approach does not offer a satisfactory account of concealed questions.

2.2 *Individuals*

Definite concealed questions have the surface form of regular definite descriptions. It is therefore tempting to think that concealed questions denote individuals. This is the proposal (cautiously) defended by Heim (1979). On her proposal, ‘the capital of Vermont’ denotes Montpelier, ‘the author of *Naming and Necessity*’ denotes Saul Kripke, ‘the present of America’ denotes Bush, and so on. ‘John knows the capital of Vermont’ is not to be analyzed as ‘John knows Montpelier’, because concealed questions are then indistinguishable from objectual noun-phrase complements. Rather, the verb that embeds the concealed question is associated with a variable whose value is determined by linguistic or extra-linguistic context. ‘Know’ is to be understood as expressing the three-place relation: know- x -as- y . ‘John knows the capital of Vermont’, for example, may express, relative to context, the proposition expressed by ‘John knows Montpelier as the capital of Vermont’.

While Heim’s proposal seems to fare better than the disguised-questions approach, it’s not entirely happy. As Maribel Romero (2005) and Lance Nathan (2006: chap. 3) have argued, if knowledge is a relation between a contextually determined guise and two individuals, then it becomes difficult to explain why ‘I know Mark Twain’ cannot be read as saying that I know Samuel Clemens as Mark Twain but can only be read objectually.

Furthermore, as Nathan points out (2006: chap. 3), if determiner phrases have the same denotation regardless of whether they are in a concealed-questions context or in a normal context, then we should expect the following sentences to be equally acceptable:

(18)

- (a) Jim told Kim, and Kim told her mother, the murderer of Smith.
- (b) Jim has seen pictures of, and Kim has actually visited, the murderer of Smith.

- (c) ?Jim found out, and Kim visited, the murderer of Smith.
- (d) ?Kim visited, and Jim found out, the murderer of Smith.

The occurrence of ‘the capital of Vermont’ in (18)a serves as the complement of both ‘Sam told me’ and ‘Kim learned independently’. Likewise, the occurrence of ‘the capital of Vermont’ in (18)b serves as the object of both ‘Sam has seen pictures of’ and ‘Kim has actually visited’. (18)a and (18)b are felicitous. Hence, if determiner phrases have the same denotation regardless of the context in which they occur, we should expect (18)c–d to be acceptable as well. But (18)c–d are rather stilted.

Finally, the individuals approach yields the wrong result in contexts in which one and the same verb embeds two complements. Consider, for instance:

- (19) Jacob knows a lot: he knows the capital of Vermont, what a concealed question is and how the world can support the growing global population.

(19) is felicitous. Yet if the occurrence of ‘know’ is Heim’s concealed-questions ‘know’, then it follows that Jacob knows-as-Montpelier what a concealed question is and how the world can support the growing global population. But (19) clearly cannot be interpreted in this way.

Given these challenges it seems fair to conclude that concealed questions do not denote individuals.

2.3 *Individual Concepts*

The thesis that definite concealed questions denote individuals has much to recommend it. Unfortunately, it has certain flaws which are better avoided. There is, however, a proposal in the vicinity which, initially at least, seems to fare better than the individuals approach, namely the individual-concepts view (Romero 2005). On the individual-concepts view, ‘*s* knows the *F*’ is true iff *s* is able to identify the referent of ‘the *F*’ at the world she occupies. For example, ‘John knows the capital of Vermont’ is true iff John is able to identify the referent of ‘the capital of Vermont’ at the world he occupies.

This proposal has several advantages compared to the disguised-questions approach and the individuals approach. First, it appears to solve the problem of explaining the difference between ‘John found out the

murderer of Smith' and 'John found out who the murderer of Smith is' (see Heim 1979). The former requires that John be able to identify the referent of 'the murderer of Smith', whereas the latter requires that John know p , where p answers the question 'who is the murderer of Smith'? The proposal has the further advantage that it is able to explain the difference between objectual and non-objectual noun-phrase complements. Objectual noun-phrase complements denote individuals, whereas non-objectual noun-phrase complements denote individual concepts. Third, it seems required anyway to explain the invalidity of the following well-known argument (due to Partee):¹⁵

The temperature is ninety.
The temperature is rising.
Therefore, ninety is rising.

If the two occurrences of 'the temperature' have the same denotation, then the argument should be valid. But it is clearly invalid. It is arguable that the invalidity of the temperature puzzle owes to the fact that 'rise' is a predicate of individual concepts rather than a predicate of individuals. If the first occurrence of 'the temperature' denotes an individual, but the second occurrence denotes an individual concept, i.e. a function from $\langle \text{world, time} \rangle$ pairs to individuals, then the premises clearly do not entail the conclusion.

These are all good *prima facie* reasons for endorsing the individual-concepts approach. However, upon further scrutiny, the motivation for the individual-concepts approach is rather weak. First, as we have seen, 'John found out the murderer of Smith' may be interpreted as meaning that John found out who is the murderer of Smith. Second, as Nathan (2006) points out, if the 'temperature' in the second premise of the temperature puzzle must be interpreted as an individual concept, then numerous other complex expressions must be similarly interpreted, for instance, 'my home' as it occurs in (from Partee)

(20) My home was once in Maryland, but now it's in Los Angeles.

If the 'it' goes proxy for 'my home', then (20) would seem to assert that my home moved from Maryland to Los Angeles but it didn't literally move. So,

15. "Reflections of a Formal Semanticist" in Partee (2004).

one might argue, ‘my home’ must be interpreted as denoting an individual concept, a function from times to referents, which yields a different referent at different times. In fact, any noun phrase that combines felicitously with ‘rises’ or ‘changes’ (in the substitution sense) will have an individual concepts denotation, including ‘the capital of Vermont’, ‘the color of her hair’, ‘the live-in boyfriend’, ‘the mayor of Boston’, ‘the coach’, ‘the picture on Alice’s wall’ (see Nathan 2006: chap 3 for further examples).

