Aboutness and attitudes

Kyle Rawlins ⟨kgr@jhu.edu⟩
Cognitive Science Department
Johns Hopkins University
Paper presented at the 2014 Michigan Linguistics/Philosophy workshop, 11/14

1 Introduction

The analysis of indirect reports has been one of the most important, and troublesome topics at the interface of formal semantics and philosophy of language. One key problem is that verbs that embed clauses in English, such as "know", "wonder", "ask", "tell", "dream", "babble", "insinuate", "wish", "hope," and so on are extremely diverse, and it has therefore been challenging to get any uniform picture of the behavior of these predicates (if indeed there is anything uniform about them).

The typical relational account of clause-embedding verbs in linguistics (often associated with Hintikka (1962), though Hintikka is not really to blame for this full constellation of elements) involves treating an embedding verb as relating some individual and a proposition (or other proposition-like object) via some paremeterized accessibility function such as 'Dox' (the set of doxastic alternatives for some individual). For example, a textbook account of the verb "think" along these lines is shown in (1). The verb syntactically takes a proposition-denoting CP complement headed by "that", and a entity-denoting subject, and relates this entity and proposition: in all of the holder's doxastic alternatives (worlds compatible with their beliefs), the complement proposition is true.

(1)
$$\text{'think': V, } [\ \ [\_\_\_\text{DP}]\ \ [\text{V}\ \ [\_\_\_\text{CP,+that}]]]$$
thinker — content

$$[\![\textbf{think}]\!] = \lambda p_{\langle st\rangle} . \lambda x_e . \lambda w_s . \forall w' : w' \in \text{Dox}_x(w) \to p(w')$$

The core question about this approach is whether it can generalize. I have already mentioned one dimension of generalization: to a diverse set of verbs; a second dimension of generalization is to a range of complement types. These two are not unconnected. For example, there is now a substantial literature on question-embedding predicates that takes this relational perspective in one way or another, substituting out propositions for some richer treatment of question meanings (see among many, many others, Karttunen 1977, Groenendijk & Stokhof 1984, Heim 1994, Lahiri 2002, Romero 2005). However, despite this work, we do not yet have a theory of how for any given verb, to generalize its meaning across complement types. That is, the same verb (apparently) will often show up with a variety of complement types specifying at some level the content of the report. For example, though "think" is relatively limited, it allows "about"-phrases, and can be used intransitively. Perhaps more typical is a verb like "tell", which is quite permissive (this time in an indirect object slot): it allows "that"-clauses, interrogative clauses, "about"-phrases, and infinitivals.[1]

---

[1] It is quite rare for a verb that embeds clauses to embed just one type of clause. Out of the verb sample developed in (Rawlins 2013), covering approximately 550 verbs, about 10% of verbs (57, to be exact) take just "that"-

(2) a. Alfonso thought that Joanna was a spy.

    b. Alfonso thought about whether Joanna was a spy.

    c. Alfonso thought (hard).

(3) a. Alfonso told me that Joanna is a spy.

    b. Alfonso told me whether Joanna is a spy.

    c. Alfonso told me about whether Joanna was a spy.

    d. Alfonso told me to find out if Joanna is a spy.

Here I address this issue by looking at the behavior of "about"-phrases. While looking at yet another 'frame' in isolation would not necessarily address the generalization question, one of the main results of this work is that "about"-phrases can't be looked at in isolation. This is because they are not actually arguments, but modifiers, and as such combine with a huge range of verbs. I show that the interaction with about phrases provide a common denominator across a large and diverse array of embedding verbs (drawing on a sample of 500 embedding verbs annotated with selectional properties). At the level of argument structure, the distribution of "about" completely cross-cuts any argument selection patterns, and therefore "about"-phrases behave as modifiers across the vast majority of this sample. For example, at one end of a spectrum there are verbs like "inquire" that take interrogative but not declarative clauses, and at the other end, verbs like "argue" that take declarative but not interrogative clauses; both groups productively combine with "about"-phrases. Opposed to both of these are verbs like "talk" that do not otherwise take clausal arguments, but do productively combine with "about".

As noted above, "about"-phrases combine with many verbs, and an introductory sample is given in (4). "About"-phrases also combine with 'content nouns', as in (5), and can be used as predicates, as in (6). I will not focus on these latter two cases in this paper, but see Rawlins (2013).

(4) *Indirect reports:* Alfonso {asked / wondered / knows / dreamed / etc.} about {Joanna / whether Joanna dances}.

(5) *Content nouns:* Alfonso read a {book / article / story / blurb / etc.} about Joanna.

(6) *Predication:* {The question / the claim} was about {Joanna / why Joanna left}.

As shown above, "about" can quite consistently take a DP or an interrogative clause as its internal argument. This does not necessarily line up with the based verb. For example, "wonder" cannot directly take a DP though it can take one in combination with "about", and "think"'s base selection properties don't line up at all with those of "about", as shown in (8).

(7) Alfonso wondered {*Joanna / ✓about Joanna}.

clauses among other clause types that I have annotated. Of these 57 verbs, the strong majority of them allow either an idiosyncratic prepositional or DP argument that serves to provide the 'content' of the report (e.g. via concealed questions). For example, one can "marvel at the price of milk" or "concede the answer to the question". Setting aside "about"-phrases, for reasons that will become clear, this leaves just 8 verbs that truly appear to have only one frame for conveying the content of the report (for example, "theorize" and "rejoin"). Now, one should worry that there is a certain amount of ambiguity that my annotation scheme has not captured (for instance, "ask that" might well involve a different "ask" than "ask +Q"), and I will leave this worry for the future. However, it seems clear from these facts that the null methodology should not be to approach e.g. "know that" as a unit. Rather, I suggest that research on attitude verbs should take a 'whole verb' approach: what is the underlying commonality of "know" across the (many) frames it appears in, and what if any would be the arguments for any ambiguity?

(8) a. Alfonso thought {*Joanna / *why Joanna left / ✓that Joanna left}.

     b. Alfonso thought about {✓Joanna / ✓why Joanna left / *that Joanna left}.

Of course, cases where the base verb's selectional properties *do* line up with its behavior in combination with "about" can be found, as well. "Ask" is such a verb, taking both DPs and interrogatives both with and without "about".

(9) Alfonso asked { the time / whether it was raining }.

(10) Alfonso asked about { the time / whether it was raining }.

While it is far from clear that these pairs are synonymous for "ask" (in fact, it is clear that they aren't; see Pesetsky 1991 fn. 6), there does seem to be some systematic connection between the "about"-less and "about"-ful meanings. In fact, this is intuitively true even for verbs like "think" and "wonder", where the selectional patterns diverge: "thinking about" does seem like "thinking". Therefore, at least at a descriptive level, analyzing "about" can't be done in isolation.

In the rest of this paper, I refine this point substantially. The paper has, broadly, two parts. For the first part of the the paper, instead of looking at a few exemplar verbs I will rather take the strategy of looking at clause-embedding verbs en masse. I will suggest that this is an extremely productive strategy, as the right account of "about"-phrases emerges from the selectional patterns of clause-embedding verbs of English, when looked at with a birds-eye view. This discussion builds of a sample of about 550 verbs of English annotated for selectional properties, developed initially as a part of Rawlins (2013). I constructed this sample by first doing corpus searches in Davies 2008- for verb-clause combinations (as well as verb+"about"), compiling a long list of verbs that take some sort of clause, and intersecting this with existing verb lists (most notably the large sample in Hacquard & Wellwood 2012). I minimally separated some verbs into frames on fairly surfacey criteria: e.g. if a verb both does and doesn't take a preposition, and shows different behavior depending, I treated this as two frames. Then, I annotated (using simple introspective judgments) for each of these verbs whether they can combine with various clause-types, "about"-phrases, and other argument types, such as DPs and certain other PPs. This annotation includes uncertainty, and in general I exclude cases where I was uncertain about the judgment from the results reported below. There are obvious extensions such as using corpus data to verify the introspective judgments (currently I have done this only on an extremely ad hoc basis), but for present purposes I will stick with these judgments. The end result is an annotated sample of 554 unique verbs broken into 654 frames.

Using this data set, I provide several arguments, both old ones from Rawlins (2013) and newer arguments, that the more obvious analyses of "about" can't work. One of these more obvious possibilities, for example, is that "about"-phrases are arguments to the verbs they combine with, providing much the same compositional material as any argument (but with whatever extra twists "about" introduces along the way). I show that this simply isn't a viable analysis. The distribution of "about" is extremely broad, and cross-cuts all other selectional restrictions that these verbs have. Rather, "about"-phrases are modifiers. As such, they must interact with more typical frames in some systematic and very general way.

