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Wh-Complement Clauses and (non-)Local Selection[*]

Anna Roussou, Christos Vlachos
University of Patras (<aroussou@upatras.gr>; <cvlachos@upatras.gr>)

Abstract:

This paper revisits c- and s-selection in the context of wh-clausal complements. The standard treatment of predicate-complement selection can be traced back to generative approaches of 70's and says that the selection of a complement by a predicate is evaluated both in syntax and semantics. As regards syntax, the grammatical category of the complement must belong to the subcategorization frame of the predicate, and vis-à-vis semantics, the semantic type of the complement must fall in the set of types selected by the predicate. The present paper examines several licit instances of wh-clausal selection that should have been ungrammatical under the standard treatment, but they are not. The analysis offered here says that c-selection reduces to argument selection and is computed derivationally (at the point of External Merge), while s-selection reduces to an interpretation function that spans a larger grammatical domain and is evaluated representationally (at the syntax-semantics interface).

Keywords: *Antirogative, Responsive, Rogative, Selection, Wh-clause*

1. Introduction: identifying the Problem

Complement clause selection is sensitive to the properties of the selecting predicate and this is usually reflected on the element that introduces the complement clause. For example, a verb like *think* in (1a) takes an embedded declarative, introduced by *that*, while a verb like *wonder* in (1b) takes an embedded interrogative introduced by *if* (or *whether*).

(1)   a.   John thinks *that/*if* Peter bought a new car.
       b.   John wonders *if/*that* Peter bought a new car.

In standard syntactic terms, the assumption is that the embedded C can be +/-Q (for Question), which is overtly manifested as *that* (-Q) or *if* (+Q).

Accordingly, *think* excludes a wh-complement, i.e., an embedded wh-question, while *wonder* allows it, as shown in (2a) and (2b) respectively:

(2)   a.   *John thinks *what* Peter bought
       b.   John wonders *what* Peter bought

Syntactically, a C_{+Q} acts as a Probe for the wh-phrase, which qualifies as a Goal (Chomsky 1995, *et seq.*). Agree takes place between the wh-phrase and the C_{+Q}. On the assumption that the Probe also has an EPP feature, Internal Merge (IM) takes place between a *what*-copy and C, as in (3) (for (2b)):

(3)   [John wonders [what $C_{+Q, EPP}$ [Peter bought ~~what~~]]]

IM of *what* cannot take place in (2a) since C_{-Q} (or a C without a Q feature) does not qualify as a Probe. Hence there is no Agree and consequently, IM is illicit.

Both *think* and *wonder* select for a CP complement, but differ with respect to the semantic type of this CP, distinguishing between embedded declaratives (propositions) and embedded interrogatives, as initially argued by Grimshaw (1979). The distinction between c- (category) and s- (semantic) selection has been well-discussed in the literature. Pesetsky (1982) further argues that c-selection can reduce to s-selection, and that any independent differences among predicates regarding c-selection can be attributed to Case. For example, while both *ask* and *wonder* s-select for an interrogative, *ask* also allows for a DP complement (*I asked the time = I asked what the time is*), while *wonder* doesn't (**I wonder the time*, but *I wonder what the time is*). This restriction follows from the fact that *wonder* is not a Case-assigner. On the other hand, Sag and Pollard (1989), Svenonius (1994), Odijk (1997), among others, offer arguments against this reductionist approach.

Keeping in mind that the basic distinction we've seen above cuts across the +/-Q in C, which is subject to selection by the relevant predicate, let us next turn to some apparently unexpected cases. The predicate *know* takes an embedded declarative, just like *think*, as in (4a). However, unlike *think*, it may also take a wh-complement, as in (4b), or an *if*-complement, provided negation or question is present in the matrix clause as in (4c) and (4d) (see Bresnan (1972) for an early discussion of similar facts):

(4)   a.   John knows *that*/**if* Peter bought a new car.
       b.   John knows *what* Peter bought.
       c.   John doesn't know *if* Peter bought a new car.
       d.   Does John know *if* Peter bought a new car?

Adger and Quer (2001) argue that the *if*-complement in (4c) is an *Unselected Embedded Question* (UEQ), distinguishing it from the *Selected Embedded Question* (SEQ) in (1b). Strictly speaking, the embedded C cannot be +Q, as the matrix predicate s-selects for a proposition. However, an operator like question or negation can trigger a complement that looks like a question. Additionally, it's unclear what triggers wh-movement if C does not have the Q feature. If anything, the interpretation of (4b) is not an inquiry about the value of *x* introduced by *what*

but a declaration that the value of x is known.[1] What the data in (4) suggest is that wh-movement should be dissociated from the presence of Q, and that licensing of an UEQ, i.e., a clause that has the form of a question without the interrogative reading, is not restricted to s-selection by the matrix predicate but arises as a function of the predicate and some sentential (polarity licensing) operator.