This proliferation of individual concepts, however, seems implausible. And, as Peter Lasersohn (2005) has shown, there is no need to treat the meaning of most noun phrases as inherently time- or world-dependent. Consider the following argument which David Dowty, Robert Wall and Stanley Peters (1981) attribute to Anil Gupta (see also Nathan 2006: chap. 3):

Necessarily, the temperature is the price.
The temperature is rising.
Therefore, the price is rising.

Unlike Partee’s temperature puzzle, this argument seems valid. But if the first occurrence of ‘the temperature’ denotes an individual, and the second occurrence denotes an individual concept, then it is invalid. The reason it is invalid is that ‘the temperature’ need not rigidly denote an individual concept. Suppose there are just two indices: t_1 and t_2 . At t_1 the temperature concept assigns 99 at t_1 and 100 at t_2 , and the price concept assigns 99 at t_1 , and 98 at t_2 but at t_2 the temperature concept assigns 89 at t_1 and 90 at t_2 , whereas the price concept assigns 91 at t_1 and 90 at t_2 . At every index, the temperature is then identical to the price. But at t_1 the temperature is rising, whereas the price is not. So, the premises are true but the conclusion false.

Dowty, Wall and Peters (1981) argue that the problem goes away if we require that the second occurrences of ‘the temperature’ and ‘the price’ rigidly denote the individual concepts they denote. However, there are several reasons to resist this move (Lasersohn 2005, Nathan 2006: chap. 3). One forceful objection against it turns on the fact that some determiner phrases are not rigid designators. Consider the following argument:

Necessarily, John’s favorite color is Amy’s favorite color.
John’s favorite color keeps changing.
Therefore, Amy’s favorite color keeps changing.

If the second occurrences of ‘John’s favorite color’ and ‘Amy’s favorite color’ denote individual concepts (i.e. functions from times to colors), then the argument is invalid, contrary to what we should expect. For, the following scenario is plausible. At t_1 John’s favorite color concept assigns red at t_1 and blue at t_2 , and Amy’s favorite color concept assigns red at t_1 and t_2 . At t_2 , John’s favorite color concept assigns blue at t_1 and red at t_2 , but Amy’s favorite color concept assigns red at t_1 and t_2 . At each index, Amy’s favorite color is then identical to John’s favorite color. But at t_1 John’s favorite color changes (red at one time, blue at the next), whereas Amy’s favorite color is constant. So, the premises are true and the conclusion false. Yet the rigidification strategy suggested by Dowty, Wall and Peters will not work in this case, as ‘John’s favorite color’ and ‘Amy’s favorite color’ are non-rigid (see e.g. Soames 2002: 261).

Lasersohn uses this sort of argument to motivate a view of definite descriptions as referring terms (in Strawson’s sense). For example, ‘the temperature’ takes the intension of ‘temperature’ and returns, relative to a time, an individual as its extension. Moreover, Lasersohn argues that predicates like ‘rise’ can take intensions as their arguments (‘rise’ intensionalizes the standard denotation). The appearance of an individual concepts meaning of ‘the temperature’ is thus built into the meaning of ‘rise’. Since the intension of ‘temperature’ is constant across worlds, no rigidification maneuver is required to guarantee the validity of the Gupta-style arguments.¹⁶ All that is required is that predicates such as ‘rise’ take intensions as their arguments.

Besides lacking in motivation the individual-concepts approach runs into difficulties that give us reason to resist it. One difficulty is that of accounting for all of the natural readings of the following kind of sentence, due to Heim (1979):

(20) John knows the price that Fred knows.

(20) admits of two readings. On one reading, John knows the same price as Fred. So, if Fred knows that the price of milk is \$3.74/gallon, then John too knows that the price of milk is \$3.74/gallon. On the second reading, John knows what the price that Fred knows is. So, if Fred knows the price of milk, then John knows that Fred knows the price of milk but he himself need not know what the price of milk is (in, say, US Dollars).

16. Ultimately, Lasersohn’s explanation will not do (Nathan 2006: chap. 4), as ordinary quantifiers also intensionalize, as witnessed by ‘each month, every picture on Alice’s wall changes’, but Lasersohn’s point that some kind of intensionalization is required still stands.

The individual-concepts account can accommodate only the first reading. For, on the individual concepts approach, John knows the price that Fred knows only if he is able to identify an individual (e.g., \$3.84) as the referent of ‘the price that Fred knows’ at the world he occupies. But the second reading does not require any such ability.

Here is another example to illustrate. Brown and Smith have been killed. Tom, Dick and Harry are working on the two cases. After a couple of weeks Tom finds out who murdered Brown and tells Dick. Dick tells Harry that Tom solved one of two cases, and that he, Dick, knows which one it is. In these circumstances Harry may truly utter the following sentence:

(21) Dick knows the murderer Tom knows.

Dick is not in the same epistemic position now as he will be when he later finds out that it was Evil Eye who murdered Brown. Yet the individual-concepts approach predicts that (21) is true only if Dick knows how to identify an individual (e.g. Evil Eye) as the referent of ‘the murderer Tom knows’.

Some defenders of the individual concepts approach have argued that one can avoid this difficulty by taking the meta-level individual concepts readings required to account for (20) and (21) to be derivable from the meaning of a meta-level form of ‘know’ (see e.g., Romero 2005).

That is not an implausible proposal but there are other reasons for rejecting the individual-concepts approach. If individual-concepts interpretations can be accounted for along the lines suggested by Lasersohn, then the individual-concepts reading of knowledge-CQ is derivable from the meaning of ‘know’, that is, ‘know’ takes the intension of the noun-phrase complement as its argument. But as Nathan points out (2006: chap 3), it then becomes mysterious why some determiner phrases that do admit of an “individual-concepts” interpretation cannot serve as the complement clauses of ‘know’. For example, when ‘the poster on Alice’s wall’ occurs in ‘the poster on Alice’s wall keeps changing’, it gets an individual concepts reading, as its intension is the argument of ‘keeps changing’. But ‘John knows the poster on Alice’s wall’ can, in most circumstances, receive only an acquaintance reading, that is, it can only be interpreted as meaning that John is acquainted with the poster on Alice’s wall (though it might receive a CQ reading in circumstances in which the speaker intends to say, for instance, that John knows that the poster on Alice’s wall is a Toulouse Lautrec). Another example: as ‘keeps changing’ takes the intension of

‘Tim’s armchair’ as its argument in ‘Tim’s armchair keeps changing’, we know ‘Tim’s armchair’ is capable of providing its intension as the argument of a predicate. So we should expect a CQ reading to be available for ‘Harry knows Tim’s armchair’. Yet ‘Harry knows Tim’s armchair’ can only be read as saying that Harry is *familiar with* Tim’s armchair.