In the second part of this paper I turn to the details of this interaction. To handle the fact that "about"-phrases are modifiers, I move to a neo-Davidsonian treatment of clause-embedding verbs (Hacquard 2006, to appear, Kratzer 2006, Anand & Hacquard 2009, 2013, Frana & Rawlins 2011). On this view, these verbs describe eventualities that have 'content'; the role of the clause

is to directly characterize that content. This is perhaps most natural for communication verbs, and it is in an odd way a very Davidson (1968)-inspired treatment of communication verbs. A "saying" is a communication event where one participant made one or more utterances. These utterances have some content (and the relationship between the utterance and that content is extremely complex; see Hand (1991), Cappelen & Lepore (1997), Kemp (2001) among others). A "that"-clause serves to describe this content in virtue of its denotation. A commitment of the proposal is that a great many verbs have 'content', and across all of these verbs an "about"-phrase serves to describe this content in a less direct way. In particular, the "about"-phrase provides some issue that is related to the content of the event, but not necessarily identical to that content. I spell out 'aboutness' (or 'relatedness') using the notion of *orthogonality* from Lewis (1988a) (see also Yablo (forthcoming)). The main empirical focus of this section is on the analysis of three key verbs: "lie", "ask", and "think". In order to handle this range of verbs, I suggest that 'content' must be treated as a *hybrid* object which can be either informative, inquisitive, or both. I conclude by pointing out some of the more general remaining linguistic issues in "about"ness, including its interaction with content nouns.

The overall claims of this paper are that (i) to handle the broad modification behavior of "about"-phrases requires a shift away from the relational account, and (ii) the treatment of 'content' required by "about"-phrases must be extremely general, requiring a notion of content that is not limited to either purely propositional or purely question-like meaning.

2 The interaction of "about"-phrases and attitude verbs

In this section I present four sets of data that substantially constrain the treatment of "about"-phrases. I start by showing that it is strictly optional. I then turn to an argument from Rawlins (2013): "about"-phrases systematically cross-cut the selectional restrictions of verbs that they combine with, and so therefore can't be reduced to any particular argument structure pattern. In the course of this second part I spell out some of the competing analyses to the modifier hypothesis. The third argument concerns verbs that take "about" only in combination with a clause. While I have so far only been talking in terms of verbs that do take what I will term 'bare' "about"-phrases, such as "think" in (11), a large chunk of verbs take "about"-phrases only in combination with a clause, such as "believe" in (12).

(11)   Alfonso thought about Joanna.

(12)   a.   * Alfonso believed about Joanna.

      b.   Alfonso believed about Joanna that she was clever.

At first glance, this is an extremely surprising fact, since "think that" and "believe that" are often treated as synonymous. However, what I show by looking at the verb sample is that this is not actually a fact about "about", but rather about independent selectional distinctions between verbs of the "think"-type and verbs of the "believe"-type. Finally, I turn to some direct evidence for a modifier account, showing that "about"-phrases obey the Davidsonian 'diamond' entailment pattern (Davidson 1967, Parsons 1990).

2.1 Optionality

An initial observation is that, in contexts where they can occur, "about" phrases are nearly always optional. I say "nearly" because there is exactly one collocation in the verb sample that does require "about":

(13) The students bandied about potential answers.

This stands in sharp contrast to transitivity requirements in the overall sample. 370 verbs are obligatorily transitive in that they do require some sort of clausal argument (and for these verbs, an "about"-phrase won't do). (I turn to the interaction of "about"-phrases and these verbs in §2.3.) A central example of this sort of case is, of course, "believe", in contrast to "think". ("Believe" does have an intransitive frame, but I take this to be a different sense, as it has only to do with religion/faith.) "Think" can be used in an intransitive frame, given sufficient context, but "believe" cannot.

(14)   Alfonso sat down and thought (for a while).

(15)   * Alfonso sat down and believed (for a while).

This suggests that "about"-phrases are a very different beast from clausal arguments. While there are plenty of optional arguments, when looking across a large set of verbs if "about"-phrases provided directly an argument to a verb we would expect not to find this degree of optionality.

2.2 The interaction of "about" and argument structure

The optionality data above is, in a sense, somewhat 'surfacey'. That is, I do not have rich, sense-disambiguated annotations for verbs in my sample, and so therefore it does not on its own provide a solid argument. In Rawlins (2013) I presented a more fine-grained annotation for the interaction of of argument structure and "about"-phrases, and I present and slightly expand on this here.

If "about"-phrases interact with the argument structure of the verbs they combine with, there are a number of ways this could play out. For example, Pesetsky (1982) suggested that "about" is a non-meaningful case marker, licensing a semantic argument syntactically when the verb itself can't do case-licensing. I will call this the purely formal account. A default expectation then, is that the function of "about" will be dependent on the verb's argument structure, and there might not be strong generalizations about its meaning across verbs; this is broadly consistent with early philosophical work on aboutness, which suggested that the notion is quite heterogenous (Ryle 1933, Putnam 1958, Goodman 1961).[2]

On the semantic side of analysis, Boër (1978) proposed that "about"-phrases can be systematically reduced to question-meanings, and therefore compose via already-developed lexical entries for question-embedding predicates. I will refer to this as the reductionist account (as the problem then transforms into that of reducing an "about"-phrase meaning to some understood argument

---

[2]Pesetsky (1991) refined this, suggesting that "about" must have some semantic function as well as a case-licensing function, based on examples like (i), showing non-synonymy in verbs that take both a bare DP and an "about"-phrase.

(i)   a. John asked the time.
      b. John asked about the time. (attributes ex. to Abney)

Table 1: Selectional behavior of "About"-taking verbs

Group	Count (+marginal)	Examples	finite reports?	int.s?	DPs?
1:	71 (+2)	ask, find out, tell, know	✓	✓	✓
2:	20 (+4)	inquire, remind, wonder	✓	✓	x
2b:	4 (+2)	curse, moan, preach	✓	x	✓
3:	62 (+6)	argue, joke, persuade, think	✓	x	x
4:	31 (+3)	talk, meet, differ, %lie	x	x	x

type). While I am not aware of other reductionist accounts, it should be clear that one might go other directions in what exactly to reduce "about"-phrases to. Finally, Kirsner (1972) and more recently Moulton (2009) propose accounts whereby "about"-phrases provide an argument, but *not* an argument that would be supplied by a clausal argument. Kirsner describes this as a 'topic' argument (echoed recently in the FrameNet annotation scheme; Baker et al. 1998), and Moulton (2009) as a "res argument" (in the sense of *de re* belief; Kaplan 1968, Lewis 1979). These a will refer to as 'extra-argument' approaches; they are in the end the closest to the approach that I advocate here.

Both the purely formal approach, and the reductionist approach, make rather strong predictions about the interaction of "about"-phrases and verbal argument structure. On both, we would expect clear correlations between the distribution/licensing of "about"-phrases, and the argument structures of verbs. What Rawlins (2013) showed is that these correlations don't exist. Rather, the licensing of "about"-phrases cross-cuts selectional requirements quite generally. For purposes of discussion in this section, I'll focus on verbs that can take just an "about"-phrase, e.g. "think" but not "believe". There are 170 such verbs in the sample (sometimes annotated with multiple frames per verb). I return to the believe-type verbs shortly.

Table 1 is adapted from Rawlins (2013). It shows verbs broken out into four main groups, plus one marginal group. Group 1, the most common case, is verbs that take finite reports including interrogatives, as well as DPs directly. For example, (16) illustrates the full paradigm for "ask". (The "that"-clause complement of "ask" is an interesting case in that it isn't clear whether a unified anlaysis is possible, but the annotation scheme I use here does assume as a null hypothesis that there is less ambiguity rather than more.)

(16) a. Alfonso asked that Mary be promoted.

b. Alfonso asked whether Mary would be promoted.

c. Alfonso asked the time.

d. Alfonso asked about the time.

Group 2 involves verbs that take declarative and interrogative complements, but not DPs. The fact that this set is somewhat smaller than group 1 is not easy to interpret, since across the whole verb sample (independent of the distribution of "about") there is a strong correlation between taking interrogative and DP content-like arguments. This can also be seen in the asymmetry with the marginal group 2b, verbs that take "that"-clauses and DPs but not interrogatives. Because

(to top things off) for the few verbs in group 2b, judgments are not always easy, I have used an attested example in (18c, and constructed the paradigm around this.)

(17) a. Joanna reminded Alfonso that she was attending the seminar.
      b. Joanna reminded Alfonso why she wasn't attending the seminar.
      c. * Joanna reminded Alfonso the time.
      d. Joanna reminded Alfonso about the time.

(18) a. Belicheck preached that each player should know his role.
      b. * Belicheck preached whether each player should know his role.
      c. Belicheck was a stickler for detail, and he preached the importance of each player knowing his role. (COCA)
      d. Belicheck preached about knowing ones role.

Group 3 is somewhat more robust, and involves verbs that take declarative clauses but not interrogative clauses. Such verbs systematically do not take bare DPs, as one might expect from the (unexplained but general) interrogative-DP connection. Group 3 is highly problematic for a question-reductionist account along the lines of Boër (1978).

(19) a. Alfonso joked that he wasn't going to class.
      b. * Alfonso joked whether he was going to class.
      c. * Alfonso joked the time.
      d. Alfonso joked about the time.