Another pattern of unexpected complementation arises with the verb *believe*, as in (5) below. Note that *believe*, just like *think*, s-selects for a proposition (that is, a C_{-Q}), and in this respect the ungrammaticality of (5c) is predicted. Unlike *know* in (4), it cannot take an *if*-complement even if there is matrix negation (or question). However, *believe* can take a wh-complement in the presence of the negated auxiliary *can't*, as in (5d).

(5)   a.   John believes *that*/**if* Peter bought a new car
        b.   *John doesn't believe *if* Peter bought a new car
        c.   *John believes *who* bought a new car
        d.   John can't believe *who* bought a new car!

Once again, the problem that arises is twofold. First, the availability of the wh-complement does not directly depend on the matrix predicate but further requires a negated modal. Second, although Q is not present, wh-movement takes place in the complement clause. Note that the sentence in (5d) converges with an exclamative reading, which is the third semantic type (along with propositions and questions) of complement clauses in Grimshaw's (1979) classification. In this respect, the problem of wh-movement can be resolved if we assume that C has an E (exclamative) feature in (5d). Even so, the first problem remains, as the availability of the E feature on C depends on the negated auxiliary and not directly on *believe*. In other words, the selectional requirements of *believe* are affected by elements that are merged in later steps of the derivation and are not present at the point where *believe* (externally) merges with the wh-clause.

The data presented above show that predicates which take a clausal complement may exhibit variable behavior regarding the properties of their complement but also the readings assigned to it. If complement clause selection is specified in the lexical entry of the predicate, then two options arise: either we assume different lexical entries which project in the syntax accordingly, or a single entry with syntax determining the variable behavior. Interestingly, Karttunen (1977: 18, fn. 11) takes the former view regarding *know*, namely that there is one lexical entry for the interrogative complement, and another one for the propositional complement. We take the second option, i.e., a single entry, for two reasons. First, the type of the complement clause may not be determined by the matrix predicate alone, and second, its form can affect the reading of the matrix (selecting) predicate. The latter pattern is quite typical in the literature regarding NP arguments (e.g., Tenny 1987, Borer 2005 a.o.), and allows us to extend this approach to sentential complements as well. We further argue for the

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[1] Ross (2009) argues that the wh-complement of *wonder* is conjunctive (CWH), while that of *know* is disjunctive (DWH). One diagnostic test for this distinction is the availability of apposition or not respectively, as in the following examples.

(i) Peter wonders who left – (namely,) John *or* Mary.

(ii) Peter knows who left – (*namely,) John *and* Mary.

Negation on *know* reintroduces the disjunction, as it uplifts the factive reading of the clause:

(iii) Peter doesn't know who left – (namely,) John *or* Mary.

elimination of features such as Q or E in the embedded C. We show that the full range of readings associated with the wh-complement would require an enrichment of these features, and more crucially, their postulation could only be accounted for in terms of a look-ahead strategy, given that in many cases these readings are not computed locally but require the presence of other elements (operators) in the matrix clause. We present the relevant evidence in section 2 of the paper, focusing on the so-called antirogative predicates, such as 'believe' and 'think'. We next argue in section 3 that there are no abstract features that guide selection: wh-movement in the complement clause is triggered by some generalized Operator-feature in C which satisfies clause-internal properties. In this respect, wh-complements have the same derivation prior to merger of the matrix predicate. This approach allows us to dispense with selectional requirements encoded as abstract features on the embedded C. Furthermore, it shows that while certain aspects of interpretation are satisfied as the derivation proceeds (in a local fashion), others can only be achieved once the whole derivation is completed (globally), that is representationally at the INT interface.

2. Wh-complements with antirogatives

2.1 Some background on predicate classes

In the semantic literature, predicates split according to whether they take an embedded interrogative as their complement or not (see Groenendijk and Stokhof 1984, Lahiri 2002, Dayal 2016, among others), giving rise to the following three classes:

(6)   a.   Rogatives: *ask*, *wonder*, …
         b.   Responsives: *know, find out, understand*, …
         c.   Antirogatives: *think, believe, consider, claim*, …

Rogative predicates take an interrogative complement, while antirogatives take a declarative complement and exclude an interrogative one. On the other hand, responsives are a hybrid class: they typically take a declarative, but may also allow for a wh-complement, and under certain conditions an *if*-complement as well – this is the case of UEQ of Adger and Quer (2001) (see Roussou 2010 for more references). In more recent accounts, these predicates are also called 'Q-agnostic' (White and Rawlins 2019).[2]

Uegaki and Sudo (2019) further split antirogatives into two classes, given that not all of them pass the Neg-raising test of Zuber (1982). For example, while 'believe' allows for neg-raising (and a wh-complement), 'prefer' doesn't (and excludes a wh-complement):