We conclude that the individual-concepts approach, while initially compelling, is not in the end viable.

2.4 *The propositions view*

Having considered and rejected the above alternatives Nathan (2006: chap: 4) suggests that concealed questions denote propositions rather than questions or individual concepts. On Nathan’s view, concealed questions of the form ‘the F ’ denote the unique (maximal) proposition p such that, for some x , p is the proposition that x is the F . For example, if Mary’s reason for leaving is that she dislikes her department, then ‘Mary’s reason for leaving’ denotes the unique proposition ‘“Mary dislikes her department” is her reason for leaving’. So, ‘John knows Mary’s reason for leaving’ is true iff John knows that ‘Mary dislikes her department’ is her reason for leaving.

Nathan’s proposal does away with many of the problems facing previous accounts. First, as Nathan does not take concealed questions to denote true answers, his proposal does not yield the result that John may know Mary’s reason for leaving even if he mistakenly believes she is leaving because she dislikes her department. Second, because he takes concealed questions to denote propositions, he is able to account for the semantic difference between objectual and non-objectual knowledge. Third, unlike the simple version of individual-concepts approach he is able to account for the ambiguity in ‘John knows the price Fred knows’. If Fred knows the price of milk, John knows the price Fred knows if John knows the proposition that Fred knows the price of milk.

But the propositional account has one drawback. It runs into the same sort of difficulties with respect to iterated knowledge ascriptions as the disguised-questions approach. Consider the following scenario:

Scenario:

John doesn’t know the capital of Vermont. But one of his class mates, Alice, does, and John knows that she does.

When interpreted against this background, (22) is true:

(22) John knows that Alice knows the capital of Vermont.

Enter Nathan's proposal. On Nathan's proposal, 'the capital of Vermont' denotes the unique (maximal) proposition p such that, for some x , p is the proposition that x is the capital of Vermont. That is, 'the capital of Vermont' denotes the proposition that Montpelier is the capital of Vermont. Thus, (22) is true iff (23) is.

(23) John knows that Alice knows that Montpelier is the capital of Vermont.

Assuming that the John knows that 'Alice knows that Montpelier is the capital of Vermont' entails 'Montpelier is the capital of Vermont', the following is true:

(24) John knows that 'Alice knows that Montpelier is the capital of Vermont' entails 'Montpelier is the capital of Vermont'.

From (23) and (24), we can then infer (by Closure: if s knows p , and s knows that p entails q , then s knows q):

(25) John knows that Montpelier is the capital of Vermont.

But, ex hypothesis, John doesn't know that Montpelier is the capital of Vermont.

How might Nathan respond to this objection? He might turn to the possible rejoinders we considered and rejected a couple of sections ago. Alternatively, he may reject the general proposal that the denotation of concealed questions of the form 'the F ' is always the unique (maximal) proposition p such that for some x , p is the proposition that x is the F . For example, Nathan might insist that (25) ascribes to John the knowledge that for some x , Alice knows that x is the capital of Vermont.

The main problem with this suggestion is that it is ad hoc. Nathan's proposal makes the following predictions. If Bill is the student who got an A on the exam, then 'John knows the student who got an A on the exam' is true iff John knows that Bill is the student who got an A on the exam. Likewise, since Montpelier is the capital of Vermont, then 'Alice

knows the capital of Vermont' is true iff Alice knows that Montpelier is the capital of Vermont. But then, by standard rules of compositionality, Nathan's proposal should predict that (22) is true iff John knows that Alice knows that Montpelier is the capital of Vermont.

We conclude that while the propositional approach seems to be on the right track, it hasn't gotten things exactly right.

3. *wh*-clauses as predicates

We turn now to our positive proposal. For the remainder of this paper we will defend the hypothesis that concealed questions and *wh*-clauses function semantically in the same way as free (or "nominal") relative clauses, that is, relative clauses without an explicit antecedent noun phrase (for example, 'I haven't bought what I am going to wear' as opposed to 'I haven't bought the clothes I am going to wear').

There is good reason to think that *wh*-clauses that occur as free relatives function as restrictors of unpronounced antecedent quantifiers. Consider, for instance, the following sentences.

(26)

- (a) I haven't bought *what I am going to wear at the wedding*.
- (b) I cooked *what I found in the almost empty fridge*.
- (c) I love *when you pay me an unannounced visit*.

Where ' x ' is a group variable, (26)a can be paraphrased 'for all x , if x is what I am going to wear at the wedding, then I haven't bought x ', (26)b can be paraphrased 'for all x , if x is what I found in the almost empty fridge, then I cooked x ', and (26)c can be paraphrased 'for all x , if x is when you arrive unannounced, then I love x '. As the *wh*-clauses in (26) occupy the restrictor position of the unpronounced antecedent quantifiers, they function as predicates which denote sets of things that satisfy the condition imposed by the *wh*-clause. For example, 'what I am going to wear at the wedding' denotes the maximal set of groups of things I am going to wear at the wedding, 'what I found in the almost empty fridge' denotes the maximal set of groups of things I found in the almost empty fridge and 'when you arrive unannounced' denotes the maximal set of groups of situations that are unannounced arrivings by you.

As several thinkers have pointed out, free relatives appear to have uni-

versal rather than existential force (Jacobson 1995, Grosu 2003). But they sometimes receive existential force. Consider, for instance (from Sternefeld 2006):

(27) Everyone who takes *what does not belong to him* is a thief.