Finally, perhaps the most interesting case is that of group 4. These are verbs that show up in the sample because it was constructed partly using corpus searches for "about" as well as clause-selecting behavior; verbs in this group do not otherwise take clauses or content-like arguments. A key case is "talk", which forms a paradigm with "say" and "tell X".

(20) a. Alfonso told me that it was raining.
      b. Alfonso told me whether it was raining.
      c. Alfonso told me the time.
      d. Alfonso told me about the weather.

(21) a. * Alfonso talked that it was raining.
      b. * Alfonso talked whether it was raining.
      c. * Alfonso talked the time.
      d. Alfonso talked about the weather.

A second key case is "lie", for which there is speaker variation (indicated by %). While I have not done any formal experiments, about half of the speakers I have consulted do not accept it with "that"-clauses.

(22) a. % Alfonso lied that he was going to the party.
      b. * Alfonso lied whether he was going to the party.
      c. * Alfonso lied the time.

Aboutness and attitudes

Table 2: Selectional behavior of "About"-taking verbs

Group	Count (+marginal)	Examples	finite reports?	that?	int.s?	DPs?
1:	62 (+2)	find out, tell, know	✓	✓	✓	✓
1-int:	9	ask, investigate, query, reconsider	✓	x	✓	✓
2:	26 (+4)	agree, care, notify X, wonder	✓	✓	✓	x
2-int:	4	consult, inquire, question, quiz	✓	x	✓	x

    d.   Alfonso lied about the time.

It is already somewhat surprising that, for so many speakers, a verb like "lie" wouldn't directly embed a clause, but as with "talk", it is perhaps even more surprising that for such speakers it does then take "about"-phrases. The existence of group 4 at all is extremely surprising on either a purely formal or a reductionist account. It is less surprising on the extra-argument accounts, or of course on a modifier account.

The above table collapses finite clause-selection and the declarative/interrogative contrast in a way that might be slightly confusing. That is, verbs that take interrogatives but not declaratives are placed in group 1, because interrogative clauses are a species of finite clause. Rawlins (2013) did this partly because there are very few such verbs in general. Here I will focus specifically on such verbs and so it is useful to examine their extent. Table 2 separates groups 1 and 2 along these lines.

In general, there is an extremely strong tendency for verbs to take "that"-clause complements if they take a complement at all; out of 657 frames, 140 do not take "that"-clauses. Very few such frames are ones that allow "about", and the tendency is strengthened among verbs that take "about". Again, this is a situation where ambiguities that are not analyzed might be masking verbs in this class (e.g. "ask that" is plausibly a distinct sense), but I will not address this here. I will make something of these verbs, however, as they are a limiting case for a reductionist analysis.

I have already noted that an interrogative-reductionist account runs up against group 3 (and 4); a declarative reductionist account runs up against group 1-int (as well as, of course, group 4). That is, at one end a reductionist account is hemmed in by verbs like "inquire", and on the other end, verbs like "argue".

(23)   a.   John inquired about Mary.
       b.   * John inquired that Mary had left.
       c.   John inquired whether Mary had left.

(24)   a.   John argued about Mary.
       b.   John argued that Mary should leave.
       c.   * John argued whether Mary should leave.

This pair, if we allow ourselves to set aside the fact that verbs like "inquire" are not frequent, places strong constraints on the generality of the meaning of "about" – it must be able to interact with a tremendous range of verb-argument-structures, and consequently verb-meanings.

2.3 The interaction of "about"-phrases and transitivity

So far, I have said little about the lingering puzzle of the extra 380-odd verbs that do not take 'bare' about (also set aside in Rawlins 2013). This puzzle is illustrated, in a nutshell, by the following minimal pairs, drawn from various sorts of verbs.

(25) a.   Alfonso thought about Joanna.

  b.   * Alfonso believed about Joanna.

(26) a.   Alfonso talked about Joanna.

  b.   * Alfonso discussed about Joanna.

(27) a.   Alfonso asked about Joanna.

  b.   * Alfonso questioned about Joanna.

The solution to these contrasts is surprisingly simple, and puts the final nail in the coffin of any argument-based account of "about"-phrases. Basically, any verb of the (a) type above also has an intransitive frame with a closely-related meaning, and any verb of the (b) type does not.[3] In fact I have already shown this contrast for "think"/"believe": intransitive "believe" has only a religious sense. The other side of the contrast is that "about"-phrases are generally good, if somewhat stilted, in combination with a clause for these verbs:

(28) "about" PP + finite clause

  a. Alfonso believed about Joanna that she was clever.

  b. Alfonso discussed about Joanna that she was clever.

  c. Alfonso questioned about Joanna whether she was clever.

To head off the concern that these examples are somewhat stilted, it may be helpful to also consider cases where there is (arguably) A′-extraction of the embedded clause. These examples are reminiscent of 'scope-marking' constructions (Dayal 1994, 2000 and others) and are quite natural:

(29) Extraction, embedded DP

  a. What did Alfonso believe about Joanna?

  b. What did Alfonso discuss about Joanna?

  c. What did Alfonso question about Joanna?

(30) Extraction, embedded interrogative

  a. What did Alfonso believe about why Joanna left?

  b. What did Alfonso discuss about why Joanna left?

  c. What did Alfonso question about why Joanna left?

I will take it for granted, given this data, that "about"-phrases can productively co-occur with clausal arguments.

To assess the relationship with transitivity quantitatively, I annotated the frames in the verb set for whether they allowed an intransitive frame with an intuitively similar meaning. Note that in some cases (such as "think") the use of the intransitive frame can be assisted by modifiers such as

---

[3]Thanks to Paul Portner, p.c., for suggesting this approach.

Table 3: χ-square table for transitivity vs. 'about'-phrase distribution

	verb can be intransitive	verb can't be intransitive	sums
allows just about-PP	202	8	210
allows about-PP only with clause	24	276	300
sums	226	284	510

"for a while"; I was relatively liberal in terms of this. There is also some variation in exactly what the intransitive frame means. Sometimes, there is the intuition that it is anaphoric, and other times, that it is existentially closed. I have not as of yet annotated these distinctions, rather going for broad coverage of intransitive frames. This pattern of course echoes the unexpressed object alternation found with many 'regular' verbs (e.g. "eat", "shave"; see Levin 1993 among many others). The result is illustrated in Table 3, which is conveniently also a chi-square table. The chi-square is highly significant ($p < 0.001$), indicative of an extremely strong correlation between transitivity, and licensing of 'bare' "about"-phrases. (Note that I am leaving out some cases where the judgments are just not clear; this choice does not effect the significance of the chi-square no matter how they are added in.)

Like any such large-scale analysis there is a residue of unexplained cases, and I will not deal with these here.[4] The overall generalization is highly problematic for either a purely formal or a reductionist account: it appears that when an "about"-phrase combines with a verb, it simply is slotted in as an extra into whatever transitive or intransitive frames that verb has. In other words, "think" has the syntactic argument structure shown in (31a) (with optionality indicated by parenthesis), and "believe" has the syntactic argument structure shown in (31b), and an "about"-phrase simply appears as an extra in any of the instantiations of these syntactic possibilities.

---

[4]It may, however, be useful to see what this residue looks like. There are both verbs that don't seem to have a basically intransitive frame, but do take bare "about"-phrases, and verbs that do have an intransitive frame but don't seem to allow "about".

Case 1 (no intransitive frame, but about):

(i) a. Alfonso cautioned/warned about taking on too much.

   b. * Alfonso cautioned/warned.

(ii) a. Alfonso regrets about Joanna.

   b. * Alfonso regrets.

Case 2 (intransitive possible, but no about):

(iii) a. I comprehend/gather.

   b. * I comprehend/gather about Mary.

(iv) a. John illustrated.

   b. * John illustrated about Mary.

A preliminary generalization about the case 2 verbs is that they tend to have an extremely high salience requirement to use the intransitive frame, and so possibly the "about"-phrases would be improved with more articulated context.

(31) a. 'think': V, [[___DP] [V ([___CP,+that])]]

holder and content brackets above: holder over [___DP], (content) over [___CP,+that]

b. 'believe': V, [[___DP] [V [___CP,+that]]]

holder over [___DP], content over [___CP,+that]

While data like (28) would be entirely unsurprising, and perhaps predicted, on an extra-argument account, the overall quantitative generalization is very much not what one would expect. Rather, we'd expect the "about"-phrase+clause structures to function like its own (ditransitive-like) frame, more independently of whether the verb has a transitive frame. In other words, one could simply at "([PP$_{about}$)" to the above syntactic selectional descriptions, as well as those of nearly every other attitude verb of English, but using the power to list this would miss a generalization: "about"-phases are extremely general/productive, and always optional.

The only account that can actually explain this strong independence of transitivity and the distribution of "about"-phrases, I suggest, is a modifier account. If the "about"-phrases is a modifier, then the chi-square table in Table 3 is exactly the kind of picture we would expect.

