Intensional Transitive Verbs: I owe you a horse

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Abstract

This paper reviews the phenomenon of intensional transitive verbs such as 'look for, 'need, and 'want, as well as its main analyses proposed in the literature. The verbs in question are special in that they relate to their object argument in ways that are different from regular transitive verbs. Key empirical reflexes of this are presented in section 2, most prominently concerning non-specificity, failure of extensional substitution, and lack of existential import. Next, the three main theoretical analyses are reviewed, which respectively propose that these verbs take covert clausal complements, intensional quantifiers, or properties as their arguments. Finally, more intricate empirical points are considered in light of their relationship to the various proposals, and the possible differences between types of intensional transitive verbs are discussed.

keywords:

1 Introduction

Many aspects of natural language semantics can successfully be captured within an extensional semantics, where (unary) predicates such as *run* denote functions from individuals to truth-values (or, equivalently, sets of individuals), and noun phrases such as *John* denote individuals (see, e.g., the introduction in Heim & Kratzer, 1998). One limitation of such a system is that it requires us to assume a certain state of affairs, e.g., that John is amongst the runners. But things could have been different - John could have failed to be a runner. A key feature of natural language, one that arguably is crucial for much of what allows humans to talk and think about things beyond the actual here and now, is that we are able to talk about different possible states of affairs (and different times and locations). There is a variety of expressions that specifically involve such a notion, and their denotations are generally thought to involve operations on intensions, rather than mere extensions. An early version of this distinction was introduced in the work of Frege (1892), who distinguished between *reference* ('Bedeutung'), corresponding to the latter, and *sense* ('Sinn'), roughly corresponding to the former. The standard approach to modeling intensions in modern linguistic semantics is based on possible worlds, broadly understood as possible states of affairs or ways that things could have been. The intension of a predicate then can be seen as providing a perspective on which individuals could be, say, the runners: in one possible state of affairs, or possible world, it might

have been John and Sue, in another John and Mary, and in yet another, Mary and Sue. Intensions (of predicates) then can be understood as functions from possible worlds to sets of individuals (see chapter *Extension, Intension, and Content* for more details). A crucial question for a semantics that aims to capture the relevant phenomena concerns the extent to which expressions involve appeal to intensions and, more specifically, what limitations, if any, there are in terms of the syntactic and semantic levels at which intensions come into play.

Standard cases of expressions whose denotations crucially operate on intensions are sentence-embedding expressions such as modals (*It is possible/necessary that...*; also see chapters in this volume on *Modal concord*, *Epistemic Modality*, *Modal-temporal interactions*, *Graded modality*, *Modal subordination*, and *Free choice items and modal indefinites*) and attitude verbs (*John believes that...*; also see chapters in this volume on *Attitude verbs* and *Attitude reports de dicto and de re: Ralph and the shortest spy*). The present chapter is concerned with another class, namely that of intensional transitive verbs (ITVs). These are verbs that combine with a simple noun phrase object (at least on the surface), rather than a sentence or clause, but still give rise to intensional effects with regards to their object. This raises important questions both about the way that verbs and their objects can combine and about the nature of intensional environments in natural language. A variety of analyses have been proposed in the literature, which vary in the role they assign to the verb, the noun phrase, and potential hidden structure present with ITVs. While all of them can capture basic properties of core examples, they differ in their predictions for more intricate cases, e.g., involving the availability of intensional readings with different types of noun phrases, in particular quantifiers, as well as the possibility of certain types of modification. The more recent literature has begun to explore more fine-grained issues, such as empirical differences between different types of ITVs and some puzzles about inference patterns for certain types of object quantifiers.

I will begin by introducing some basic examples that illustrate the general phenomenon and relating them to the historical context of their study. Next I review the core properties that are traditionally assumed to be at play, and survey the expressions that have been considered as ITVs in the literature (given the current state of the literature, this is mostly limited to English). In section 3, I introduce the three major families of analytical approaches to ITVs. Section 4 sketches a variety of more intricate empirical issues and relates them to the main theoretical accounts. Section 5 concludes.

2 Empirical overview

This section begins with some of the original examples considered in the literature, which will introduce some of the central puzzles associated with ITVs. I then review core properties of ITVs more generally, and finally turn to an inventory of English verbs that have been put forward as falling into this category.

2.1 Core data and its historical context

An initial discussion of some of the puzzles that ITVs introduce can be found in the work of the medieval logician Buridan (1966 [1350]). To set the stage, first consider a very simple example with a regular transitive verb. Imagine that I have two horses, Morellus and Favellus, and you make the following statement to me:

(1) I rode a horse of yours.

One could sensibly ask *Which horse did you ride - Morellus or Favellus?* And if your statement is true, then inevitably you will have ridden (at least) one of these two, i.e., either the statement 'You rode Morellus' or the statement 'You rode Favellus' must be true. Things become more interesting if we consider another verb, namely *owe*. Imagine we had a bet, and that I have to give you one of my horses if I lose. I do lose, thus it would seem adequate for me to state the following:

(2) I owe you a horse.

But now, it no longer makes sense to ask *Which one?* Indeed, I might try to utilize the observations made by Buridan and try to get out of paying the price for the lost bet: you insist that I owe you a horse, but then please tell me, which horse? Did I agree to give you Morellus if I lost? Certainly not. And I also did not promise you Favellus. So I don't owe you Morellus and I don't owe you Favellus. But then how can you maintain that I owe you a horse if it holds for neither one of my horses that I owe it to you? Clearly, trying to get out of my obligations in this way seems wrong-headed from an intuitive point of view, but understanding precisely where my reasoning goes wrong constitutes one of the core puzzles of ITVs. For if we assume a simple classical semantics where all transitive verbs, including *owe*, denote relations between individuals (construable set-theoretically as sets of pairs, or equivalently, as functions of type $\langle e, \langle e, t\rangle\rangle$, i.e., from individuals to functions from individuals to truth-values), my reasoning is indeed rock-solid.

The first modern discussion - about 600 years later - of relevant examples is due to Quine (1956, 1960). Among the examples he considers are the following:

(3) I want a sloop.

(4) The commissioner is looking for the chairman of the hospital board.

He considers a possible first-order logic translation of (3) paraphrasable as:

(5) 'There is an x such that x is a sloop and I want x'
(adapted from Quine, 1956, p. 177)

While this corresponds to one possible interpretation of the sentence, there is another one that we do not yet capture. As (Quine, 1956, p. 177) puts it, '[i]f what I seek is mere relief from slooplessness, then [(5)] conveys the wrong idea.' The situation

here, of course, is very much on par with the issue Buridan pointed out for (2): It is possible to want a sloop without there being any particular sloop that is the target of your desire.

As for (4), Quine (1960) raises another central issue for ITVs. Imagine that, unbeknownst to the commissioner, the dean has recently been appointed chairman of the hospital board. In this situation, it is possible to affirm (4) and at the same time deny (6):

(6) The commissioner is looking for the dean. (Quine, 1960, p. 142)

As in the previous examples, such a 'not purely referential' use (as Quine calls it), is inconsistent with a simple treatment of *look for* as a relation between individuals. For on such a treatment, we would expect 'substitutivity of identity' - i.e., we should be able to exchange expressions with the same referent for one another without affecting the truth-value of the sentences that contain them. And by assumption, *the chairman of the hospital board* and *the dean* introduce reference to the same individual. Yet we can treat (4) and (6) independently from one another. Thus there is an interpretation of *look for* that cannot be accounted for on a relational treatment (though there also is a relational interpretation). Quine calls such an interpretation 'notional' (Quine, 1956).

Having introduced some of the original examples of ITVs, we can now turn to a more systematic overview of their properties. The details of Quine's analysis will be saved for section 3.2.

2.2 Core properties of intensional transitive verbs

Traditionally, three central properties are discussed in relation to ITVs:

i. Availability of non-specific readings
ii. Failure of extensional substitution
iii. Lack of existential import

We already encountered the first two in the discussion above. In the following, I review these properties in some more detail. While the present subsection will show that the ITVs considered so far have all three properties, the picture becomes more complicated as we consider a broader range of lexical items.

2.2.1 Non-specificity

On the interpretation of (2) that is of special interest to us, there is no particular horse that I do in fact owe you - I just am obliged to give you some horse of mine, without any commitment to a particular one.

(2) I owe you a horse.