(27) cannot be read as saying that everyone who takes every item that does not belong to him is a thief, but must be interpreted as saying that everyone who takes some item that does not belong to him is a thief. So (27) is of the form ‘for all x and some y , if y is what does not belong to x , then x is a thief’. Here is another example:

(28) The pilgrims settled where water could be found.

(28) cannot be read as saying that the pilgrims settled at every place where water could be found but must be read as saying that the pilgrims settled at a place where water could be found. So, (28) is of the form ‘for some x such that x is where water could be found, the pilgrims settled at x ’. One explanation of the variable force of the antecedent quantifiers is that *wh*-clauses function as predicates which are bound by a quantifier that receive existential force. The universal force of the quantifier antecedents in (26) may be thought to derive from the nature of the *wh*-clause. For example, it is possible that the *wh*-clauses in (26) denote singleton sets containing a group that satisfies the condition specified by the *wh*-clause.¹⁷ In some cases the universal force may be due in part to a restriction on the denotation of the *wh*-clause to a singleton set containing a contextually relevant group of items.¹⁸

Now, it is tempting to think that *wh*-clauses function in the same way regardless of whether they occur as constituents of free relatives or as the complement clauses of ‘know’. *Wh*-clauses then function as the restriction of a wide-scope existential quantifier. If the existential quantifier is a kind of existential closure, we should expect it to take wide scope with respect to ‘know’. We thus arrive at the following logical forms for knowledge-*the*, knowledge-*a*, and knowledge-*wh* (see Brogaard 2007d, forthcoming a).

Logical form (know-*the F*): $\exists x(s \text{ knows}(x \text{ is the } F))$

17. That is, it is arguable that ‘what-*F*’ is of the form ‘ $[\lambda x(x = (t)y)\text{what-}F y]$ ’.

18. Alternatively, we might treat the phenomenon as a case of semantic quantifier variability. On the latter, see Heim (1982).

Logical form (know-*an* F): $\exists x(s \text{ knows}(x \text{ is an } F))$
Logical form (know-*wh*- F): $\exists x(s \text{ knows}(x \text{ is } wh\text{-}F))$.

The following are instances of these schemas:

Knowledge-*the*

‘Rosa knows Ted’s reasons for leaving’: For some r , Rosa knows that *the* rs are Ted’s reasons for leaving.

‘Dorothy knows the way to Kansas’: For some w , Dorothy knows that w is the way to Kansas.

Knowledge-*a*

‘Rebecca knows a place that sells Italian newspapers’: For some l , Rebecca knows that l is a place that sells Italian newspapers.

Knowledge-*wh*

‘John knows what Mary did at 3 p.m.’: for some e , John knows that e is what Mary did at 3 p.m.

‘Rebecca knows where one can buy an Italian newspaper’: for some l , Rebecca knows that l is where one can buy an Italian newspaper.

‘Simon knows who attended the lecture’: for some s , Simon knows that s is who attended the lecture.

‘Alice knows why John is upset’: for some r , Alice knows that r is why John is upset.

‘Ruth knows which ones of her students left’: for some xs , Ruth knows that the xs are which ones of her students (that) left.

‘Where one can buy an Italian newspaper’ denotes the property of being a place at which one can buy an Italian newspaper, ‘who attended the lecture’ denotes the property of being a person who attended the lecture, ‘why Mary is upset’ denotes the property of being a reason that Mary is upset, and so on.

The domain of quantification is, of course, likely to be contextually restricted. For example, if Mary fed the dog at 3 p.m. and smoked a cigarette at 3 p.m., but the cigarette-smoking is not salient in the context, then John knows what Mary did at 3 p.m. iff John knows that Mary fed the dog at 3 p.m.

The account just offered does not straightforwardly apply to knowledge-*whether*, for where ‘ e is what Mary did at 3 p.m.’ is well-formed, ‘ p is

whether q or r is not. At first glance, it may seem that knowledge-*whether* is of different species. We can, however, offer the following paraphrase which is reasonably close to the ones already offered for the other instances of knowledge-*wh* (Brogaard forthcoming a)

s knows whether q or r : for some p , s knows that p is a true proposition identical to q or r .

We have a unified proposal if we assume that *whether*-clauses of the form ‘whether q or r ’ are predicates with the meaning ‘is a true proposition identical to q or r ’.

One advantage of the present proposal is that it straightforwardly extends to pseudo-clefts (Brogaard forthcoming a). Consider, for instance:¹⁹

(29)

- (a) What Mary did at 3 p.m. was feed the dog.
- (c) Where he lives is on the other side of the ocean.
- (d) Who we thought he would end up marrying was Alisa Brown.
- (f) That Mary left is why John is upset.
- (g) This is how you open a can with one hand.
- (h) Whether Mary gets a raise is none of your business.

A plausible account of pseudo-clefts is the semantic approach defended by Pauline Jacobson (1994). Following Partee (1986),²⁰ Jacobson suggests that the *wh*-clauses are best treated as predicates which denotes sets of actions (‘what Mary did’), sets of properties (‘what John is’), sets of times (‘when the talk is’), sets of locations (‘where the talk is’), etc., whereas the post-copular constituents of pseudo-clefts are treated as either property designators or predicates. Consider, for instance:²¹

(30)

- (a) What John is is admirable.
- (b) What John is is proud of himself.
- (c) What John is is boring.

19. 1(b)-(c) are from Partee (1986: 200).

20. See also Bach and Partee (1980) and Szabolsci (1987).

21. Clauses with a property-denoting subject and an entity-denoting post-copular element are also known as ‘specificational clauses’. For discussion, see Mikkelsen (2004) and Brogaard (2007b).

The *wh*-clause ‘what John is’ functions as a predicate which denotes the set of (salient) properties John has. In 30(a) ‘is admirable’ functions as a predicate. Since predicates cannot occur in argument position at the level of logical form, sentences with predicates in argument position at the level of surface form require for grammaticality existential closure (Heim 1982, Fara 2001, 2006, Brogaard 2007a).²² 30(a) thus says that a salient property of John has the property of being admirable.