2.4   Residue: verbs that do not take "about"

There remain 77 verbs in the sample that do not ever take "about". I won't propose any deep conclusions about these verbs, as they are extremely heterogenous and often low-frequency enough that the judgments about selectional facts are not easy. Many of these verbs never take finite clauses at all. The largest sub-class is what might be termed the 'pure' deontic/bouletic verbs, "want" being the core exemplar. Rawlins (2013) suggests that these particular verbs do not meet the presupposition of "about" (following work on 'representationality'; see Bolinger 1968, Farkas 1992, Villalta 2008, Anand & Hacquard 2009, 2013). Here is a brief description of some apparent subclasses of these 77:

- Many that never take finite clauses: e.g. "ban", "finish", "offer"
- A few sub-regularities:
  - **Deontic/bouletic verbs** ("allow", "deem", "direct", "disallow", "endure", "forbid", "need", "pardon", "prefer", "permit", "require", "want")
  - % Semi-communication verbs ("chirp", "cluck")
  - Some (but not most) observation verbs: "estimate", "glimpse", "smell", "witness"
  - Others: "cause", "count", "resolve"

I return briefly to the treatment of the deontics in the conclusion.

2.5   The diamond entailment pattern

A semantic hallmark of modifier-like behavior, introduced by Davidson (1967) and explored in depth in Parsons (1990), Landman (2000) among many others, is the so-called 'diamond' entailment pattern. What Davidson and those following him pointed out, is that a VP modified by α consistently shows an entailment pattern to the VP not modified by α, and this is independent of any other modifiers. So, (32) entails (a) and (b), and all three entail (c).

(32) Jones buttered the toast at midnight in the bathroom.
    a. ⤳ Jones buttered the toast at midnight.
    b. ⤳ Jones buttered the toast in the bathroom.
    c. ⤳ Jones buttered the toast.

This diamond entailment pattern carries over to the behavior of "about"-phrases. I have illustrated this using both the intransitive and the transitive frame of "think". (I did allow substitution of a proper name for a pronoun when dropping the "about"-phrase; this is justified in that the main thing barring the original example from using "Joanna" twice is that it would be a condition C violation.)

(33) (While waiting,) Alfonso thought carefully about Joanna.
(34) a. ⤳ (While waiting,) Alfonso thought carefully.
    b. ⤳ (While waiting,) Alfonso though about Joanna.
    c. ⤳ (While waiting,) Alfonso though.
(35) Alfonso thought on Tuesday about Joanna that she should take the job.
    a. ⤳ Alfonso thought about Joanna that she should take the job.
    b. ⤳ Alfonso thought on Tuesday that she(/Joanna) should take the job.
    c. ⤳ Alfonso thought that Joanna should take the job.

Beyond just arguing again for a modifier approach, this diamond-entailment data provides a path to understanding how to implement this approach. Davidson's proposal (and this persists into all neo-Davidsonian analysis of action verbs that I am aware of) is that these entailment patterns follow because modifiers are interpreted as introducing conjunctions of properties around some central variable – an event variable.

3 Towards a (neo-)Davidsonian account of "about"

The first part of this paper argued that "about"-phrases, when interacting with attitude verbs, must be treated as modifiers, not as arguments. A common thread, though not one I have emphasized, is that "about"-phrases are extremely productive in their interactions with verbs – the number of verb frames in my verb sample that don't take "about" is actually *smaller* than the number of frames that don't take "that"-clauses. The complication with getting to this generalization was the interaction of "about"-phrases with clausal arguments, but I showed that this is almost entirely dependent on transitivity, rather than following from anything about "about" or from particular verbs. The only way to deal with this is to take "about"-phrases to be modifiers.

The extra challenge is of course that a semantic account of "about" must be *extremely* general. The verbs that productively combine with "about"-phrases include a huge range of existing classes, from verbs of communication, to factive verbs, to intensional question-embedding verbs, to even (group 4) verbs like "talk" that haven't ended up so-classified because they don't ordinarily take a clause. Two opposed corners of this space have already been illustrated by "inquire" and "argue" (examples repeated from (23) and (24)).

(36) a. John inquired about Mary.

    b.   * John inquired that Mary had left.

    c.   John inquired whether Mary had left.

(37)   a.   John argued about Mary.

    b.   John argued that Mary should leave.

    c.   * John argued whether Mary should leave.

Both of these are communication verbs, but the set of verbs to cover includes many that are not communication verbs, covering apparently many mental attitudes. There is one potential exception: I have noted that perhaps the 'pure' desire predicates like "want" are the one exception. However, the so-called hybrid emotive doxastics (Anand & Hacquard 2013) such as "hope" can productively combine with "about".

I will first develop the proposal by zooming in on "lie": this verb is important to understand both because of its presence in group 4 for some speakers, and the dialect variation as to whether the verb takes a "that"-clause. Moreover, it is a hybrid of a communication verb and a mental state verb, so allows us to cover both grounds quickly. Finally, it presents some clear entailment patterns to capture:

(38)   Alfonso lied about whether he was going to the party.
     ⤳ if A believed that he was going to go the party, he said that he wasn't.
     ⤳ if A believed that he wasn't going to go the party, he said that he was.

3.1   Lying about

A good account of what it takes to lie is somewhat subtle (see e.g. Chisholm & Feehan 1977, Falkenberg 1982, Adler 1997, Meibauer 2005). Here I will follow Chisholm & Feehan (1977) in assuming roughly, that a lie is an act in which a speaker believes p to be false, but asserts p to someone. (This sets aside some questions about what is involved with indirect deception.) Therefore, we might take an entry like (39) to be a starting point for intransitive "lie", andfor speakers who do allow "that"-clause complements to "lie", (40):[5]

(39) $[\![\textbf{lie}_{\textbf{intrans}}]\!] = \lambda x_e . \lambda w_s . \exists p_{\langle st \rangle} : x$ believes $\neg p$ in w & x asserts p in w

(40) $[\![\textbf{\%lie}_{\textbf{trans}}]\!] = \lambda p_{\langle st \rangle} . \lambda x_e . \lambda w_s . x$ believes $\neg p$ in w & x asserts p in w

One can substitute one's preferred account of belief into the metalanguage expression here; e.g. $\forall w' \in \text{Dox}_{\text{Agent}(e)}(w) : p(w')$.

---

[5] I am not a speaker of this dialect, so I am going on some limited fieldwork as well as attested examples. The generalization from attested examples is that the "that"-clause complement provides the content of what was uttered, not the belief (though I know of no reason why it had to be this way). Here are some attested examples from Davies (2008-) that illustrate this.

(i)   at first the women returned the favor and lied that they were fine, even though anyone could see that Mrs. Fleming's wrist hung at an odd angle and that a Spanish governess named Maria was badly suffering from shock.

(ii)   He asked if I was in Fresno. I lied that I was coming tomorrow.

(iii)   she could barely manage to hold a job as a secretary, having lied that she knew typing and shorthand to get it.

Before even introducing "about", we can consider what a neo-Davidsonian account of "lie" might look like. A very natural account presents itself based on the communication side of the verb: to lie is to be a participant in a communication event (specifically, an assertion) in which the content of what was asserted is contrary to one's beliefs at the time of the event. The content of what was asserted is, effectively, however the assertion in this event was interpreted. Let us assume, following Hacquard (2006, 2010), Kratzer (2006), Moulton (2009), Anand & Hacquard (2009, 2013), Frana & Rawlins (2011) that the 'content' of an eventuality can be recovered from the eventuality by means of a function Con. As this is a quite general and abstract claim it requires more motivation than I am giving at present, but I think it is quite natural to assume that the content of an assertion is something like the propositional content of what was conveyed. This then leads to the following refactoring of "lie" into a neo-Davidsonian predicate, where v is the type of eventualities.

(41)   Lying v.2 (non-final)
$\llbracket \textbf{lie}_{\textbf{neo}} \rrbracket = \lambda e_v . \lambda w_s .$ assertion(e) & Agent(e) believes $\neg$Con(e, w) at w during e

This entry accounts handily for the intransitive frame. For the transitive frame there are two options. One is to keep the account Davidsonian for the object position, and the other is to, following Kratzer (2006), Moulton (2009) suppose that it is the complementizer "that" itself that introduces the complement clause as the content of the event it modifies. Kratzer's key piece of evidence for this more radical neo-Davidsonian approach is that "that"-clauses can be used predicatively (Higgins 1973). This argument extends to lies (and in fact speakers who don't accept "lie that" do accept predications of lie-nominalizations):

(42)   The second lie was that it would do anything to curb illegal immigration. (COCA)

A Kratzer-inspired neo-Davidsonian treatment of "that" (which is much simpler than Kratzer's actual proposal) is shown in (43), and a full "lie that" VP is shown in (44).