This is precisely what amounts to a non-specific reading (also see the chapter on *Kinds of (Non-)specificity* in this volume on notion(s) of specificity more generally).[1] Empirical support for non-specificity is based on the availability of certain tags indicating that the choice of individuals amongst those satisfying the nominal predicate is left open:

(7) John wants a picture of Mary, any will do. (Moltmann, 2013)

(8) Oedipus is looking for a member of his family, but no particular one. (adapted from Forbes, 2013)

This of course contrasts with regular transitive verbs - a point made by Forbes (2013) by contrasting (8) with (9):

(9) Oedipus embraced a member of his family, #but no particular one.

As already mentioned, non-specific readings are incompatible with a simple relational analysis. For (9) to be true, some particular individual has to be in the set of individuals embraced by Oedipus, but nothing parallel (necessarily) holds for (8). Note, however, that specific readings are also possible for ITVs, as illustrated in (10):

(10) Oedipus is looking for a member of his family, namely Jocasta.

Thus, assessing specific verbs with respect to the property under discussion amounts to an existence proof: the main point to establish is that non-specific readings are possible for the verb in question.

2.2.2 Failure of extensional substitution

Quine's examples in (4), repeated below, illustrate the second property commonly discussed in connection with ITVs, namely failure of extensional substitution.

(4) The commissioner is looking for the chairman of the hospital board.

(6) The commissioner is looking for the dean.

Assume that the two definite descriptions *the chairman of the hospital board* and *the dean* actually happen to pick out the same individual, namely John (i.e., they have the same extension), though circumstances of course could have been different (the offices are not necessarily tied together). Now consider the sentence in (4) as uttered in the actual circumstances, under the assumption that the commissioner is unaware of the fact that John serves both as chairman of the hospital board and

[1] Note that there is quite a bit of variation in the literature, both in terminology and substance (for example, the term 'unspecific' is sometimes used as well). Crucially, non-specificity in the relevant sense is distinct from simply leaving the referent unspecified, as in standard uses of indefinites.

as dean - in fact, he doesn't know who holds either office. It is consistent to regard (4) as true in such circumstances while at the same time taking the variant in (6) to be false. This is so because the commissioner has a general goal in his search, which could be characterized as wanting to ensure that he find whatever individual happens to be chairman of the hospital. But given his ignorance as to who fills these roles, this is not generally directed at John. Therefore, the sentences in (4) and (6) are independent of one another (on the relevant interpretation), despite the identity of the actual referents of the two definites. For this to be possible, the object argument of ITVs must contribute something other than its mere extension to the semantic computation.

The existence of an interpretation yielding failure of extensional substitution *salva veritate* (i.e., without affecting the truth-value) is another central property of ITVs. This is, of course, again in stark contrast with regular transitive verbs, e.g., *meet*:

(11) The commissioner met {the chairman of the hospital board = the dean}

When assessing this sentence in circumstances where John serves in both roles, the truth-value of the two variants will necessarily be the same.

While the example of definite descriptions provides the perhaps simplest illustration of the present property, other noun phrases display the same behavior (but see section 4.3.3 for differences between noun phrases). Take the following variants of (4) and (6):

(12) The commissioner is looking for a member of the hospital board.

(13) The commissioner is looking for a professor of medicine.

Now imagine that unbeknownst to the commissioner, all and only the professors of medicine are members of the hospital board. As before, there is a reading of these sentences on which they are independent of one another (i.e., could differ in truth-value), despite the fact that the nominal predicates happen to have the same extension in the world of utterance.

2.2.3 Lack of existential import

The final property standardly considered for ITVs is quite closely related to the previous one, and is based on the notion that it is possible to look for (or want) something that actually does not exist. For example, the following sentence could well be regarded as true in a world where there are no unicorns:

(14) Barbara is looking for a unicorn.

Naturally, one would assume that Barbara takes the existence of a unicorn to at least be possible. But as far as the actual state of affairs in the world that she lives

in is concerned, the existence of unicorns is entirely independent of the truth or falsity of the sentence. Once more, compare this to a regular transitive verb:

(15) Barbara is riding a unicorn.

In order for this sentence to be true in a given world, that world must contain at least one unicorn. This will be true in general for (non-negated) transitive verbs that denote relations between individuals. But we already saw that ITVs must involve denotations of another sort, and the property of lack of existential import further reinforces this notion.

2.2.4 Further properties and considerations

In addition to these traditional criteria for ITVs, (Moltmann, 1997, pp. 6-8) discusses three further properties. The first is yet another correlate of non-specificity and concerns the lack of support for anaphora, as in (16):

(16) #John is looking for a horse. Mary is looking for it too. (Moltmann, 1997)

On the interpretation of interest for the first sentence, it is generally not possible (with certain exceptions, such as modal subordination; see Roberts, 1989, and the chapter on *Modal subordination*) to refer back to the object of an ITV pronominally (parallel to embeddings under attitude verbs; see Karttunen, 1976).

Secondly, Moltmann observes a contrast in the availability of proforms for objects of ITVs:

(17) John is looking for $\{^{OK}$something / #someone $\}$, namely a secretary.

(18) $\{^{OK}$What / #Whom$\}$ is John looking for? - A secretary.

Only impersonal proforms seem to be available for (non-specific) objects of ITVs (though native speaker judgments have been noted to vary in this regard). Similarly, *thing*, rather than *person* is the appropriate noun to be used in characterizing the identity of what two people are looking for:

(19) John is looking for the same $\{^{OK}$thing / #person$\}$ as Mary, namely a new assistant. (Moltmann, 1997)

One question that arises concerns potential differences between the various verbs that have been considered as (candidates for being) ITVs. Do they invariably display all the properties considered here? Or are these independent from one another, at least to a certain extent? And if the latter, which properties - if any - are crucial for classifying a given verb as an ITV? The survey of the inventory of potential ITVs in the next section will provide some initial insights into these questions.

2.3 The inventory of intensional transitive verbs

A variety of lexical items have been considered in connection with ITVs, usually with some rough descriptive classification. The following is an attempt at a fairly comprehensive survey of the cases mentioned in the literature. Given the current state of the literature, the discussion is mostly focused on English. I also comment on some of the (obvious or, in some cases, perhaps just apparent) limitations with regards to the properties discussed above. I close the section by reviewing potential empirical generalizations about relations between these properties.

Search verbs constitute one major class of ITVs.[2] In addition to the classical cases of *seek* and *look for*, these include the following:

(20) a. *search for, hunt for, ransack . . . for, rummage about for, listen for* (Partee, 1974)
b. *quest for* (Larson, 2002)
c. *scan for* (Forbes, 2006)

It immediately stands out that English displays an at least somewhat productive pattern involving the preposition *for* (which may require a somewhat loose interpretation of the term 'transitive', if *for* heads a prepositional phrase).[3] While this would seem to call for consideration of a potential compositional break down of the verb root and *for*, I am not aware of any existing proposal along these lines. It's also worth noting that not all (complex) verbs with *for* yield a verb of search - Partee (1974) mentions *advertise for*, for example, and several others appear below.

Verbs relating to an agent's desires form another class. Examples include:

(21) a. *want* (Quine, 1956)
b. *long for* (Moltmann, 1997).
c. *desire*, *lust for*, *insist-on* (Larson, 2002)
d. *hope for*, *hunger for*, *prefer* (Forbes, 2006)

Moltmann classifies these as 'psychological verbs of absence', and contrasts them with 'modal verbs of absence', which include the ones in (22a) and (22b). Relatedly, Forbes mentions *omit* as falling into the 'absence' category, as well as verbs of requirement (23) and transaction (24).

(22) a. *need*, *lack*, *is due to*, *promise*, *owe*, *prevent* (Moltmann, 1997, pp. 40-43)

[2]Note that the grouping under a more general label here and below is purely descriptive based on intuitive conceptual commonalities. The lines could be (and in some cases have been) drawn differently, and it is an entirely open question whether the formal properties of verbs within any such grouping are uniform and what the extent of any potential variation might be.