In 30(b) ‘is proud of himself’ does not function as a predicate. For, 30(b) does not say that a salient property of John has the property proud-of-self. Rather, it says that a salient property of John is identical to the property proud-of-self. So, ‘proud of himself’ undergoes a type-lowering from predicate type (type $\langle e, t \rangle$) to individuals type (type e). The same sort of type-shifting is known to take place in the case of ‘John’s favorite color is red’, which cannot be interpreted as meaning that John’s favorite color has the property *red*, but only as meaning that John’s favorite color is identical to the property *red*. So, ‘red’ here shifts from predicate type (type $\langle e, t \rangle$) to the type of individuals (type e). Something similar goes on in the case of ‘Mary dress is the color of the sky’, which cannot be interpreted as meaning that Mary’s dress is identical to the color of the sky but only as meaning that Mary’s dress has the property denoted by ‘the color of the sky’. So, ‘the color of the sky’ type-shifts from quantifier-type (type $\langle \langle e, t \rangle, t \rangle$) to predicate type (type $\langle e, t \rangle$).

30(c) is ambiguous between the two readings exemplified by 30(a) and 30(b). On one reading, it says that a salient property of John (e.g. the property of being prudent) has the property of being boring. On the second reading, it says that a salient property of John is identical to the property *boring*. So, on the second reading, ‘boring’ type-shifts from the predicate type (type $\langle e, t \rangle$) to the individuals type (type e), and ‘is’ type-shifts from the ‘is’ of predication to the ‘is’ of identity.

On Jacobson’s proposal, *wh*-clauses with embedded quantifiers receive a functional interpretation.²³ Consider, for instance:

22. Jacobson (1994) argues that pseudo-clefts are inverted. For example, ‘what John is is proud of himself’ has the same logical form as ‘the proud-of-self property is what John is’. There is then no need for existential closure. But this approach is unmotivated, as existential closure is required for ‘what John is is what Mary is’.

23. This idea has been developed in further detail in e.g. Jacobson (1994), Sharvit (1999) and Brogaard (2007b). It rests on a variable-free approach to binding proposed in Quine (1966). Jacobson’s goal is to develop a general variable-free approach to binding. That is not my intention. I am simply using Jacobson’s idea to account for the appearance of binding in sentences with a clear functional interpretation, such as ‘the person every student admires is his mother’.

(31) What every freshman admires most is her father.

Following Jacobson, ‘what some student read’ can be treated as a predicate which denotes the set of functions f such that f takes individuals in the domain as input and yields individuals every freshman admires most as output. ‘Her father’ is a function-designating expression which denotes the father-of function (on female individuals if ‘her’ is gendered). So, (31) says that a function that takes individuals in the domain as input and yields individuals every freshman admires most as output is the father-of function (on female individuals).

If we adopt Jacobson’s treatment of *wh*-clauses in pseudo-clefts and a variation on the standard treatment of free relatives, we have a unified treatment of *wh*-clauses in pseudo-clefts, as complement clauses and as free relatives. In the remainder of this paper we will develop this proposal in further detail and respond to objections.

4. *De re knowledge*

On the predicate view, many things that puzzled us in this paper fall into place. First, as we have seen, knowledge-CQ and knowledge-*wh* are special kinds of *de re* knowledge. s knows *wh-F* iff s knows that x (for some x) is *wh-F*. For example, John knows what Mary’s reason for leaving is iff John knows that r (for some r) is what Mary’s reason for leaving is. As it stands, the disguised-questions approach does not prove to be a particular promising way of making good on that view. The predicate view, on the other hand, automatically delivers this result. On the predicate view, ‘what Mary’s reason for leaving is’ denotes the property of being a (salient) reason for Mary’s leaving. To know Mary’s reason for leaving is to know that r (for some reason r) has that property.

Second, unlike the view that concealed question denote individuals, the present proposal is able to explain why only determiner phrases occur as concealed questions. On the present proposal, concealed questions function as predicates. Names, on the other hand, do not function as predicates.

Third, unlike the disguised-questions and the propositional view, the predicate view is able to offer an account of iterated knowledge ascriptions. On the predicate view, ‘John knows that Mary knows the capital of Vermont’ has the underlying logical form: ‘John knows that for some y , Mary knows that y is the capital of Vermont’.

A similar approach can be extended to account for Heim's price-of-milk case. 'John knows the price Fred knows' may be interpreted as meaning that John knows a particular price known to Fred (e.g., the price of milk). On this interpretation, 'John knows the price Fred knows' does not entail that there is x such that John knows that $\$ x$ is the price of milk. Given the predicate view, it is a simple matter to account for this reading. 'John knows the (salient) price Fred knows' is true iff John knows that there is a y such that Fred knows that y is the (salient) price. This is true if, for example, John has a knowledge mental state with the content of 'there is a y such that Fred knows that y is the price of a gallon of milk'.²⁴

Despite its clear advantages to previous approaches, the predicate view runs into trouble. On the present analysis, knowledge-CQ and knowledge-*wh* are special cases of de re knowledge. It is sometimes thought that even in the scope sense, de re knowledge requires a special kind of acquaintance relation between the subject and the entity the subject is said to have knowledge of. For example, it is sometimes thought that on its de re reading, 'John knows that Smith's murderer is insane' entails that John knows of a particular person—whom John could identify demonstratively—that *he* is insane.

That is not quite right (see e.g. Kripke 1977, Kaplan 1978, Ludlow and Neale 1991).²⁵ The de re/de dicto distinction (in its scope sense) is syntactic, not psychological. To say that Smith's murderer is such that John knows he is insane does not imply that John stands in any kind of direct acquaintance relation to Smith's murderer. The de re reading of 'John knows Smith's murderer is insane' is preferred just when for some person x thought to be Smith's murderer by the conversationalists, John knows x is insane. Thus, if the conversationalists think Bill is Smith's murderer and think John knows Bill is insane, then it is appropriate for one of them to assert that John knows Smith's murderer is insane.²⁶ The same considerations carry over to knowledge-CQ and knowledge-*wh*. Knowledge-CQ and knowledge-*wh* are de re syntactically, not psychologically.