(43) $\llbracket \textbf{that John went to the party} \rrbracket = \lambda e_v . \lambda w_s .$ Con$(e, w) = (\lambda w' . $J went to the party in $w')$

(44) $\llbracket \textbf{lied that John went to the party} \rrbracket =$
$\lambda e_v . \lambda w_s .$
     assertion(e)
     & Agent(e) believes $\neg$Con(e, w) at w during e
     & Con$(e, w) = (\lambda w' . $J went to the party in $w')$

To lie that John went to the party is therefore to be the agent of an assertion whose content is that John went to the party, while believing that content to be false. On this radical neo-Davidsonian decomposition, the dialect variation is not about the semantics of "lie", but is captured entirely in syntactic selection: if "lie" syntactically (optionally) selects for a "that"-clause then such a clause can be used to directly provide the content of the speech event compositionally. Otherwise, some other means must be used; the two typical uses in corpora are "about"-phrases or "when"-adjuncts.

This neo-Davidsonian treatment of "lie" is, arguably, elegant, but to see real payoff we must turn to "about". I argued in the first half of the paper that "about"-phrases are modifiers, and therefore need a (neo-)Davidsonian treatment. The account sketched above provides exactly the right hook: an "about"-phrase tells us something about the content of the event it is a modifier

for. In the earlier example, (38), the intuition is that the interrogative complement provides the 'topic' of the lie, and that the content of the lie must be 'related' in some strong sense to the issue of whether Alfonso was going to the party.

(45)   Alfonso lied about whether he was going to the party.

This leads us directly into the rabbit-hole that is 'aboutness'. What does it mean, setting aside argument structure issues, for X to be about Y? There is a long, difficult, and still-developing literature about this (Ryle 1933, Putnam 1958, Goodman 1961, Lewis 1988a,b, Yablo 2012, Rawlins 2013 a.o.), and I won't present anything here that is a complete solution to the problem. What I will do is take as a starting point David Lewis's theory (Lewis 1988a,b) and extend it as needed; see Yablo (2012) for a recent, much more involved take on Lewis's theory.

Lewis's insight can be paraphrased as saying that a question Q_1 is *non-orthogonal* (what I am calling 'about' here) to a question Q_2 just in case answering Q_1, or merely asking Q_1, helps in answering Q_2. Lewis did not use the term 'question' or 'issue', but rather 'subject matter'; but his subject matters as it happens have the same formal structure as Groenendijk & Stokhof's 1984 classic theory of question meaning. A subject matter for Lewis is a (total) equivalence relation on possible worlds. Each cell of the equivalence relation (for equivalence relations induce partitions) corresponds intuitively to some precise way of resolving a subject matter – or in Groenendijk & Stokhof's 1984 terms, some way of completely answering a question. The reader may have observed that I am beginning with the case of interrogative complements to "about", which provides a direct connection. An eventuality e is about ?ϕ just in case ?ϕ is non-orthogonal to the content of e. A statement of Lewis's definition is given in (46).

(46)   **Orthogonality, v. 1** (Lewis 1988a)
         a_1 and a_2 are orthogonal iff $\forall w, v \in \mathbb{W} : \exists u \in \mathbb{W} : \langle u, w \rangle \in a_1 \wedge \langle u, v \rangle \in a_2$

Two subject matters are orthogonal if for any cell in each subject matter, there is a point of connection with any cell in the other subject matter. In question-terms, no way of answering a_1 makes any progress towards reducing the alternative set for a_2 and vice versa. The intuition behind this is demonstrated graphically in (47). In (i), every cell of I_1 completely overlaps with every cell of I_2, but this isn't so in (ii). If the ground of these figures is assumed to be a cell as well, then there is a resolution of I_2 that would determine I_1 as well: if the top-most cell is picked, then we are in the ground-cell of I_1.

(47)   Orthogonality, visually

(i) Two subject matters that are completely orthogonal
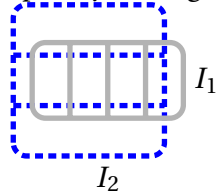
(ii) Two subject matters that are not orthogonal
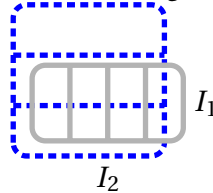
Intuitively, "about Q" tells us that the content of an event is non-orthogonal to the denotation of the interrogative complement of "about". However, the definition can't be applied as-is. First, question-denotations may not be total relations (in the case of e.g. presuppositions), and the

content of a lying event as I have construed it certainly isn't. In fact, that content would appear to be a proposition. I will assume that propositional contents involve partial equivalence relations with just one (totally connected) cell. The diagonal of this cell provides the worlds in a proposition if one wants to reconstruct a proposition. At the moment this is just a formal trick and there are other choices I could have made, but this will pay off when extending the account to other verbs. For the time being, since I am now assuming that Con is a function from eventuality-world pairs to (potentially partial) equivalence relations in $\mathcal{W}$, the entry for "lie" will need a slight modification:

(48)   For any equivalence relation a, let $Dom(a) = \{w \mid \langle w, w \rangle \in a\}$.

(49)   Lying v. 3 (non-final)
$[\![\mathbf{lie_{neo}}]\!] = \lambda e_v . \lambda w_s . \text{assertion}(e) \,\&\, \text{Agent}(e)$ believes $\neg Dom(\text{Con}(e, w))$ at w during e

The definition of orthogonality must also be modified. What does it mean for a proposition to be orthogonal or not to a subject matter? Again, there are many ways this could go, but I will follow Rawlins (2013) in assuming that a non-total subject matter is extended to a total one by adding in the ground worlds as a new cell.

(50) $\mathbb{W}\text{-}closure(a) = a \cup \{\langle w_1, w_2 \rangle \in \mathbb{W} \times \mathbb{W} \mid w_1 \notin Dom(a) \wedge w_2 \notin Dom(a)\}$
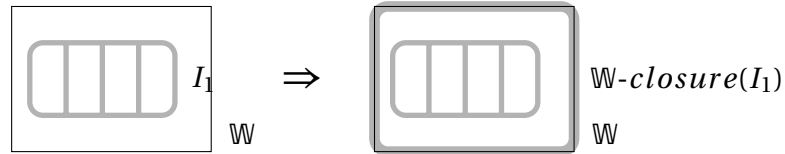
(51)   **Orthogonality v.2**
a_1 and a_2 are orthogonal iff $\forall w, v \in \mathbb{W} : \exists u \in \mathbb{W} : \langle u, w \rangle \in \mathbb{W}\text{-}closure(a_1) \wedge \langle u, v \rangle \in \mathbb{W}\text{-}closure(a_2)$

Finally, we are in a position to see a lexical entry for "about". Given some Groenendijk and Stokhof question-meaning (a function of type $\langle s, \langle s, t \rangle \rangle$, i.e. a curried characteristic function of a relation in D_s), event, and possible world, it returns true just in case the content of that event is non-orthogonal to the subject matter built from c.

(52) $[\![\mathbf{about}]\!] = \lambda c_{\langle s, \langle s, t \rangle \rangle} . \lambda e_v . \lambda w_s . \text{Con}(e, w)$ is non-orthogonal to $\{\langle w_1, w_2 \rangle \mid c(w_1)(w_2)\}$
defined only if $\langle e, w \rangle \in Dom(\text{Con})$

Alfonso lying about whether he was going to the party, then, involves an event that is an assertion with Alfonso as the agent; this event has content (such is presupposed by both "about" and implicitly by the verb), and Alfonso's beliefs entail the negation of this (propositional) content; finally, the "whether"-issue constructed from this content is non-orthogonal to the issue of whether he was going to the party. Since the latter issue has two alternatives, and the former issue does as well, then the content of Alfonso's utterance must be a proposition that would resolve the going-to-the-party issue one way or the other (even if it isn't exactly that issue). Since his beliefs actually entail the negation of whatever he uttered, he must actually believe the opposite resolution of whether he is going to the party. The entailment patterns in (38) thus follow directly from the analysis.

The derived truth-conditions for (38) are shown in full in (53) (though I will later make one slight further amendment to the entry for "lie").

(53) $[\![$**Alfonso lied about whether he was going to the party**$]\!]=$
  $\lambda w_s . \exists e_v : \text{Agent}(e) = alfonso$
  $\quad\quad \& \, \text{assertion}(e, w)$
  $\quad\quad \& \, \text{Agent}(e) \text{ believes } \neg Dom(\text{CON}(e, w)) \text{ at } w \text{ during } e$
  $\quad\quad \& \, \text{CON}(e, w) \text{ is non-orthogonal to } \{\langle w_1, w_2 \rangle | \text{a-goes-to-party}(w_1) = \text{a-goes-to-party}(w_2)\}$

3.2 Asking about

The apparatus that I introduced for "lie" may seem, at this point, overly complex. Why not simply define an aboutness relation from propositions to question-meanings? This is in fact a direct analytical translation of the question addressed in the first part of the paper: can "about" be analysed in a reductionist fashion? The answer remains no, and the reason is that "lie" is only one case. At the other end of the communication verb spectrum are verbs such as "ask" and "inquire", whose content is not propositional and require the generality of the above analysis. I set aside "ask that" here, as it seems to typically report requests/commands and I am currently witholding judgment about whether it should be unified. (A point against is its requirement that the "that"-clause have subjunctive "be".)