[3]Interestingly, similar observations can be made about other languages, e.g., German (*suchen nach*) and Spanish (*buscar a*), though the preposition appears to be optional there. More comprehensive cross-linguistic investigations clearly are in order.

b. *guard against*, *ask for* (Partee, 1974)

c. *require*, *demand* (Larson, 2002)

d. *omit* (Forbes, 2013, p. 6)

(23) *cry out for*, *deserve*, *merit* (Forbes, 2006)

(24) *wager*, *buy*, *sell*, *reserve*, *order* (Forbes, 2006, 2013)

Yet another class of ITVs crucially involves some form of comparison:

(25) a. *resemble* (Zimmermann, 1993)

b. *compare*, *differ* (Moltmann, 1997)

c. *be-similar-to*, *simulate*, *remind-one-of* (Larson, 2002)

d. *imitate*, *be reminiscent of* (Forbes, 2006)

e. *different*, *-er* [comparative], *like* [as a preposition] (Moltmann, 1997)

In addition to the verbs in (25a) and (25b), Moltmann includes the non-verbal predicates in (25e) here as well. While this raises the interesting question as to what the relationship between verbal roots with the relevant properties and expressions of other syntactic types might be, we will continue to focus on the verbal cases.

Verbs of creation and depiction, such as those in (26), are also commonly considered as (candidates for) ITVs:

(26) a. *imagine*, *paint* (Zimmermann, 1993)

b. *write*, *draw*, *plan*, *conceive* (Moltmann, 1997)

c. *picture*, *suppose*, *envisage*, *envision*, *fancy*, *visualize* (Larson, 2002)

d. *assemble*, *bake*, *build*, *construct*, *fabricate*, *make* (Forbes, 2006)

e. *sculpt* (Forbes, 2013)

f. *caricature*, *portray*, *show* (Forbes, 2006)

Larson (2002) introduces several additional verbs as ITVs. One group consists of 'verbs of expectation or presumption'. In the same vein, Forbes (2006) also includes a number of verbs of anticipation.

(27) a. *expect*, *anticipate*, *foresee*, *await*, *presuppose* (Larson, 2002)

b. *allow for*, *plan*, *wait for* (Forbes, 2006).

By and large, the literature takes the verbs in the classes considered so far to exhibit all three of the standard properties of ITVs (with some exceptions; see below). However, it should be emphasized that each combination of a given verb and property needs to be scrutinized individually. In many cases, there are potential confounds that make a proper assessment more difficult, and specific assumptions about the exact lexical semantics of a given entry may affect the outcome as well.

In any case, it would be theoretically interesting if the three main properties always came as a package empirically, despite their logical independence. However, a number of cases have been proposed to only satisfy the relevant properties to a limited extent, thus showing that they do not necessarily appear together in natural language. The remainder of this section reviews such more varied cases, as well as potential candidates for ITV-status that have been discarded in the literature.

In addition to the fairly standard inventory of groups of ITVs considered above, Moltmann (1997) proposes two additional classes, neither of which straightforwardly displays the property of existential import. Nonetheless, Moltmann considers them as intensional, based on their other properties. The first class consists of 'Epistemic verbs' (or 'cognitive verbs'):

(28) *see*, *feel*, *hear*, *distinguish*, *recognize*, *discriminate* (Moltmann, 1997, p. 43)

She illustrates her motivation for counting these as intensional for the case of *recognize* as follows:

(29) a. When John talked to his wife yesterday, he recognized a genius. #Bill recognized her too.

b. John recognized what Bill recognized, namely a person with extraordinary abilities.

Since Moltmann takes the need for an impersonal proform to be indicative of ITVs, *recognize* clearly meets the mark. (Extensional substitution also would seem to fail in this case.)[4]

A second novel class of ITVs that Moltmann proposes is introduced under the label of 'resultatives', e.g., cases involving appointment to some type of position:

(30) *appoint*, *hire*, *elect*, *choose*, *find*[5]

Among other things she notes that (at least on one reading) (31) is not appropriately paraphrased as (32a), but rather as (32b) (or (32b')):

(31) John is hiring an assistant.

(32) a. There is an assistant x such that John is hiring x.

b. There is an x such that John is hiring x as an assistant.

(Moltmann, 1997, p. 46)

[4]Another case that Moltmann discusses is that of *count*, though here things are somewhat more complex, and we will skip a more detailed discussion in the interest of space. See Voloshina (2014) for some recent discussion.

[5]Moltmann describes *find* as multiply ambiguous, with roughly the following senses: a) come across (extensional); b) recognize (as in *John found a student who could solve the problem*), c) parallel to *appoint*, as in *John found a secretary*.

b' John is hiring someone to be an assistant.[6]

This captures the intuition that prior to the hiring, there need not have been an assistant. While this comes close to meeting the property of lack of existential import, it is not exactly the same - note the wide-scope of the existential quantifier in the paraphrase in (32b). Relatedly, Moltmann points out that if John hired an assistant, and the person he hired as an assistant happens to be Mary's babysitter, it still does not follow that John hired a babysitter (in contrast, this inference goes through with regular transitive verbs such as *meet*). This is, of course, at least roughly parallel to the property of failure of extensional substitution.

Forbes (2013) and Larson (2002) consider yet another class of ITVs, under the respective labels of 'evaluatives' and 'verbs of veneration and worship':

(33) a. *respect, admire, disdain, worship, lust (after), fear* (Forbes, 2013)
b. *venerate, revere, adore, reverence idolize, honor* (Larson, 2002)

This class is not entirely novel, as Montague (1969) already considered *worship* (on *fear*, also see Kaplan, 1986). However, it is once again by no means clear that these verbs should be considered as ITVs fully on par with the cases considered initially. In particular, as pointed out by (Zimmermann, 1993, p. 157), *worship* may be better understood as an 'extranuclear' predicate (Parsons, 1980), which can be true of objects that do not exist. In other words, if John worships a Greek godess, there has to be some particular Greek godess (that happens to be non-existent) that he in fact worships.

Two additional verbs that have been controversial in the literature should be mentioned here. First, Montague (1973) suggested that raising verbs such as *appear* should be seen as verbs with an intensional subject position. However, Zimmermann (1993) disagrees with this assessment and proposes a raising analysis of *appear* instead, where the subject ends up inside of a clause that *appear* takes as its complement at the level of interpretation.[7]

Secondly, the verb *own* has been discussed in the context of ITVs (Zimmermann, 1993, who attributes the original observations to Mats Rooth). It seems to allow for non-specific interpretations:

(34) Mats owns 75% of the ball bearings in the basement.

This can be claimed without it having been sorted out which particular ball bearings belong to Mats. But at the same time, it is not obvious that it fails extensional substitution. Indeed, Zimmermann (1993) considers it to be a case where non-specificity and failure of extensional substitution come apart. In Zimmermann

[6] An anonymous reviewer suggests this as a more appropriate paraphrase of the intended interpretation, which arguably reflects that being an assistant is distinct from, say, being a babysitter in a more transparent way.

[7] This effectively puts it on par with clausal analyses of ITVs.

(2001), however, the issue is investigated in more detail, with the conclusion that *own* is either intensional, despite the initial appearances, or does not have a genuinely non-specific interpretation (see also the analysis of Moltmann, 1997, which sees *own* as an instance of a verb taking an intensional quantifier as its argument (see below)).

Overall, we are thus left with a picture where the three properties we have focused on are empirically correlated. This correlation is most probably not a perfect one: *rise* is commonly assumed to fail extensional substitution (Montague, 1973; Romero, 2008, among many others), but is generally specific and ensures existential import. And *remember* seems to fail extensional substitution and lack existential import, yet be specific. Nonetheless, the strong tendency of these properties to cluster together remains in need of a deeper explanation.

3 The analytical challenge and possible solutions

3.1 Possible variations in structure and meaning

Given the differences between ITVs and regular relational transitive verbs, the analytical challenge is to come up with semantic entries that capture the properties detailed above. Assuming they combine directly with their (apparent) objects, their non-specificity requires object arguments of higher order, i.e., going beyond type e. And their intensional nature requires appeal to functions that take possible worlds as arguments. The nature of such a proposal then will also have to ensure lack of existential import (at least where appropriate). The literature contains three main proposals for analyzing ITVs.[8] The first, originating with Quine (1956, 1960), chooses a different route and denies that they are transitive verbs relating noun phrases to one another in the first place. It assumes, instead, that they take a clausal complement, and that the putative object noun phrase features in the proposition it introduces, much (or perhaps even exactly) as it would with verbs that take clausal complements. The second, due in its original form to Montague (1970, 1974), raises the types of ITVs so that they combine with intensions of quantifiers. Finally, the proposal by Zimmermann (1993) is that they take arguments of the type of properties ($\langle e, st\rangle$ or $\langle s, et\rangle$). This section provides a brief introduction to the details of these three analyses, and sketches how they capture the three properties above. The next section then turns to empirical points that have been argued to support or challenge specific analyses.