But all is not well. The predicate view seems to yield the wrong result in the following sort of case (Boër and Lycan 1986, Sterelny 1988):

24. On the notion of a knowledge mental state, see Williamson (2000: intro).

25. The cited articles are mostly concerned with the attributive/referential distinction but precisely the same points can be made with respect to the de re/de dicto distinction.

26. See also Kaplan (1973: 555, note 71) who considers examples such as 'John thinks the lying S.O.B. who took my car is honest', which clearly do not specify John's way of picking out the lying S.O.B.

(32) Alice, you don't know who you are: you're the rightful heir to the Swedish throne.

If the predicate view is correct, then the sentence 'you don't know who you are' has the following logical form:

(32a) There is an x such that Alice doesn't know that x is who Alice is.

But unlike (32), (32a) would seem to require for its truth that Alice doesn't know that she is Alice.

In such cases a version of the disguised-questions approach would seem to do better. On the disguised-questions approach, (32) is true iff there is a p such that Alice doesn't know p , and p answers the question 'who is the rightful heir to the Swedish throne?' So on the propositional view, (32) is true iff Alice doesn't know that she is the rightful heir to the Swedish throne.

One way out of this problem would be to argue that (32a) is the right interpretation of (32) but that the quantifier in (32) ranges over individual concepts rather than individuals. If 'who Alice is' denotes the property of being an individual concept of who Alice is, verifiers of (32) will then be individual concepts. (32), then, is true iff there is an x (e.g. the concept of being the heir to the Swedish throne) such that Alice doesn't know that it has the property of being who Alice is. But the individual-concepts interpretation of *wh*-clause complements is not independently motivated.

As it turns out, however, the problem posed by (32) is an instance of a more general problem of *de re* attitude ascription (Brogaard forthcoming b). Consider the following variation on Kaplan's S.O.B. case (1973: 555, note 71).²⁷ Suppose detective Brown just discovered that the infamous New Jersey carjacker is identical to the less well known New Jersey pickpocket. One afternoon Brown overhears John say to his pal 'the person who stole my wallet just sent me a letter from Newton'. Upon his return to the office Brown says to his colleague:

(33) Remember the New Jersey carjacker? Well, I just met a guy who thinks that the S.O.B. sent him a letter from Newton.

27. Kaplan's original example was 'John thinks the S.O.B. who took my car is honest'.

Suppose the New Jersey carjacker (alias the S.O.B.) is the person who stole John's wallet. In that case, Brown's utterance could be true. But this is not what the Russellian approach gives us. As John does not have a belief with the content 'the S.O.B. sent me a letter from Newton', he does not have a general belief with the content of the *that*-clause of (33). So, we cannot assign narrow scope to the description 'the S.O.B.'. On a wide-scope reading, the second sentence in (33) is of the form 'the S.O.B. is an x such that I just met a guy who thinks that x sent him a letter from Newton'. This is true only if John has a belief with the content of ' x sent me a letter from Newton' for the assignment of an individual (who happens to be the New Jersey carjacker) to ' x '. That is, it is true only if John has a singular belief directly about the New Jersey carjacker (alias the S.O.B.) to the effect that he or she just sent him a letter from Newton. But John does not have a belief directly about the New Jersey carjacker in the envisaged circumstances. He has a general belief with the content of 'the person who stole my wallet (whoever that may be) sent me a letter from Newton', that is, he has a belief that is only indirectly about the New Jersey carjacker.

Here is another case, a variation on Kripke's (1977) Hoover case.²⁸ After a press conference at which Henry Kissinger, Nixon's impending security advisor, is mentioned by Hoover, Hoover tells his assistant:

- (34) The Berrigans believed that their accomplices would kidnap the official I mentioned at the press conference

Intuitively, (34) could be true if the Berrigans had guesstimated that their accomplices would kidnap the impending president's security advisor (whoever that would turn out to be), and so did not have a belief directly about Kissinger. Yet on the standard approach to attitude ascriptions, (34) can be true only if the Berrigans had a belief with the content of the *that*-clause or a belief directly about Kissinger to the effect that their accomplices would kidnap him. So, on the standard approach, (34) is false in the envisaged circumstances.

The problem arises only on the assumption that attitude ascriptions, if correct, specify the Russellian content of a mental state. This assumption is normally regarded as uncontroversial (see e.g. Richard 1990: chaps.

28. Kripke's original example was 'Hoover charged that the Berrigans plotted to kidnap a high American official'.

3 and 4). Neo-Russellians, for example, take the belief relation to be a two-place relation between a subject and a Russellian proposition,²⁹ and hidden indexicalists take it to be a three-place relation among a subject, a Russellian proposition and a guise.³⁰ But, as the above examples illustrate, attitude ascriptions need not specify the Russellian content of a mental state even if correct. While an utterance of the sentence ‘the Berrigans believed their accomplices would kidnap the official I mentioned at the press conference’ does not require for its truth that the Berrigans had a belief with the content of the *that*-clause or a singular belief directly about the mentioned official, it does require that they had a belief which is *about* the individual the report is about in some sense yet to be specified. On the Russellian account, a belief is about an individual only if the content of the belief is singular. For example, a belief is about Henry Kissinger only if its content is a Russellian proposition containing Kissinger. But this notion of aboutness is too strong.

To arrive at a weaker notion, let us introduce what we shall call the ‘structured extension of a sentence’. The structured extension of a sentence, as we envisage it, is a composite of the extensions (denotations, referents) of its syntactic constituents. The structured extension of ‘John is male’, for example, consists of John and the set of men, and the structured extension of ‘the author of *Naming and Necessity* is male’ consists of Saul Kripke and the set of men.³¹

Given the notion of structured extension, we can offer the following account of attitude reports (‘*t*’ is a name or quantifier phrase) (Brogaard forthcoming b). ‘*s* believes that *t* is *F*’ is true iff *s* has a belief with an ‘*t* is *F*’-appropriate Fregean component and with the structured extension of a sentence which has ‘*t* is *F*’ as an obviously relevant and necessary consequence. This account integrates the plausible idea that belief is closed under obviously relevant and necessary consequence (see Brogaard forthcoming b).