The basic idea is a natural extension of the neo-Davidsonian account of "lie". I have stated, though not made explicit, the constraint that "lies" are assertions, building on early work on lying. While I could perhaps continue a line of analysis where the treatment of this kind of constraint is about the type of act (assertion vs. question, etc) it will be convenient to shift to talking about the *content* of the act. "Ask" does not typically describe assertions, but rather describes eventualities that involve a communicative act, whose content is 'inquisitive' rather than 'informative'.

3.2.1 Digression: informativity and inquisitivity

That is, subject matters as I have redefined them are what has recently been termed *hybrids* in the questions literature (see Velissaratou 2000, Isaacs & Rawlins 2008, Groenendijk & Roelofsen 2009, Ciardelli et al. 2010 among others). They can have both informative and inquisitive potential, even at the same time. The notion of a hybrid (though not in name) goes back to Hamblin (1971), who in that work generally allowed question meanings that were not necessarily exhaustive or exclusified (in contrast to the better known Hamblin (1958, 1973)). The informative potential of a question is what Hamblin (1971) termed the question's 'presumption', and here I have reconstructed this idea by simply collecting the domain of the equivalence relation. A subject matter is informative if its domain is something other than $\mathcal{W}$, that is, if it eliminates worlds entirely. The inquisitive potential of a question involves the partitioning of $\mathcal{W}$ into distinct cells, each corresponding to a resolution of a subject matter or (in question terms) to an answer. A subject matter is therefore inquisitive if it has more than one cell, and non-inquisitive otherwise.[6] It is hybrid if it is both informative and inquisitive. Formal definitions of these notions in terms of equivalence relations/subject matters are given in (54).

(54) a. Inquisitivity: $Inq_D(a) = 1$ iff $\exists w_1, w_2 \in Dom(a) \cap D : \langle w_1, w_2 \rangle \notin a$
  b. Informativity: $Inf_D(a) = 1$ iff $\exists w \in D : w \notin Dom(a)$

---

[6]While there is no particular reason to stick with exclusivity, and it is abandoned in Groenendijk & Roelofsen (2009), Ciardelli et al. (2010) etc., in virtue of continuing to use equivalence relations, I do implicitly assume that alternatives do not overlap.

c. *a* is purely inquisitive: $Inq_D(a) \wedge \neg Inf_D(a)$.
   a is purely informative: $Inf_D(a) \wedge \neg Inq_D(a)$
   a is hybrid otherwise.

Sometimes it is useful to refer to the propositional alternatives (a la Hamblin) that determine the cells of an equivalence relation. These are easy to reconstruct:

(55) $Alts(m) = \{p_{\langle st \rangle} \mid \exists u \in Dom(m) : \forall v \in Dom(m) : \langle u, v \rangle \in a \leftrightarrow p(v) = 1\}$

The pictures in (56) show these possible configurations of a subject matter visually in terms of propositional alternatives/cells of a partition.
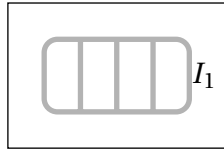
(56)   Informativity and inquisitivity, visually
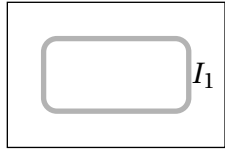
(i) A purely informa-
tive subject matter
$\mathbb{W} \supset Dom(I_1)$,
$Alts(I_1) = \{Dom(I_1)\}$

(ii) A purely inquisi-
tive subject matter
$\mathbb{W} = Dom(I_1)$, $|Alts(I_1)| > 1$

(iii) A hybrid subject matter
$\mathbb{W} \supset Dom(I_1)$, $|Alts(I_1)| > 1$

3.2.2   Back to asking   With this machinery in place, it is easy to state a constraint that a verb like "ask" might plausibly impose on its content: this content is purely inquisitive. (Further modifications that may be necessary include placing further restrictions on the domain for inquisitivity, e.g. it could be the context set, and placing further constraints on the form of the communication eventuality. I will not address these here.)

(57) $[\![\textbf{ask}]\!] = \lambda e_v . \lambda w_s . \text{communication-act}(e, w) \, \& \, Inq_{\mathbb{W}}(\textsc{Con}(e)) \, \& \, \neg Inf_{\mathbb{W}}(\textsc{Con}(e))$

Again, I will take it that a finite interrogative argument to "ask" provides the exact content of the asking event. So asking whether it is raining involves being the agent of a communication event whose content is the purely inquisitive and is the equivalence relation that partitions $\mathbb{W}$ into worlds where it is raining, and worlds where it isn't.

(58) $[\![\textbf{Alfonso asked whether it was raining}]\!] =$
   $\lambda w_s . \exists e_v : \text{Agent}(e) = alfonso$
       $\& \, \text{communication-act}(e, w)$
       $\& \, Inq_{\mathbb{W}}(\textsc{Con}(e))$
       $\& \, \neg Inf_{\mathbb{W}}(\textsc{Con}(e))$
       $\& \, \textsc{Con}(e, w) = \{\langle w_1, w_2 \rangle \mid \text{raining}(w_1) = \text{raining}(w_2)\}$

More interestingly, the account makes some immediate predications about "asking about". Asking about whether it is raining should involve much the same thing as asking whether it is raining (since anything that is non-orthogonal to a two-cell purely inquisitive subject matter must provide some potential of completely resolving that subject matter), though we expect that the question might be less direct.

(59) $[\![$**Alfonso asked about whether it was raining**$]\!] =$
$\lambda w_s . \exists e_v : \text{Agent}(e) = alfonso$
     & communication-act(e, w)
     & $Inq_{\mathcal{W}}(\text{CON}(e))$
     & $\neg Inf_{\mathcal{W}}(\text{CON}(e))$
     & $\text{CON}(e, w)$ is non-orthogonal to $\{\langle w_1, w_2 \rangle \mid \text{raining}(w_1) = \text{raining}(w_2)\}$

The connection between asking a constituent question directly and asking about a constituent question may be substantially more tenuous. That is because, in the most general case, we have two many-alternative subject matters that are being compared via non-orthogonality, and non-orthogonality is quite weak.

At this point, a final revision to "lie" presents itself: rather than requiring that a lie be an assertion event, it is preferable to simply require that it be a communication act, with purely informative content.

(60) Lying v. 4 (final)
$[\![$**lie$_{\text{neo}}$**$]\!] = \lambda e_v . \lambda w_s . \text{communication-act}(e)$
     & $Inf_{\mathcal{W}}(\text{CON}(e, w))$ & $\neg Inq_{\mathcal{W}}(\text{CON}(e, w))$
     Agent(e) believes $\neg Dom(\text{CON}(e, w))$ at w during e

I turn now to the final case study for the present paper, "think".

3.3   Thinking about

The central case study in Rawlins (2013) was the behavior of the verb "think". This is because, at the level of descriptive selection, "think about" and bare "think" are completely mismatched, yet there is still the intuition that it is the same verb; this data is repeated from (61) from (8).

(61) a. Alfonso thought {*Joanna / *why Joanna left / ✓that Joanna left}.
     b. Alfonso thought about {✓Joanna / ✓why Joanna left / *that Joanna left}.

Moreover, when "think" takes about, it acts more like an intensional question-embedding verb than a simple belief verb. That is, examples like (??) are nearly paraphrasable as "wondering" events.

(62) Alfonso thought about whether he should go to the party.

A sentence like (62) can be true under quite complicated circumstances: Alfonso might have considered various options, his current mood, potential consequences, who else was going to the party, etc. as part of the described thinking eventuality. How can the apparently ordinary behavior of base "think", often treated as synonymous to "believe", be reconciled with its complicated 'intensional' behavior with "about"?

I suggest that the hybrid nature of content provides the key here. In the most general case, the content of a "thinking" even can in fact be hybrid. However, a "that"-clause forces a purely informative meaning obscuring this, so what the interaction with "about" reveals is that a thinking even can have this hybrid content. A thinking event has, in the general case, two constraints. First, the informational content of the event (e.g. its domain, or Hamblin's 'presumption') is entailed by the agent's belief state. Second, for every cell (/alternative) in the content of the thinking event, the agent contemplates the proposition constructed from that alternative. I do not attempt to decompose 'contemplate' here.

(63) $[\![\textbf{think}]\!] = \lambda e_v . \lambda w_s . Dom(\text{Con}(e)) \supseteq Dox_w(\text{Agent}(e))$
$\& \forall p_{\langle st \rangle} \in Alts(\text{Con}(e)) : \text{Agent}(e) \text{ contemplates } p$

When "think" takes a "that"-clause, the content of the event will be purely informative, and thus its alternative structure consists of a single alternative. Moreover, the domain of the content will be that single alternative. Therefore, "thinking that" on this proposal involves believing as well as contemplating a single proposition characterized by the complement clause. "Thinking about", on the other hand, involves potentially contemplating many propositions, at least some of which are potentially true in the agent's beliefs, where this whole set is not orthogonal to the complement of "about". This is shown in (64) for a composed VP.