[8] Another family of proposals is based on the idea that (at least some) noun phrases may quantify over 'intentional' objects rather than ordinary individuals; see, e.g., Zimmermann (2006); Moltmann (2013), and the brief related discussion in section 4.5.

3.2 Clausal complement accounts

The propositional analysis of ITVs finds its initial motivation in the fact that their properties seem to parallel those of verbs taking clausal complements (e.g., attitude verbs such as *believe*), and that many of them indeed can themselves appear with overt clausal complements.

(35) John believes that a unicorn lives in the woods behind his house.

(36) a. John wants a unicorn.
b. John is looking for a unicorn.

(37) a. John wants (for) {John/himself} to have a unicorn.
b. John is endeavoring (-to-cause) himself to find a unicorn (Quine, 1960)
(Or simply: John is trying to find a unicorn)

Since the indefinite *a unicorn* in (35) can be interpreted relative to the agent of *believe*, the sentence can be uttered truly without there actually being a unicorn. Furthermore, John is not necessarily said to believe of some particular individual that it is a unicorn, he may just think that there is some unicorn or other in the woods. Finally, extensional substitution with another non-actualized predicate - say, *a 13-leaf clover* -, will not ensure the same truth-value. Given these parallels, Quine concludes:

> 'Whenever sentences capable of containing 'want' or 'hunt' or 'look for' in an opaque sense are up for consideration in an at all analytic vein, it behooves us forthwith to paraphrase them into the more explicit idiom of propositional attitude.' (Quine, 1960, p. 156)

The central tenet of this analysis thus amounts to the claim that the interpretation of the sentences in (36a) and (36b) in fact is exactly equivalent to (37a) and (37b) respectively. On this view, ITVs are not actually transitives relating the denotations of two noun phrases to one another, but rather contain hidden clausal structure, and thus essentially only differ in what material is phonologically realized (McCawley, 1974; den Dikken et al., 2018) (see chapter on *Concealed questions* for similar proposals that assume *knowing the price of milk* involves a covert embedded question). The structure posited by den Dikken et al. (2018) is the following (where capitalized expressions are covert):

(38) John$[_{VP}$wanted$[_{CP}[_{C'}$ FOR $[_{AgrSP}$ PRO TO$[_{VP}$ HAVE a beer]]]]]

On this approach, the semantics of ITVs is entirely on par with that of attitude verbs such as *believe*, taking a proposition and an individual as arguments. The denotation of *want*, for example, relative to a world w (indicated by the parameter on the interpretation function), could be characterized as in (39). The truth-conditions of (36a) would then be as in (40).

(39) $[\![\textbf{want}]\!]^w = \lambda p_{\langle s,t\rangle}.\lambda x_e.\forall w'\big[[\text{John's desires in } w \text{ are met in } w'] \rightarrow p(w')\big]$

(40) $[\![\textbf{John wants a unicorn.}]\!]^w = 1$ iff

$$\forall w'\big[[\text{John's desires in } w \text{ are met in } w'] \rightarrow \exists x[x \text{ is a unicorn in } w' \text{ \& John has x in } w']\big]$$

'(40) is true in a world w if and only if John has a unicorn in all worlds w' in which John's desires in w are satisfied'

An account of the properties of ITVs along these lines will simply be a special case of a more general account of clause-embedding predicates. For example, if the existential quantifier takes scope inside of the embedded clause, i.e., below the matrix verb, a non-specific reading results. This also ensures that the nominal predicates will be interpreted relative to the desire-worlds w', which accounts for the failure of extensional substitution and lack of existential import as well.

At least from a certain perspective, this type of syntactic account of ITVs is rather constrained and parsimonious. Indeed, den Dikken et al. (2018) and Larson (2002) couch it within a more general approach - sententialism - that assumes strong grammatical conditioning of intensionality, in that it is only introduced at the level of clausal complementation. In this regard, determining what constitutes the best analysis of ITVs is of central importance for understanding the general role of intensionality in natural language, specifically with regards to its relation to grammar.

3.3 Intensional quantifiers

The second account to be considered here assumes that ITVs do express relations between noun phrase denotations, but takes them to differ from regular relational transitives in terms of the semantic types of their arguments (Montague, 1970, 1974; Moltmann, 1997; Richard, 2001). Montague's original version proposes to analyze ITVs as relations between individuals and intensional generalized quantifiers.[9] The denotation of an ITV like *want* would then have the following formal format:

(41) $[\![\textbf{want}]\!]^w = \lambda Q_{\langle s,\langle et,t\rangle\rangle}.\lambda x_e.\text{want}(Q)(x)(w)$
'A function that maps the intension of a quantifier to functions mapping individuals to true if they stand in the *want*-relation to that quantifier.'

A crucial remaining question is what exactly the requirements imposed by the meta-language predicate 'want' are. This can be spelled out in a variety of ways. Most generally, we could adapt the proposal by Moltmann (1997) by paraphrasing the truth conditions of sentences such as (36a) as follows:[10]

[9] Montague himself actually took all verbs to have this highest possible type and augmented verbs that did not make any use of the intensional aspect with meaning postulates.

[10] Note that I'm only following Moltmann's format here very loosely, in a way that does not capture all the details of her proposal. Among other things, she introduces partial situations to capture certain effects with quantifiers such as *exactly two* and *at most two*.

(42) $[\![\textbf{John wants a unicorn.}]\!]^w = [\![\textbf{want}]\!]^w([\![\textbf{a unicorn}]\!]_{\mathbb{c}})([\![\textbf{John}]\!]^w) = 1$ iff
$\forall w'[[\text{ John's desires in } w \text{ are met in } w'] \rightarrow [\{y|\ R(j)(y)(w')\} \in [\![\textbf{a unicorn}]\!]^{w'}]]$

To paraphrase, this again imposes a requirement on the worlds in which John's desires are met, but it expresses it differently, by saying that the set of individuals to whom John stands in a contextually relevant relation R in a given world w' is an element of the extension of the generalized quantifier expressed by *a unicorn* in that world (recall that (extensions of) generalized quantifiers of type $\langle et, t\rangle$ are equivalent to sets of sets).

The central properties of ITVs are straightforwardly captured on this account: since *a unicorn* contributes its intension to the interpretation, different worlds w' can contain different sets of unicorns, which leads to failure of extensional substitution. Furthermore, this is consistent with there not being any unicorns in the world of utterance w, and thus predicts lack of existential import. Finally, even if two worlds happen to contain the same individual unicorns, John could stand in relation R to one in one of them and to another one in the other. In other words, the noun phrase is interpreted non-specifically.

One aspect of this proposal that needs to be fleshed out is what exactly R stands for and how this is determined. While Moltmann relies on the context to supply this, an alternative view is that a more specific predicate is part of the lexical entry of a given ITV. The prime candidate is the predicate *have* (or some more general predicate of possession, perhaps on par with that present in possessives). Indeed, the analysis by Dowty (1979) is an instantiation of this view. The object language ITV *want* combines with a quantifier, but on the level of the meta-language, the predicate 'want' involves the standard relation between and individual and a clausal denotation, which I assume to be a proposition.[11] The proposition in question, in turn, features the meta-language predicate 'have':

(43) $[\![\textbf{want}]\!]^w = \lambda Q_{\langle s,\langle et,t\rangle\rangle}.\lambda x.\text{want}\big(\lambda w'.Q(w')(\lambda y.x \text{ has } y \text{ in } w')\big)(w)$

In a sense, Dowty's analysis is a hybrid between an intensional quantifier account and a clausal account, in that it lexically decomposes the content of the clause posited by syntactic accounts and builds it directly into the denotation of the ITV-version of *want*. Note that while Dowty takes the additional predicate and resulting proposition to feature directly in the denotation of ITVs, Montague (1974) assumes that correspondence with clausal paraphrases can be captured by meaning postulates, where appropriate.

The question of what predicates are involved in the characterization of the propositional complement of *want* (and other ITVs) will be taken up in more detail in section 4.1. For the moment, the main point was to show how letting ITVs combine with intensions of quantifiers (type $\langle s, \langle et, t\rangle\rangle$ or some variant thereof) can capture their central properties.

[11] Dowty himself seems to analyze at least some of the relevant infinitival clauses as contributing properties, but this is largely orthogonal to the present discussion.