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[2] The discussion on the semantics of interrogatives is modelled around different assumptions on how interrogatives differ from declaratives. Simplifying the picture, there are two main strands. The more traditional one that goes back to Karttunen (1977) takes declaratives to denote propositions and interrogatives to denote sets of propositions, so interrogatives are a special case of declaratives (also Groenendijk and Stokhof 1984; Lahiri 2002; Egré 2008; Spector and Egré 2015). The more recent account builds on the idea that both declaratives and interrogatives denote sets of propositions (Ciardelli *et al.* 2013; Uegaki 2015, 2022; Theiler *et al.* 2018) the difference being that declaratives denote a singleton set of propositions. Since interrogative clauses denote sets of alternative propositions they are 'inquisitive' and accordingly declaratives are 'non-inquisitive'. Under this approach, responsives, which are compatible with either complement (declarative or interrogative), are not sensitive to the inquisitive property.

(7)   a.   Mary doesn't believe that Peter left early → Mary believes that Peter didn't leave early.
        b.   Mary doesn't hope that Peter will leave early ≠ Mary hopes that Peter won't leave early.

Their distinction builds on two additional features, namely veridical and representational, as below:

(8)   a.   Representational, veridical: *know, forget, remember* (cognitive factives)
        b.   Representational, non-veridical: *believe, be certain, doubt*
        c.   Non-representational, veridical: *be glad, be surprised, be happy* (emotive factives)
        d.   Non-representational, non-veridical: *hope, wish, demand* (preferential)

Given the above classification, (8b) and (8d) are antirogatives, while (8a) and (8c) are responsives. The distinction between the two subclasses of antirogatives is due to the representational vs non-representational property. As we saw in the example (5d), under certain conditions which we discuss below, *believe* can embed a wh-complement and converge with a factive reading similar to that of the responsive predicates in (8c) (emotive factives). This indicates that *believe* can shift to a different class. Uegaki and Sudo (2019) argue on semantic grounds that this shift cannot take place for the class of preferential non-veridical predicates in (5d). Their analysis takes notions such as veridicality (and factivity) to be part of the lexical entry of predicates. However, as we will see in the discussion that follows, shifting from one class to the other is also subject to syntactic properties of the clause. On the other hand, it's unclear how notions such as veridicality (and factivity) are lexical properties, given that they refer to propositional content.

White (2021) offers experimental evidence against generalizations over lexical predicates which determine what type of complement clause they embed (i.e., interrogative vs declarative). He tests three such generalizations: (i) A predicate is responsive if it is veridical (Egré 2008), (ii) A predicate is antirogative if it is neg-raising (after Zuber 1982), and (iii) A predicate is antirogative if it is nonveridical and preferential (Uegaki and Sudo 2019). He then shows, building also on work by White and Rawlins (2018, 2019), that generalizations of these sort hold weakly, given that a given predicate can potentially have different senses (veridical and non-veridical) depending on the context and its use, and that neg-raising may be triggered in some contexts but not others. For example, in a sentence like (5d), i.e., *John can't believe who won the race*, neg-raising is blocked, and it is precisely this context where the wh-complement is available (also non-veridical *believe* becomes veridical). Furthermore, the prediction of the above generalizations that preferential predicates (e.g., *prefer*) cannot take a wh-complement is falsified, as examples like *I was hoping whether you were able to guide* are well attested in corpora. White (2021) concludes that complement clause selection is best predicted on properties that relate to the event structure of the predicate, namely aspectual notions such as stativity, durativity and telicity. Regarding the correlation between factivity, veridicality and complement selection, White and Rawlins (2018), following experimental methods, show that there seems to be a canonical correlation between these notions and "the possibility or requirement of a DP direct or indirect object" (232). They take this to support their view that clausal selection should also be linked to aspectual properties, as is the case with NP (DP) arguments.

The above discussion is a brief introduction to the problem of what determines clausal selection and in what ways. In what follows we focus on two antirogative verbs, namely 'believe' and 'think' and show what determines selection of a wh-complement, i.e., what in the above

literature is referred to as an embedded interrogative. We argue that whether the wh-complement is interpreted as an interrogative or not is not determined directly by the predicate or the feature specification of the embedded C but arises as a function of different factors such as: wh-fronting in the embedded clause, the predicate, and other elements that are merged in the derivation above the verb's projection. The interpretation of the wh-complement then is computed once the derivation is complete. Terms like 'responsive' and 'antirogative' are used descriptively in the discussion that follows, with no further implications for lexical semantic classes.

2.2 The case of 'believe'

As we saw in the preceding section, *believe* can take a wh-complement which converges as an embedded exclamative. Roberts (2019) discusses this pattern quite extensively. Consider the following data from his article:

(9)   a.   Susan {can't/*can/*doesn't} believe which town was obliterated by the meteor.
       b.   It's unbelievable who is lecturing us about fake news!
       c.   Can you believe which dessert Sherrod baked?
       d.   I can *(hardly/scarcely/barely) believe what score I got on the midterm!