(64) $[\![\textbf{think about whether to go to the party}]\!] =$
$\lambda e_v . \lambda w_s . Dom(\text{Con}(e)) \supseteq Dox_w(\text{Agent}(e))$
$\& \forall p_{\langle st \rangle} \in Alts(\text{Con}(e)) : \text{Agent}(e) \text{ contemplates } p$
$\& \text{Con}(e) \text{ is not orthogonal to } \left\{ \langle w_1, w_2 \rangle \middle| \begin{array}{l} (\text{Agent}(e) \text{ should go in } w_1) \\ = (\text{Agent}(e) \text{ should go in } w_2) \end{array} \right\}$

Nothing about the expression in (64) requires that the Agent have made any decisions, or come to any particular conclusions (in fact, they may even consider alternatives they know to be false but that would've helped deciding the question). Of course, if the agent does make a decision, or conclude that some arguments require a decision, the sentence is still true. But, in the limiting case of a singleton alternative, which is forced by "that", the truth-conditions end up similar (though not identical) to those of a textbook treatment of "think" and "believe".

This third case study illustrates two extremely important things. First, substantial internal complexity can be obscured by simplifications forced by a single 'frame' (which analytically here, amounts to the complementizer meaning). Second, the full power of hybrid contents is necessary to account for clause-embedding verbs in the general case. Many verbs may use purely informative or purely inquisitive contents, and so we already need both ends of the spectrum to describe the behavior of "about" in a general way, and verbs like "think" make the case that we need the middle as well.

A substantial part of this project (and I believe, the project of understanding attitudes and indirect reports) is that of giving precise, motivated lexical entries for a range of verbs. Here I have presented only three case studies (and each case study provides its own, complicated challenges), with a couple more discussed in Rawlins (2013), so this is clearly a promissory note. However, these case studies were chosen on the basis of the large-scale empirical work presented in the first part of this paper, and so I suggest that this approach does generalize. I leave proof of this for the (long-term) future

3.4 Extension to DP arguments

In the analysis so far I have focused on interrogative clause arguments to "about". However, the data in this paper makes clear that "about" can systematically take DPs as well. I will not do justice to this issue in the present paper, but in the interests of completeness, I will provide a sketch of an account.

The basic function of DP arguments, in many examples, is to provide a sort of short-hand for some salient proposition or issue. For example, suppose that Joanna has recently been arrested and everyone has been talking and speculating about this. Joanna's brother, Alfonso, has been on vacation and we are wondering whether he has heard the news. In this scenario, one can use the "about"-DP phrase as a sort of shorthand for, approximately, "Joanna has been arrested", and in fact in context these two sentences are paraphrases:

(65) Alfonso knows that Joanna has been arrested.

(66) Alfonso knows about Joanna.

Intuitively, "about Joanna" here still provides something that the content of Alfonso's knowledge is related to, without directly providing that content.

The relationship between the DP and the proposition/issue it fills in for is quite free. This stands in contrast to, for example, concealed questions (Heim 1979, Romero 2006, Aloni 2008, Frana 2013) where there are relatively strict constraints on the DP (e.g. it can't be rigid) and on the interpretive process. However, it doesn't seem to be completely free – it is subject to some salience requirement that I will not attempt to pin down further at present. I assume that the DP is used pragmatically to construct a question-meaning via a very unconstrained process, thus giving a reductionist account of the *internal* argument structure of "about"-phrases. A sketch of this is given in (68).

(67) Where $A \subseteq D_{\langle s \langle st \rangle \rangle}$:
$$Sum(A) = \lambda w_1 . \lambda w_2 . \forall a_{\langle s \langle st \rangle \rangle} \in A : a(w_1)(w_2)$$

(68) $[\![\text{about } \alpha_{\text{DP}}]\!] =$

$[\![\text{about}]\!] \left(Sum \left(\left\{ a_{\langle s \langle st \rangle \rangle} \mid \exists P_{\langle e \langle st \rangle \rangle} : P \text{ is salient } \wedge a = \lambda w_1 . \lambda w_2 . \left(\begin{array}{cc} & P([\![\alpha_{\text{DP}}]\!])(w_1) \\ = & P([\![\alpha_{\text{DP}}]\!])(w_2) \end{array} \right) \right\} \right) \right)$

A DP-argument to "about" causes an interpreter to find some salient property, and construct the issue of whether that property holds of the DP. In the above example, therefore, the salient property is the property of being arrested. Clearly, in future work it is necessary to give a more precise account of exactly how the salience constraint might work. In addition, a single binary alternative structure constructed around a single property probably isn't enough. But for now, I will stop at this sketch.

4 Conclusions

I will begin closing with two further predictions. Both center around the role of 'content' in this proposal. First, we might now expect that some predicates can combine with "about" phrases if the event the describe can be coerced into having content. This prediction is borne it in some of the more unusual Group 4 verbs. For example, "meet" (in the sense of coming to be in the same

place) describes events that needn't have any content, communicative or otherwise, thought they involve multiple participants. "Meeting about" describes meeting events that have communicative content. "Laugh" describes verbal events with a certain repeated sound pattern, but one can laugh for any reason or none. On the other hand, to "laugh about" something is to perform a laughing, while having a mental state that is (indirectly) characterized by the "about"-phrase.

A second prediction is that if a verb really can't have 'content' in the right sense, then it shouldn't take "about"-phrases even if it is described as an attitude or clause-embedding predicate. This prediction, I suggest, is borne out in at least a subset of the residue described in (2.4). In particular, the proposal converges with work on 'representational' vs 'non-representational' attitudes (Bolinger 1968, Farkas 1992, Villalta 2008, Anand & Hacquard 2009, 2013); representational attitudes line up with belief predicates, and non-representational ones with desire predicates. If 'content' in the sense I have used it here corresponds to representationality (something we would expect from Anand & Hacquard 2009, 2013) then there is a clear prediction that non-representational verbs shouldn't take "about"-phrases. This prediction is borne out for the core, exemplified by "want":

(69)   * Alfonso wants about Joanna.

(70)   * Alfonso wants about Joanna to go to the party.

(71)   * Alfonso wants about Joanna that she go to the party.

However, more work must be done on this prediction: some verbs like "wish" can in fact combine with "about" but are said to be non-representational. If "about" is used as a diagnosis for content (and I am not aware of any stronger direct diagnosis) then the class of non-representatial verbs is much smaller than previous research would lead us to believe.

I began with the question of whether the relational account of indirect report predicates can scale up – both to handle a diverse array of predicates, and to handle uniformities across 'frames' for single verbs. Over the course of this paper, by focusing on "about"-phrases, I have shown that it can't (at least not without being transformed beyond recognition). The analysis of clause-embedding predicates and attitudes needs to reckon with the fact that modifiers such as "about"-phrases can interact with the 'content' of the reported eventuality. I have suggested that to account for this, we need both a neo-Davidsonian account of embedding predicates[7], and a rich and general notion of content (that can handle informative, inquisitive, and hybrid contents). I supplemented this with three case studies. The verb "lie" is (in some but not all dialects) a key Group 4 verb, i.e. in those dialects the primary means of getting at the content of the lie is via "about"-phrases. The verb "ask" is, on the other hand, a group 1 (or 2, depending on how the "that"-clause is treated) verb, and in fact "ask about" is often extremely close in meaning to "ask whether". Finally, I ended with the case-study from Rawlins (2013) of "think", which despite a common core of meaning involves a sharp divergence between its behavior with "that"-clauses and "about"-phrases. These case studies begin to make the case in an empirical way that we do need this general notion of content, as each of these three verbs instantiates one type – with their interaction with "about"-phrases being the common denominator.

The neo-Davidsonian account, in contrast to the relational account, does scale up: it provides a flexible system for describing a common core to a lexical entry, its behavior across multiple

---

[7]It should be noted that though I have gone the neo-Davidsonian route, I do not rule out or intend to rule out a purely Davidsonian account.

selectional 'frames', and its interaction with modifiers. Of course, the proof of this in the long-run is in succesfully analyzing many, diverse predicates across frames, a task which provides no shortage of future work.

Acknowledgements

Appendix: more examples of the verb types

All verbs take "about"-PPs. The criteria for taking a DP is conservative, including anything that provides some information about the 'content' of the report (except cognate objects, which are too widely acceptable.) In particular, the type 2B verbs except for 'preach' are all good only with concealed question DPs.

(72) Type 1 verbs (take interrogative and DP).
advertise, advise, agree, anticipate, **ask,** babble, blog, boast, chatter, check, clarify, communicate, confess, crow, daydream, debate, decide, explain, extrapolate, figure out, **find out,** forecast, foresee, forget, gossip, guess, hear, howl, inform X, **know,** learn, mumble, murmur, mutter, overhear, point out, probe, project, protest, read, realize, reason, recollect, regulate, remember, remind, report, scream, scribble, share, shout, sign, signal, study, suspect, **tell X,** tweet, understand, whisper, write, yell

(73) Type 2 verbs: take interrogative but not DP.
advise X, agree, boast, care, consult X, educate X, enlighten X, inform X, **inquire**, **notify X**, question X, **wonder**, worry

(74) (Type 2b, converse case is marginal. Some possibilities: cry, gush, moan, preach.)