3.4 Property-denoting object NPs

The property analysis, first proposed by Zimmermann (1993) (see also Van Geenhoven & McNally, 2005), takes yet another perspective on ITVs and their complements. Like the intensional quantifier approach it takes ITVs to directly combine with the object noun phrase. But the type it assumes for this argument is that of a property, i.e., type $\langle s, et\rangle$ (or $\langle e, st\rangle$). At least since Partee (1986), it has been well-known that (certain) noun phrases can be seen as having a property denotation. In particular, indefinite (or more generally, existential) noun phrases can be identified with the sets of objects that have the property introduced by the nominal predicate (the motivation for the restriction to those noun phrases that can have such a denotation will be examined below). The general formal format for the ITV *look for* then is as follows:

(44) $[\![\textbf{look for}]\!]^w = \lambda P_{\langle s,et\rangle}.\lambda x.\text{look-for}(P)(x)(w)$
'A function from properties to functions mapping individuals to true if they stand in the 'look-for'-relation to that property.'

Parallel to the issue we faced with the intensional quantifier approach, there is a question as to what exactly it takes for the meta-language predicate 'look-for' to relate an individual to a property. Presumably, it will characterize worlds where the subject's search was successful as ones that involve finding some entity or other that has the property in question:

(45) $[\![\textbf{John is looking for a unicorn.}]\!]^w = 1$ iff
in all worlds where John's search is successful, there exists a unicorn that he finds.

Just like in the case of the intensional quantifier analysis, these details could be specified directly in the denotation of *look for*, or, alternatively, be encoded through a lexical generalization (a meaning postulate) such as the one in (46), which states the equivalence of *look for* and *try to find*:

(46) $\text{look-for}(P)(x)(w) = \text{try}\big(\lambda w'.\exists y[P(w')(y) \,\&\, \text{find}(y)(x)(w')]\big)(x)(w)$

The property analysis accounts for the main properties of ITVs as follows: since the object noun phrase does not contribute any quantificational force of its own, a non-specific reading is directly possible (specific readings can be derived through various types of scoping mechanisms). The intensional nature of ITVs is captured because the nominal predicate contributes its intension to the computation, which can then be evaluated relative to the worlds in which the search's success is considered. This ensures failure of extensional substitution. Lack of existential import follows from the fact that the search may not be successful to begin with in the world of utterance.

4 Empirical considerations for differentiating the accounts

In this section, I will turn to some more detailed issues that have been argued to inform the choice between the proposals introduced above. Perhaps needless to say, empirical arguments against one account or another may be successfully countered by further additions to that account. So the point here is not so much to conclusively settle the choice of one analysis over another, but rather to lay out the support and possible challenges for the accounts that have been brought forth in the literature. In fact, some of the evidence points towards more than one account being needed, based on differences between (classes of) ITVs. I begin by looking at empirical points relating to clausal accounts in more detail. Next, I consider the motivation of property accounts based on differences between different types of object noun phrases for ITVs, as well as evidence for differences between ITVs. Finally, I briefly sketch some more intricate issues with higher order quantificational objects.

4.1 Clausal accounts

4.1.1 Reflexes of hidden clausal structure

A chief motivation for seeing ITVs as involving hidden clausal structure, beyond the mere availability of clausal paraphrases, is provided by a fairly wide range of parallels between ITVs and their clausal counterparts. As discussed first by McCawley (1974) and Partee (1974), ITVs display an ambiguity with adverbial modification that corresponds precisely to the syntactic attachment ambiguity with clausal complements. To begin with, the following sentence is most intuitively understood as describing the time for which Bill wants to have your apartment, rather than characterizing the time frame during which his desire holds.

(47) Bill wants your apartment {until June / for 6 months / while you're in Botswana} (McCawley, 1974)

The availability of this interpretation, which can straightforwardly be captured if we assume that the ITV *want* has a covert clausal complement, becomes even more clear when we consider cases with two conflicting pieces of temporal information:

(48) a. A week ago, Bill wanted your car yesterday. (McCawley, 1974)
b. A week ago, Bill wanted to have your car yesterday.
c. #A week ago, Bill drove your car yesterday.

(49) a. The foundation has demanded a report by next month. (Partee, 1974)
b. The foundation has demanded to have a report by next month.
c. #The foundation has written a report by next month.

The two temporal modifiers in (48) are incompatible with one another, as witnessed by the inappropriateness of (48c) with a relational transitive verb. However, the ITV *want* can tolerate these just fine, on par with its overt clausal counterpart. In (49), the same can be observed for the temporal information introduced by the past tense on *demand* and future-oriented modifiers.

Schwarz (2006) extends this line of evidence by considering modification of the embedded clause by *too* and *again*, looking at cases with the ITV *need*. We'll use *again* for illustration here, which has been used to identify different possible attachment sites for a number of constructions in the literature (e.g., double objects; see von Stechow, 1996; Beck & Johnson, 2004). The following scenario provides a setup where the presupposition of the high attachment readings is not satisfied while that of the low attachment readings is.

(50) Several years ago, John inherited everything his grandfather owned, including a few surprise items. For example, he found a brand new Mercedes in the garage. As he was living in Manhattan at the time, he really didn't need a car at all. He kept the Mercedes in a garage for a while, and then decided to sell it - he never regretted it, since he just didn't need it. Last month, John accepted a new job in upstate New York.

(51) He definitely needs a car again while he lives up there.

a. low attachment presupposition (satisfied in context):
John had a car before.

b. high attachment presupposition (NOT satisfied in context):
John needed a car before.

The fact that the sentence is entirely felicitous in the given context provides evidence for the availability of a low attachment interpretation. A further upshot of the facts with *again* is that they may provide more decisive evidence in favor of a syntactic propositional account. With regards to the adverb-facts above, Dowty (1979) considers the possibility of adjusting the meaning of *want* and the adverbs so as to allow low modification at the level of lexical decomposition, without any syntactic clausal structure. However, at least if we follow the structural analysis of *again* in von Stechow (1996), the *again*-facts with ITVs would be indicative of the presence of clausal structure in the underlying syntax.

Another observation by McCawley (1974) in favor of a clausal analysis is that ITVs license pronominal reference to the embedded clause:

(52) a. Joe wants a wife, but his mother won't allow $\{^{OK}$it / *her / *one$\}$.

b. Bill wants a Cadillac and a Volkswagen, and his girlfriend wants that too.

(McCawley, 1974)

The most natural interpretation of (52a), of course, is that Joe's mother will not allow him to have a wife. And the fact that only *it* is available in (52a), in contrast with *her* and *one*, suggests that the antecedent here is not *a wife*, but something like *have a wife* (or perhaps *him having a wife*). Similarly, while pronominal reference to the conjunction in (52b) would require *them* (which would be possible but enforce a specific interpretation, as McCawley points out), the abstract proform *that* seems to have as its antecedents something like the corresponding hidden clause with *have*.

Finally, den Dikken et al. (2018) point to data involving ellipsis to support the clausal view:

(53) A: Do you want a beer?
B: I can't $[_{VP}\emptyset]$, but I will $[_{VP}\emptyset]$ just this one time.
(den Dikken et al., 2018)

(54) Jonathan wants more toys than Benjamin.
(den Dikken et al., 2018, attributed to David Pesetsky, p.c.)

In (53), B's reply is understood as suggesting that he can't, but will, have a beer - i.e., the elided clause seems to correspond to the covert clausal complement of *want*. The case of comparative ellipsis in (54) once more involves a crucial ambiguity, namely whether the comparison is with how many toys Benjamin has or how many he wants.

All the phenomena reviewed here are straightforwardly accounted for if the ITVs in question have a covert clausal complement. They constitute challenges for the other two accounts, as they do not straightforwardly offer any access to content corresponding to the embedded clause posited by clausal accounts. It may be possible, at least for some cases, to capture these phenomena by further varying the types of the expressions involved (as in Dowty's (1979) account of adverbial modification within a lexical decomposition analysis), but the path to such extensions by no means seems clear. That being said, clausal accounts do face their own needs for elaboration and challenges as well. I first turn to questions about the precise nature of the hidden complement, and then review some remaining challenges.