29. See e.g. McKay (1981, 1991), Salmon (1986), Soames (1988, 1995), Braun (1998, 2000), and Nelson (2002, 2005).

30. See e.g. Schiffer (1977, 1992, 1996), Crimmins and Perry (1989), Crimmins (1992), Recanati (1993), Jaszczolt (1999, 2000).

31. This is a simplification. Strictly speaking, the structured extension of ‘John is male’ consists of the set containing the referent(s) of ‘John’, the set of males, and a relation between them, and the structured extension of ‘the author of *Naming and Necessity* is male’ consists of two sets (viz. the set of authors of *Naming and Necessity* and the set of males) and a relation between them. In both cases the relevant relation (R) can be defined as follows: Rxy iff x has exactly one member, and x is a subset of y .

There are several ways to arrive at these truth-conditions. One way is to take 'believe' to express a three-place relation among a subject, a guise and a structured extension. Another way is to go two-dimensional. Epistemic two-dimensionalists think every expression has two different kinds of meaning: a non-Fregean and a Fregean meaning (see e.g. Chalmers 1996, 2002, 2006, forthcoming, for discussion see also Brogaard 2007c). On standard two-dimensional accounts, the two kinds of meaning are a Russellian intension (a function from worlds considered counterfactually to extensions) and a Fregean intension (a function from worlds considered as actual to extensions). The extension of an expression at a world can be derived from either kind of meaning by keeping the world constant. And the structured extension of a complex expression can be derived from the extensions of its syntactic constituents. So, if every expression has a Russellian intension and a Fregean intension, then arguably it also has a structured extension.

Given a two-dimensional framework, we can say that 'believe' expresses two kinds of relations: a relation between a subject and a structured extension, and a relation between a subject and a Fregean sense. The main difference between the hidden-indexical version and the two-dimensional version of the extensional view is this. For the hidden-indexicalist, 'believe' ascribes a three-place relation among a subject, a structured extension and a Fregean sense. For the two-dimensionalist, 'believe' expresses two distinct two-place relations: a relation between a subject and a structured extension, and a relation between a subject and a Fregean sense.

Given the extensional account of attitude ascriptions we can handle the problematic cases as follows. As 'the person who found John's wallet', and 'the New Jersey carjacker' denote the same person in the S.O.B. case, they have the same structured extension. So, if John has a belief with the exact content of 'the person who found my wallet sent me a letter from Newton', it may be correct to say that John believes that the New Jersey carjacker sent him a letter from Newton.

Similar remarks carry over to the Hoover case. As 'the impending president's security advisor', and 'the official Hoover mentioned at the press conference' both denote Henry Kissinger in our envisaged circumstances, they have the same structured extension. So, if the Berrigans had a belief with the exact content of 'our accomplices will kidnap the impending president's security advisor', it may be correct for Hoover to say 'the Berrigans believed that their accomplices would kidnap the official I mentioned at the press conference'.

Finally, let us consider our problematic knowledge-*who* case. In the envisaged circumstances, ‘Alice: you don’t know who you are’ cashes out to ‘there is an x such that Alice doesn’t know that x is who Alice is’. ‘The rightful heir to the Swedish throne is who Alice is’ is an obviously relevant and necessary consequence of ‘Alice is the rightful heir to the Swedish throne’. Moreover, ‘Alice’ and ‘the rightful heir to the Swedish throne’ have the same structured extensions in the envisaged circumstances. So if Alice doesn’t know she is the rightful heir to the Swedish throne, then she fails to know something with the structured extension of a sentence that has ‘Alice is who Alice is’ as an obviously relevant and necessary consequence. So, ‘there is an x such that Alice fails to know that x is who she is’ is true in virtue of Alice’s lack of the knowledge that she is not the rightful heir to the Swedish throne.

5. *Finding out who*

We still need to say something about the following problematic pair of sentences:

- (35)
- (a) John found out who the murderer of Smith is.
 - (b) John found out who is the murderer of Smith.

Recall that the disguised-questions approach runs into trouble with this pair of sentences because it treats the embedded *wh*-clauses in exactly the same way. (35)a and (35)b are true iff there is a p such that John found out that p , and p answers the question ‘who is the murderer of Smith?’ Yet, intuitively, (35)a and (35)b have different truth-conditions. (35)a may be true if John found out that James (who happens to be the murderer of Smith) is his brother but (35)b is not true under these circumstances.

The difference between (35)a and (35)b, we will argue, is that the subject term of the *wh*-clause is ‘the murderer of Smith’ in (35)a but ‘who’ in (35)b. In fact, (35)b is acceptable only when ‘who’ is focused (for instance, by adding stress, or by inserting an adverb like ‘exactly’, as in ‘who, exactly, is the murderer of Smith’). In (35)b ‘is the murderer of Smith’ functions as a genuine predicate and not as a device to single out an individual. This means that (35)b is acceptable only when it is read as equivalent to:

(36) John found out who murdered Smith

Unlike (35)a, (36) isn't true if John found out that James is his brother. The reason (35)a admits of this reading is that quantification into attitude context is possible. (35)a may be read as saying:

(35)c The murderer of Smith is an x such that John found out who x is.

(35)b, on the other hand, may not be read as saying:

(35)d The murderer of Smith is an x such that John found out who is x .

The reason the wide-scope reading is not available for (35)b is that the occurrence of 'the murderer of Smith' occurs in predicate position. When a description occurs in predicate position, it does not have its ordinary scope-taking properties (Fara 2001, Brogaard 2007a). For example, it is unable to take wide scope with respect to other operators.

The lesson to be learned from (35)a and (35)b is a familiar one. Attitude ascriptions which quantify into attitude contexts need not specify how the subject believes what she does. Whereas the occurrences of 'the murderer of Smith' in (35)a describes in more or less precise terms one of the ways in which John thinks of the murderer of Smith, the occurrence of 'the murderer of Smith' in (35)b does not pick out John's way of thinking of the murderer of Smith.