(75) Type 3 verbs: take neither argument type. (Communication predominates.)
apologize, **argue**, bitch, brag, brood, carp, caution (X), chime in, comment, complain, concur, conjecture, counsel X, fret, fume, gripe, grouse, grumble, hint, insist, **joke**, kid (X), marvel, mislead, obsess, panic, **persuade X**, petition, **pray**, pretend, quibble, quip, rant, rave, reassure X, reflect, remark, reminisce, reply, respond, scoff, speculate, stew, swear, tease (X), **think**, theorize

(76) Type 4 verbs: not otherwise used in (finite) indirect reports.
bicker, call (X), confuse X, contact X, differ X, discipline X, discourage X, encourage X, fuss, impress X, laugh, **lie**, listen, press X, speak, **talk**, deliberate, relax, **meet**, fight, hesitate, consult X, grill X

Bibliography

Adler, Jonathan. 1997. Lying, deceiving, or falsely implicating. *Journal of Philosophy* 94. 435–452.

Aloni, Maria. 2008. Concealed questions under cover. *Grazer Philosophische Studien, special volume on Knowledge and Questions* 191–216.

Anand, Pranav & Valentine Hacquard. 2009. Epistemics with attitude. In Tova Friedman & Satoshi Ito (eds.), *Semantics and Linguistic Theory (SALT) 18*, 37–54. CLC Publications.

Anand, Pranav & Valentine Hacquard. 2013. Epistemics and attitudes. *Semantics and Pragmatics* 6(8). 1–59.

Baker, Collin F., Charles J. Fillmore & John B. Lowe. 1998. The Berkeley FrameNet project. In *COLING 1998 Volume 1: The 17th International Conference on Computational Linguistics*, 86–90.

Boër, Steven E. 1978. 'Who' and 'whether': towards a theory of indirect question clauses. *Linguistics and Philosophy* 2. 307–345.

Bolinger, Dwight. 1968. Post-posed main phrases: an English rule for the Romance subjunctive. *Canadian Journal of Linguistics* 14. 3–30.

Cappelen, Herman & Ernie Lepore. 1997. On an alleged connection between indirect speech and the theory of meaning. *Mind & Language* 12. 278–296.

Chisholm, Roderick & Thomas Feehan. 1977. The intent to deceive. *Journal of Philosophy* 74. 143–159.

Ciardelli, Ivano, Jeroen Groenendijk & Floris Roelofsen. 2010. Information, issues, and attention. Manuscript, ILLC, University of Amsterdam.

Davidson, Donald. 1967. The logical form of action sentences. In *The Logic of Decision and Action*, University of Pittsburgh Press.

Davidson, Donald. 1968. On saying that. *Synthese* 19. 130–146.

Davies, Mark. 2008-. Corpus of American english: 360 million words, 1990-present. Available online at http://www.americancorpus.org.

Dayal, Veneeta. 1994. Scope marking as indirect WH dependency. *Natural Language Semantics* 2. 137–170.

Dayal, Veneeta. 2000. Scope-marking: cross-linguistic variation in indirect dependency. In Uli Lutz, Gereon Müller & Arnim von Stechow (eds.), *Wh-Scope Marking*, 157–194. John Benjamins Publishing Company.

Falkenberg, Gabriel. 1982. *Lügen: : Grundzüge einer Theorie sprachlicher Täuschung*. Mouton de Gruyter.

Farkas, Donka. 1992. On the semantics of subjunctive complements. In Paul Hirschbühler & Konrad Koerner (eds.), *Romance languages and modern linguistic theory*, 69–104. John Benjamins.

Frana, Ilaria. 2013. Quantified concealed questions. *Natural Language Semantics* .

Frana, Ilaria & Kyle Rawlins. 2011. Unconditional concealed questions and the nature of Heim's ambiguity. In *Proceedings of SALT 21*, 495–514. CLC Publications.

Goodman, Nelson. 1961. About. *Mind* 70(277). 1–24.

Groenendijk, Jeroen & Floris Roelofsen. 2009. Inquisitive semantics and pragmatics. Paper presented at Stanford workshop on Language, Communication, and Rational Agency.

Groenendijk, Jeroen & Martin Stokhof. 1984. *Studies in the semantics of questions and the pragmatics of answers*: University of Amsterdam PhD dissertation.

Hacquard, Valentine. 2006. *Aspects of Modality*: Massachusetts Institute of Technology Ph.D.

dissertation.

Hacquard, Valentine. 2010. On the event relativity of modal auxiliaries. *Natural Language Semantics* 18. 79–114.

Hacquard, Valentine. to appear. Modality. In K. von Heusiger C. Maierborn & P. Portner (eds.), *Semantics: An International Handbook of Natural Language Meaning*, Mouton de Gruyter.

Hacquard, Valentine & Alexis Wellwood. 2012. Embedding epistemic modals in English: a corpus-based study. *Semantics and Pragmatics* 5(4). 1–29. doi:10.3765/sp.5.4.

Hamblin, C. L. 1958. Questions. *Australasian Journal of Philosophy* 36. 159–168.

Hamblin, C. L. 1971. Mathematical models of dialogue. *Theoria* 37. 130–155.

Hamblin, C. L. 1973. Questions in Montague English. *Foundations of Language* 10. 41–53.

Hand, Michael. 1991. On saying that again. *Linguistics and Philosophy* 14. 349–365.

Heim, Irene. 1979. Concealed questions. In Rainer Bäurle, Urs Egli & Arnim von Stechow (eds.), *Semantics from Different Points of View*, 51–60. Berlin: Springer.

Heim, Irene. 1994. Interrogative semantics and Karttunen's semantics for *know*. In Rhonna Buchalla & Anita Mitwoch (eds.), *IATL 1: Proceedings of the Ninth Annual Conference and of the Workshop on Discourse*, The Israel Association for Theoretical Linguistics.

Higgins, F. Roger. 1973. *The Pseudo-cleft Construction in English*: MIT Ph.D. dissertation.

Hintikka, Jaakko. 1962. *Knowledge and belief*. Cornell University Press.

Isaacs, James & Kyle Rawlins. 2008. Conditional questions. *Journal of Semantics* 25. 269–319.

Kaplan, David. 1968. Quantifying in. *Synthese* 19. 178–214.

Karttunen, Lauri. 1977. Syntax and semantics of questions. *Linguistics and Philosophy* 1. 3–44.

Kemp, Gary. 2001. Samesaying, propositions and radical interpretation. *Ratio* 14(2). 131–152.

Kirsner, Robert S. 1972. About "about" and the unity of "remind". *Linguistic Inquiry* 3(4). 489–499.

Kratzer, Angelika. 2006. Decomposing attitude verbs. Talk given in honor of Anita Mittwoch, the Hebrew University of Jerusalem.

Lahiri, Utpal. 2002. *Questions and Answers in Embedded Contexts*. Oxford University Press.

Landman, Fred. 2000. *Events and Plurality*. Kluwer Academic Publishers.

Levin, Beth. 1993. *English verb classes and alternation: a preliminary investigation*. University of Chicago Press.

Lewis, David. 1979. Attitudes *de dicto* and *de se*. *The Philosophical Review* 88. 513–543.

Lewis, David. 1988a. Relevant implication. *Theoria* 54. 161–237.

Lewis, David. 1988b. Statements partly about observation. *Philosophical Papers* 17. 1–31.

Meibauer, Jörg. 2005. Lying and falsely implicating. *Journal of Pragmatics* 37. 1373–1399.

Moulton, Keir. 2009. *Natural Selection and the Syntax of Clausal Complementation*: UMass Amherst Ph.D. dissertation.

Parsons, Terence. 1990. *Events in the Semantics of English*. Cambridge, MA: MIT Press.

Pesetsky, David. 1982. *Paths and Categories*: Massachusetts Institute of Technology Ph.D. dissertation.

Pesetsky, David. 1991. Zero syntax vol 2: Infinitives. Manuscript, MIT.

Putnam, Hilary. 1958. Formalization of the concept "about". *Philosophy of Science* 25(2). 125–130.

Rawlins, Kyle. 2013. About 'about'. In *Proceedings of SALT 2013*, .

Romero, Maribel. 2005. Concealed questions and specificational subjects. *Linguistics and Philosophy* 28. 687–737.

Romero, Maribel. 2006. Biased *Yes/No* questions: The role of VERUM. *Sprache und Datenverar-*

beitung 30. 9–24.

Ryle, Gilbert. 1933. 'about'. *Analysis* 1(1). 10–12.

Velissaratou, Sophia. 2000. *Conditional questions and which-interrogatives*: University of Amsterdam Master of Logic Thesis. ILLC Publications.

Villalta, Elisabeth. 2008. Mood and gradability: an investigation of the subjunctive mood in Spanish. *Linguistics and Philosophy* 31. 467–522.

Yablo, Stephen. 2012. Truth and content. John Locke Lecture Series.

Yablo, Stephen. forthcoming. *Aboutness*. Princeton University Press.