4.1.2 What is the content of covert clausal complements?

One important question that has to be settled if we assume a clausal account is what the precise nature of the hidden clausal structure is. As McCawley (1974) already noted, we could either assume that there is one specific English verb (most plausibly *have*) that is deleted, or that there is a range of English verbs that are possible here. Alternatively, there might not be any specific expression involved at all, but rather a (contextually supplied) semantic object (perhaps introduced through a contextual variable). Initial evidence for the first option comes from the fact that *want* seems to pattern with *have* in terms of its selectional restrictions (McCawley, 1974; Ross, 1976; den Dikken et al., 2018):

(55) I {want / have} { a cold / a sister / freedom / a driveway / sentencehood} (Ross, 1976)

However, the parallel is far from perfect, as already noted by McCawley (also see Harley, 2004; Wechsler, 2005; Marušič & Žaucer, 2006; Schwarz, 2006, for further discussion):

(56) #I want a blast (cf. I want to have a blast) (McCawley, 1974)

If we assume that (at least certain) ITVs involve a silent *have*, one interesting question concerns the cross-linguistic availability of such ITVs, specifically with respect to languages that lack a lexical item for *have*. While most semantic work on ITVs has been limited to English, this particular issue has recently received more attention from a typological perspective. In particular, Harves & Kayne (2012) examine a wide range of languages and classify them with respect to whether or not they have a lexical verb of possession corresponding to *have*. They also assess whether the languages have a transitive lexical verb *need*, and find an interesting gap in their sample: if a language fails to have a lexical correlate of *have*, it also does not have a lexical correlate of *need*. This result would seem to strongly support an analysis of *need* as crucially involving *have*, and Harves & Kayne (2012) present an analysis based on such an argument. However, the validity of this correlation has been contested: Antonov & Jacques (2012) report various exceptions, including Estonian, varieties of Arabic, several Bantu languages, and Ayacucho Quechua, which they argue do exhibit the relevant combination (a lexical item for *need*, but none for *have*). Halpert & Diercks (2013) argue along the same lines based on evidence from various Bantu-languages, (including Zulu, Setswana, and Swahili).

At a structural level, there also is a question of just how complex the hidden structure is. Some proposals assume it to be a full infinitival clause, as on den Dikken et al.'s (2018) proposal presented in (38) above. However, there is at least some evidence that may speak against this. First, placement of adverbs is more limited with ITVs than with overt infinitival clauses:

(57) a. I need to finally have a laptop.
b. *I need finally a laptop (that works reliably every time I use it).
(Schwarz, 2006)

Secondly, as noted by Wechsler (2005), the availability of readings based on low modification of clause-final adverbs turns out to be more limited than for overt infinitival clauses as well. In particular, durational adverbs seem to not be able to modify the embedded clause in the following examples:

(58) John needed a beer in thirty seconds.
CANNOT mean: 'John needed to [drink a beer in thirty seconds]'
(inspired by Wechsler 2005)

(59) *Hans brauchte schnell ein Bier*
Hans needed quickly a beer
CANNOT mean: 'He needed to [drink a beer quickly]' German

In (58), *in thirty seconds* can only specify the time within which John's need arises. It cannot specify that in John's need-worlds, the drinking takes place within thirty seconds. Similarly, *schnell* 'quickly' in the German example in (59) can only express that Hans needs to have the beer soon, not that the drinking needs to happen quickly. It is worth noting that while at least the English case can be paraphrased with *have*, no notion of possession in a narrow sense is expressed, but rather one of consumption.

Another piece of evidence that the overt and the covert complement cases behave differently comes from German *brauchen* 'need'. *Brauchen* can either take an infinitival clause (with *zu* 'to') or a nominal complement. Interestingly, the two come with different requirements. When it combines with an infinitival clause, it behaves like a negative polarity item, i.e. it has to be licensed, for example by *kein*. But when it combines with a nominal, no such restrictions exist:

(60) a. *Hans braucht keine Angst zu haben.*
Hans needs no fear to have
'Hans doesn't need to be afraid.'
b. **Hans braucht Angst zu haben.*
Hans needs fear to have

(61) *Hans braucht (kein) Geld.*
Hans needs (no) money
'Hans needs (no) money.'

If the overt and covert complement forms were completely identical with respect to their structure and only differed in what parts of the complement are pronounced, this contrast would be unexpected. For alternative proposals on what the covert structure might involve, see Harley (2004); Marušič & Žaucer (2006); Schwarz (2006).

4.1.3 Summary

There are some strong indications of the presence of clausal structure with (at least some) ITVs. In addition to the existence of straightforward paraphrases, these include the possibility of modifying the assumed embedded clause, pronominal reference to it, and ellipsis. Some questions remain as to what exactly the content and structure of that clause are. An additional challenge, discussed in some detail by den Dikken et al. (2018), is the availability of passive structures for ITVs, in contrast with their ungrammaticality for the assumed clausal counterparts:

(62) a. A cracker was hoped for.

b. *Max is hoped (for) to have a cracker.

(den Dikken et al., 2018)

Readers are referred to den Dikken et al. (2018) for details on a possible account of this based on a restructuring analysis. Several other challenges have been raised in the literature (see, e.g., Montague, 2007), but ultimately, they only seem to show that not all ITVs are amenable to a propositional analysis. I therefore save a more detailed discussion of these for section 4.3.

4.2 Limits on the types of objects with intensional readings

4.2.1 Restrictions on objects of ITVs

Let us now turn to the central empirical argument for the property analysis, which is based on the claim that low scope readings are absent with truly quantificational DPs (Zimmermann, 1993). It is actually not trivial to demonstrate that this is so, because many constructions that originally were analyzed as generalized quantifiers (e.g. in Barwise & Cooper, 1981) now have alternative analyses (Partee, 1986; Reinhart, 1997; Kratzer, 1998; Matthewson, 2001). But let us begin by considering the example Zimmermann uses to motivate his case:

(63) a. Alain is seeking each comic-book.
b. Alain is trying to find each comic-book.

Crucially, there is a contrast here between the possible readings of the two sentences. Both can have the wide-scope reading with an extensional interpretation of *comic-book* in (64a), but only (63b) can have the narrow scope and intensional reading in (64b):

(64) a. 'For every comic book in (the world of utterance) w, it holds that Alain tried to find it.'
b. 'Alain tried to find every comic-book (whatever the comic-books may turn out to be)'

Some people find it hard to get the intensional reading with *each* even for (63b), and it is sometimes claimed that *each* has a strong wide-scope preference. Since *every*, on the other hand, has problems of its own (discussed by Van Geenhoven & McNally, 2005; Zimmermann, 1993), Schwarz (2006) suggests looking at *most* as another clearly quantificational determiner for additional evidence. Consider (65) in a context where Matt is running the book tables at a conference and wants to ensure that he has enough change available:

(65) Matt is looking for most of the small bills that were in the cash-box.

For the most part, speakers find (65) odd in this context, because it can only mean that Matt is looking for particular bills, and not that he is simply trying to find the majority of the bills. In other words, it can have the meaning in (66a) but not the one in (66b):

(66) a. 'For the majority of particular individual bills it holds that Matt is trying to find them.'

b. 'Matt is trying to bring it about with his search that he end up with the majority of the bills (without caring about which particular bills he ends up with).'

If so, (65) does not seem to have a non-specific interpretation. (But note that not all speakers seem to share this judgment.) Next, compare (65) to (67):

(67) Matt is looking for some of the small bills that were in the cash-box.

This sentence very clearly has a reading on which Matt doesn't care which particular bills he will find, but just needs to find some change, i.e. it is ambiguous between the readings in (68a) and (68b):

(68) a. 'There is some particular (set of) small bill(s) for which it holds that Matt is trying to find it.'

b. 'Matt is trying to find some small bills (but he doesn't care which particular bills he finds).'

Forbes (2013) makes parallel points for depiction verbs by observing that neither one of the following sentences has a non-specific interpretation:

(69) a. Guercino drew every dog.

b. Guercino drew most dogs.

(Forbes, 2013)

Zimmermann's (1993) generalization about which noun phrases allow for non-specific, intensional interpretations is that it is precisely the weak quantifiers, i.e., those which can be type-shifted to a property denotation (type $\langle e, st \rangle$, Partee, 1986) that fit the bill. This falls out as a prediction from the property analysis, since it takes the object noun phrases of ITVs to contribute a property to the semantic computation. The other two accounts, on the other hand, face a problem of over-generation: the intensional quantifier analysis predicts that any noun phrase (assuming it can denote a generalized quantifier, which at least in a Montagovian framework, is true for all) can play this role.[12] Similarly, propositional accounts will have to allow for some scoping mechanism that allows for a low-scope position within the posited hidden clause. This position presumably would be available for any type of noun phrase (that can take scope) as well.

[12] Moltmann (1997) tries to capture some of the limitations with *look for*, but as far as I can see, her account does not extend to the present case.