We thus have further evidence for the hypothesis that *de re* belief reports in the syntactic sense are to be distinguished from *de re* belief reports in the psychological sense. As *de re* belief reports in the syntactic sense purport to be partial descriptions of what someone believes, they need not involve any singular or direct thoughts about an object.

6. *Know-How*

Before concluding we should say something about how to extend the proposed analysis of knowledge-*wh* to knowledge-*how*. As mentioned above, there is good reason to think that knowledge-*how* is a kind of knowledge-*wh*. First, semantically speaking 'how' just is a *wh*-word (linguists will give

you the blank stare if you say it is not). Second, it is a fluke that ‘how’ is not explicitly a *wh*-word in English. In many other language (e.g. German) ‘how’ translates into the equivalent of a *wh*-word.

If we extend the above analysis for knowledge-*wh* to knowledge-*how* we end up with the following logical form.

s knows how to F: for some w , s knows that w is how to F.

For example, Amy knows how difficult this task is iff for some x , Amy knows that x is how difficult this task is. This proposal is remarkably similar to that offered by Stanley and Williamson (2001). According to them, ‘ s knows how to F’ is true iff for some contextually relevant way w which is a way for s to F, s knows that w is a way for her to F. If we require that the way w be contextually salient and allow some instances of knowledge-*how* to be about degrees rather than ways, the Stanley/Williamson proposal reduces to the proposal we have just offered. And we now have an explanation of why this proposal is correct. It is correct, because ‘how to F’ functions semantically as a predicate. For example, ‘how to curse out someone in French’ functions as a predicate which denotes the property of being a way of cursing out someone in French, and ‘how to open a can with one hand’ functions as a predicate which denotes the property of being a way to open a can with one hand.

In philosophy, however, there has been a lot of reluctance toward taking knowledge-*how* to be a kind of knowledge-*that*. It has been noted by several authors that knowing-*how* need not entail possessing an ability (see e.g. Stanley and Williamson 2001, Bengson and Moffett (2007)). For example, the Olympic figure skater Irina Slutskaya knows how to perform a quintuple salchow, but she cannot perform one herself (the example is from Bengson and Moffett). But some knowledge-*how* attributions seem to entail the possession of an ability. That seems to threaten the account of knowledge-*wh* offered in this paper. Suppose I have never practiced playing the piano but that I have taken numerous theory lessons. There is then an x such that I know x is how to play the piano. Still, it would seem that someone could correctly claim that I don’t know how to play the piano. Likewise, if Mary—a mono-lingual speaker of English—sees Danny curse out his cousin in Italian, she might correctly say [while pointing] ‘*that* is how to curse out someone in Italian’. Yet someone could correctly say ‘Mary doesn’t know how to curse out someone in Italian’. After all, Mary doesn’t even speak Italian.

There is, however, a straightforward reply to these sorts of objections (for details see Stanley and Williamson 2001—their approach varies slightly from the one taken here).³² Unlike knowledge-*how* sentences that do not embed infinitive clauses, knowledge-*how* ascriptions that do embed infinitives are ambiguous between a reading that requires that the subject possess an ability (first-person) and a reading that does not require that the subject possess an ability (third-person). For example, ‘John knows how to play the piano’ may be read as saying that John knows how JOHN *may* play the piano, or as saying that John knows how ONE *may* play the piano. So, on the analysis offered here, ‘John knows how to play the piano’ can be read as saying that there is a *w* such that John knows that *w* is how John may play the piano or as saying that there is a *w* such that John knows that *w* is how one may play the piano. If John has never practiced playing the piano, it is false that there is a *w* such that John knows that *w* is how John may play the piano’ but it may well be true that there is a *w* such that John knows that *w* is how one may play the piano. So, ‘John knows how to play the piano’ is false when given the first reading but it may well be true when given the second reading. Likewise, if Mary doesn’t speak Italian, then it will be false that there is a *w* such that Mary knows that *w* is how Mary may curse out someone in Italian but it may be true that there is a *w* such that Mary knows that *w* is how one may curse out someone in Italian.

Unlike knowledge-*how* sentences with infinitive clauses, knowledge-*how* sentences without infinitive clauses are not ambiguous between a first-person and a third-person reading. For example, ‘John knows how Mary got home’, ‘John knows how the sandwich ended up in the refrigerator’, and ‘John knows how difficult this task is’ do not have readings that require that John possess an ability to do any particular thing.

7. Conclusion

Knowledge attribution sentences such as ‘John knows the capital of Vermont’ and ‘Mary knows the price of milk’ differ from standard knowledge-*that* attribution sentences such as ‘John knows that Montpelier is the capital of Vermont’ by having a determiner phrase as complement. Such knowledge attribution sentences are fairly puzzling. It might be thought

32. For example, they invoke the notion of a practical guise.

that we can simply interpret ‘John knows the capital of Vermont’ as shorthand for ‘John knows that Montpelier is the capital of Vermont’ but this proposal runs into trouble with examples such as ‘Elisa knows that Mary knows the capital of Vermont’. The latter is not shorthand for ‘Elisa knows that Mary knows that Montpelier is the capital of Vermont’. For the latter entails that Elisa knows that Montpelier is the capital of Vermont; yet it may be that Elisa knows that Mary knows the capital of Vermont, even if she doesn’t know that Montpelier is the capital of Vermont.

We argued that concealed questions function in the same way semantically as the corresponding *wh*-clauses, and that *wh*-clauses are to be interpreted as predicates. ‘John knows the capital of Vermont’ has the logical form: there is an *x* such that John knows that *x* is what the capital of Vermont is. We further argued that these wide-scope attitude ascriptions are best dealt with on a two-dimensional semantics that treats mental states as relations to structured extensions and Fregean senses. A two-dimensional semantics is independently motivated, as it is required to solve certain puzzles about de re attitude ascriptions.³³

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