4.2.2 Further issues for property analyses

While the property account as proposed by Zimmermann (1993) neatly captures the data just discussed, various issues remain that may require adjustments or additions. (In addition, there are issues concerning the generality of the property account, which we will defer until section 4.3.) The first problem was already noted by Zimmermann himself: at least in certain cases, even a quantifier like *every* seems to give rise to an intensional reading:

(70) I'm looking for every typo in this manuscript. (Zimmermann, 1993)

(70) can be uttered in a context where the speaker is reviewing some manuscript for the first time and has no idea of what specific typos there might be. And at least on a standard account, *every* cannot be straightforwardly shifted to a property denotation. However, Van Geenhoven & McNally (2005) propose (following suggestions by Zimmermann, 1993; Moltmann, 1997) that *every* can be analyzed as contributing a maximality operator that provides access to the group of typos (in the example at hand) as a whole. This allows for a straightforward shift to the property corresponding to that group. What remains to be fleshed out is just in what circumstances this interpretation becomes available.[13] But presumably, the corresponding readings are not the norm with ITVs, so it will be desirable to wind up with a mechanism yielding the maximality interpretations that is in some way limited.[14]

Another issue that is highlighted by Van Geenhoven & McNally (2005) concerns the relationship between extensional and intensional interpretations of ITVs and their objects. Zimmermann (1993) merely hints at the use of standard scoping mechanisms to derive wide scope interpretations for property-denoting objects, thus suggesting that extensional interpretations are derived from intensional ones.[15] However, Van Geenhoven & McNally (2005) argue that this fails to capture the fact that bare plurals, which are also commonly assumed to denote properties, only can be interpreted intensionally:

(71) Max is looking for books on Danish cooking (Carlson, 1977)

This sentence does not have an interpretation according to which there is a certain set of books on Danish cooking that Max is looking for. Furthermore, West

[13] Note that not everyone agrees on this point: Forbes (2013) argues that there are no restrictions on quantifiers with search verbs, and an anonymous reviewer argues that sentences such as *The police are looking for everyone who witnessed the incident.* do not involve any special interpretation of *every*.

[14] A further set of cases that have been used to argue for the availability of intensional readings with quantificational noun phrases includes *at most 3*, *exactly 3*, etc. However, as Van Geenhoven & McNally (2005) argue convincingly (following Krifka, 1999) these cases can also be analyzed as involving property denotations.

[15] See Zimmermann (2005) for further discussion of the relation between the two interpretations.

Greenlandic exhibits morphemes that make intensional interpretations available, and which - parallel to English bare plurals - do not allow extensional ones:

(72) *Juuna-p atuakka-mik ujar-lir-p-u-q*
J.ABS book-INST.SG look.for-AP-IND-[-tr]-3SG
'Juuna is looking for any book.'
(attributed to Bittner, p.c. in Van Geenhoven & McNally, 2005)

(73) *Vittu marlun-nik cykili-sscar-siur-p-u-q.*
V.ABS two-INS.PL bike-FUT-look.for-IND-[-tr]-3SG
i. 'Vittus is looking for any two bikes.'
ii. #'There are two bikes such that Vittus is looking for them.'
(Van Geenhoven & McNally, 2005)

To capture this relative independence of extensional and intensional interpretations, Van Geenhooven and McNally propose that English verbs like *look for* are indeed ambiguous (in a systematic way, e.g., based on the general availability of operations on the lexicon[16]), with a simple relational interpretation in addition to the property variant. That is the one, then, that makes available extensional readings for truly quantificational noun phrases (e.g., *each comic-book* in (63a)). And the difference between bare plurals and singular indefinites might be that the latter have a quantificational variant that fits with relational *look for*, whereas the former can only denote a property.

4.3 Differences between types of intensional transitive verbs

While our discussion so far has followed the bulk of the literature in this area in assuming that we should strive for one unified analysis of ITVs, Forbes (2006, 2013) and Schwarz (2006) have suggested that the empirical facts do not justify such a uniform solution, desirable as it may be in abstract theoretical terms. The reader may already have noticed that in the two previous sections, we have focused mostly on different verbs, and this was no accident. At least in some regards, apparent differences had been noted early on. However, they were primarily leveraged as arguments against a given particular account, rather than as supporting different types of analyses for different cases. The present section will review some of the arguments for differences between certain ITVs in more detail, and reflect on the theoretical implications of these claims.

4.3.1 Paraphrasability

One issue for propositional approaches that was already raised by Partee (1974) is that for certain ITVs, it is not clear whether there is any suitable Quinean para-

[16]In fact, Van Geenhoven & McNally's (2005) proposal is part of a broader agenda that assumes property-variants for all transitive verbs, though not all of them intensional.

phrase of an explicit clausal nature. In particular, Partee (1974) points out that Quine's characterization of *look for* as 'endeavoring to find' is wanting in that we cannot characterize all search verbs (see (20)), in just these terms, given their intuitively different meanings. den Dikken et al. (2018), as well as Parsons (1997), propose paraphrases of the form *is looking to find...* instead, but Forbes (2006) notes that this is problematic as well, at least if we assume that we are dealing with a purpose clause. Further cases brought up in this connection include *worship* (Montague, 1969) and *resemble* (Zimmermann, 1993), though it is questionable whether these fall into the same category as the other verbs considered here (see Zimmermann (1993) and above for discussion of the former, and Van Geenhoven & McNally (2005) for the latter). For other cases, paraphrases with *to have* seem quite generally straightforward (but see section 4.1.2 for potential limits to this). To the extent that there only is a problem for certain alleged ITVs in this regard, this could either be used as an argument against clausal accounts in general, if we assume that all ITVs warrant a uniform analysis, or against a clausal analysis for those particular verbs.

4.3.2 Modification

The modification phenomena from section 4.1.1 also turn out to vary between different verbs. Partee (1974) already noted this, contrasting examples using *want* with search verbs such as *look for*. For the latter, we find sharp contrasts between the ITV version and its presumed clausal correlate:

(74) a. Martha is trying to find an apartment by Saturday.
b. *Martha is looking for an apartment by Saturday.[17]

(75) a. I tried to find you alone.
b. I looked for you alone.

(76) a. Fred was trying to find the minutes before the meeting.
b. Fred was looking for the minutes before the meeting.

(all examples from Partee, 1974)

The *by*-phrase in (74) can only modify the embedded verb, so its unavailability with *look for* suggests no such embedded predicate is available for modification. Similarly, the *try to find* versions in (75) and (76) are ambiguous, in that the modifiers can target either the trying or the finding, but the versions with *look for* only have the 'high' modification interpretations.

Schwarz (2006) extends this point to modification by *too* and *again*, noting that a version of (51) with *look for* is not felicitous in the scenario considered there, despite the fact that a car had been found before.

[17] An anonymous reviewer raises a worry about the progressive in Partee's example and suggests an improved version in the future with *will*, which renders (a) ambiguous, while (b) only has one reading. The basic point remains the same.

(77) #Now he is looking for a car again before the move.

a. hypothetical low attachment presupposition (satisfied in context): John had found a car before.

b. high attachment presupposition (NOT satisfied in context): John had looked for a car before.

(Schwarz, 2006)

These differences suggest that only some ITVs, such as *need* and *want*, contain a hidden clausal complement, or at least one that is accessible for modification.

4.3.3 Different types of noun phrase objects

For the case of genuinely quantificational noun phrases, the reverse pattern can be observed relative to the cases considered so far. While *look for* seems to resist intensional readings with a quantifier such as *most* in (65) in a context where Matt simply is on a search with the goal of obtaining the majority of the small bills, it is perfectly fine in a parallel context to describe his need with the minimally changed (78):

(78) Matt needs most of the small bills that were in the cash-box.

In contrast with *look for*, the most natural interpretation of the noun phrase object of *need* is available here, namely a non-specific, intensional one, according to which his needs are met by any majority subset of whatever bills may actually be in the cash-box. Thus we once again find differences with respect to the properties of ITVs relating to their objects.

Moltmann (1997) points to another interesting contrast between different types of noun phrases, by noting that definites lack non-specific interpretations:

(79) a. John hired the assistant.

b. The Americans elected {a $\neq$ the} president.

It remains an open question whether this provides grounds for differentiating between these verbs and other ITVs, or whether an independent explanation of this special case can be construed.

4.3.4 Negative quantifiers

A third difference concerns the scope of negation.[18] It has been noted in the literature that there is a clear contrast between verbs like *need* and *look for* in this respect

[18] Depending on your favorite analysis of *no DP*, you might put this in either one of the previous categories, as they could either involve an indefinite plus sentential negation (which might be expected to pattern with modifiers in terms of attachment sites) or a genuine generalized quantifier. However, since nothing directly hinges upon this decision, I discuss these cases separately here.

(Van Geenhoven & McNally, 2005). This difference comes as no surprise after the preceding sections, as it patterns with the observations made there: low scope is possible with *need*, but not with *look for*, for example in the following sentences:

(80) John is looking for no assistants.

(81) John needs no assistants.

The sentence in (80) cannot be understood in such a way that the goal of John's search is to find no assistants. It can only mean that there is no assistant that John is looking for. But while the preferred reading with *need* is also one where negation takes high scope, this is by no means necessary. With proper context (and perhaps a particular intonation), the low scope reading is also available, as can be seen in the following example (taken from von Fintel & Heim, 2007):

(82) I'm trying to finish my paper this weekend, so I need no visitors!

Furthermore, the preference is reversed for *want*: If you want no visitors, it is quite clear that all your desire worlds are worlds in which there are no visitors.

One interesting point in connection with this concerns subtle differences between overt and covert clausal complements with *need*. It has been claimed in the literature that the scope possibilities with negation differ between the two cases (narrow scope only for the overt cases and wide scope only for the ITV cases), which in turn has been brought forward as an argument against a clausal analysis (Zimmermann, 1993; Moltmann, 1997). However, not only are both readings at least in principle possible with the covert complement, as illustrated above, but they are also both possible with overt clausal complements (Schwarz, 2006):

(83) The President really needs to have no military training in order to serve in his role as Commander in Chief. [Google]

(84) In theory modern Linux distributions make it so the user needs to have no idea where their programs are physically installed. [Google]

Obviously, the author of (83) is not trying to express that only people inexperienced in military matters can serve as Commander in Chief (the low scope reading), but rather that it is not necessary for the President to have military experience. Similarly, (84) allows for educated users that do indeed know where the programs are physically installed.

Interestingly, it so far seems as if the facts concerning modification, quantifiers, and negation pattern in parallel, which would suggest that the variation may be due to the same source. However, a more thorough empirical investigation is obviously needed to get a fuller picture of which ITVs pattern which way for each property.

4.4 Taking stock: Empirical evidence and theoretical options

Let us briefly take stock of the theoretical ramifications of the properties of (different types of) ITVs reviewed in this section. First, the positive modification facts seem to strongly support analyses according to which ITVs take propositional complements. To the extent that at least certain modifiers (e.g. *again*, following von Stechow, 1996) are indicative of clausal structure, they more specifically support clausal accounts, which assume hidden syntactic structure in the complements of ITVs. Predicate and intensional quantifier accounts do not have much to offer in accounting for modification (though the account of modification in purely semantic terms by Dowty, 1979, could do part of the job). The fact that modification is not available across the board, on the other hand, poses a challenge to uniformly clausal accounts. There have been attempts to meet this challenge: den Dikken et al. (2018) propose a pragmatic explanation of the lack of modification for *look for*, and Larson (2002) raises the possibility of seeing *look for* as a restructuring verb. However, it is far from clear that these approaches are sufficiently general and hold up to further empirical scrutiny (Forbes, 2006, 2013).

With respect to the restrictions of intensional readings to weak quantifiers, the property account obviously has the most straightforward way of capturing these. For clausal accounts, it's unclear why there should be selective restrictions with respect to which noun phrases can take narrow scope. If there is an available scope site within the hidden structure in the complement of ITVs, it should be available to all quantifiers. Generally speaking, intensional quantifier accounts face the same problem, since they allow any quantifier in the object position of ITVs. Moltmann (1997) alludes to the domain presuppositions of strong quantifiers to account for some of the relevant effects. However, given the contrast between *need* and *look for* noted above, it's unclear why these considerations should depend on what ITV is being used. But the contrast between different types of ITVs is of course also problematic for a uniform property analysis of all ITVs.

The phenomena with negative quantifiers yield a similar pattern, though formulating the implications precisely requires a more fleshed out account of negative quantifiers. In particular, these could be seen as standard generalized quantifiers, or, alternatively, as indefinites that have to occur in the scope of negation (Ladusaw, 1992). Either way, clausal accounts will generally predict availability of narrow scope readings for negation, as will intensional quantifier analyses. Property analyses, on the other hand, will most likely predict narrow scope to be unavailable (unless they somehow accommodate negation in the scope of the ITV).

In light of the differences between ITVs that we discussed here, it then seems most promising to assume that we need at least two analyses to account for different classes. A clausal analysis seems to make all the right predictions for verbs like *need* and *want*, whereas the property analysis accounts for the behavior of *look for*. The intensional quantifier analysis doesn't quite fit the bill for either case: it does not (or at least not in any obvious way) allow for modification of *need*-type cases,

and it over-generates in predicting all quantifiers (including both *most* and *no*) to have narrow scope readings relative to *look for*. That being said, these tentative conclusions will have to be assessed in more detail with respect to all of the verbs that are candidates for being ITVs. It may turn out that there is not as much of a clear-cut line between classes as the discussion here suggests, or that there are additional classes to be accounted for.

4.5 Further puzzles with special quantifiers

Various more recent works (e.g. Zimmermann, 2006; Moltmann, 2008, 2013) have begun to shed light on additional puzzles with ITVs. One central phenomenon involves so-called 'special' quantifiers, which do not always interact with other noun phrases as objects of ITVs in the way one might expect. In particular, they give rise to various puzzling inference patterns. First, note that special quantifiers allow for interpretations with ITVs that express equivalence of objects at a rather abstract level:

(85) a. John is looking for an assistant.
b. Mary is looking for an assistant.
c. John and Mary are looking for *the same thing*. (Moltmann, 2013)

The definite *the same thing* here clearly allows for a non-specific interpretation, in that it is not necessary for John and Mary to be looking for the same individual. The fact that special quantifiers can have these abstract and general meanings now will give rise to some puzzles relating to monotonicity. First, consider the apparent upward monotonicity of the object position of *look for*:

(86) a. Jones is looking for a green sweater.
b. Jones is looking for a sweater.
(Zimmermann, 2006)

(86b) seems to follow from (86a), even on a non-specific interpretation. But then the following, even more general conclusion also follows:

(87) Jones is looking for something.

A puzzle now arises when we consider the relationship of these most general descriptions for cases of different searches directed towards very different objects. In particular, it is by no means clear, given standard assumptions, why (88c) can not validly be inferred from the preceding premises:

(88) a. Jones is looking for a sweater.
b. Smith is looking for a pen.

c. Smith is looking for something Jones is looking for.

(Zimmermann, 2006)

Unfortunately, we cannot go into greater detail on these more intricate issues here for reasons of space. For theoretical proposals for handling these and related issues, see Zimmermann (2006) and Moltmann (2008, 2013). Broadly speaking, these propose that 'special' quantifiers are best understood in higher order terms of one sort of another, rather than analyzing them as having one of the usual types available for noun phrases.

5 Conclusion

Intensionality constitutes a central property of natural language, and the analysis of ITVs has important implications for its role in regards to the syntax-semantics interface. Sententialists assume that it is only introduced at the level of complete clauses, whereas formal semantics in the tradition of Montague sees it as available pretty much anywhere. Our review of empirical phenomena relating to ITVs suggests that there are different classes of ITVs, and that one of them is not amenable to a clausal analysis. The other one, however, provides evidence in favor of a clausal analysis, so the hidden clauses proposed by sententialists do seem to exist. For the other cases, we seem to not only find limitations for modification of putative embedded predicates, but also for the availability of intensional, non-specific readings with strong and negative quantifiers. However, the empirical assessment of ITVs remains rather incomplete to date, as only a few special cases have been looked at in sufficient detail, and is furthermore mostly limited to English. Future work will have to determine which of the verbs mentioned in section 2.3 might belong to which category, and whether further categories are warranted. More broadly, it will be of crucial importance to extend the empirical perspective cross-linguistically, to uncover any more general patterns, e.g., relative to possible lexical, semantic and structural correlations between types of expressions and languages. The first steps in these directions discussed in section 4.1.2 (see Harves & Kayne, 2012; Antonov & Jacques, 2012; Halpert & Diercks, 2013) illustrate the promise of such endeavors, but much empirical work remains to be done.

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