(10)   a.   *I {must not/don't have to/shouldn't} believe who came to the party.
       b.   You'll never believe what J.J. Abrams wrote before Star Wars.

The data in (9)-(10) show that the wh-complement requires a (dynamic) modal such as *can* in the context of matrix negation (9a) or question (9c). Neither negation nor modality on their own suffice, as the ungrammatical versions of (9a) manifest. An adjectival predicate like *unbelievable* also satisfies both conditions through affixation in (9b), while the negation condition can also be satisfied by negative adverbs, as in (9d). The ungrammaticality of (10a) shows that not any modal would do, i.e., deontic modals are ruled out, while the grammaticality of (10b) shows that *will* can trigger a dynamic modal reading, like *can*.

Roberts' (2019) account is a semantic one within the framework that treats embedded declaratives and interrogatives alike (sets of propositions) with the former reducing to singleton sets (see fn. 3). The veridical reading assigned to *believe*, when followed by a wh-complement, arises compositionally, so it is not part of the lexical semantics of the predicate (as opposed to Uegaki and Sudo 2018). On the other hand, the unified account of declaratives and interrogatives facilitates the availability of a wh-complement provided the matrix predicate is accordingly modified. In his words: "we might want to consider clausal selection not only as a restriction on complements imposed by particular lexical predicates, but rather a bilateral compatibility relation between a predicate and its broader linguistic context, including its complement" (682). We agree on this point and further show how syntax contributes towards the various readings that arise.

The English pattern with 'believe' is also attested in Greek, as the example below (adapted from Vlachos and Balasi 2022) shows:

(11)   a.   Dhen   boro   na   pistepso   pjos   irthe!
             not   can-1sg   prt   believe-2sg   who   came
             'I can't believe who came!'

b.	Boris	na	pistepsis	pjos		irthe*?*	
	can-2sg	prt	believe-2sg	who		came-3sg	

'Can you believe who came?'

c.	Ine	apistefto	pjos	irthe		simera!	
	be-3sg	unbelievable	who	came-3sg		today	

'It's unbelievable who came today!'

d.	Dhen	to	pistevo	pjos		irthe	simera!
	not	it	believe-1sg	who		came-3sg	today

'I can't believe who came today!'

Despite differences regarding the syntactic expression of modality in Greek (modal verb, modal particle, present tense), the point that the embedded wh-clause converges with an exclamative reading is as in English. Greek further shows that the negated/questioned modal and the wh-complement can be further apart, as the modal embeds a *na*-complement whose verb embeds the wh-complement. In other words, in (9a) and (9b), the sentential operator and the selecting predicate are not in the same clause, a property that follows from the lack of infinitives in Greek. In (9c) both negation and modality are encoded on the adjectival predicate via affixation (*a-* and *-to* respectively). (9d) has no overt modal; however, present tense can give rise to an implicit modal reading (see Tsimpli and Roussou 1996 on polarity licensing by the present tense).

Given the above pattern in Greek and English, one possible way to proceed is to assume that 'believe' selects a wh-CP which is an embedded exclamative. In other words, it selects for a CP which bears the E feature, attributing the difference of rogative and antirogative wh-complement to a different feature on C, that is Q vs E respectively, as in (12).

(12) a. [$_{VP}$ wonder [what C$_Q$ [$_{IP}$ John bought ~~what~~]]]   (Rogative)
       b. [$_{VP}$ believe [what C$_E$ [$_{IP}$ John bought ~~what~~]]]   (Antirogative)

In either case, the relevant feature activates C as a Probe, triggering Agree and IM of the wh-phrase, thus allowing for a wh-complement.

As already pointed out, selection for E does not arise from the matrix predicate directly but requires a negated modal of some form. So, postulating an E feature on the embedded C is a clear case of a look-ahead property, which in the case of Greek at least may cross two clause-boundaries. Another problem that arises has to do with the fact that the wh-complement does not always converge with an embedded exclamative reading. Consider the following examples from Greek and their English translations:

(13)	a.	Pistepsa	(sto telos)	pjos	ftei.		
		believed-1sg	in.the end	who	is.responsible		

'I came to believe (in the end) who was responsible.'

	b.	Mono	o Janis	pistevi	pjos	irthe	simera.
		only	the John	believe-3sg	who	came-3sg	today

'Only John believes (can believe) who came today.'

	c.	Tha	pistepsis	pjos	irthe	otan	ton dhis.
		will	believe-2sg	who	came-3sg	when	him see-2sg

'You will (be able to) believe who came (when you see him).'

The wh-complements in (13) are grammatical but crucially, they are not construed as exclamatives. The perfective past (aorist) of the matrix verb *pistepsa* in (13a) blocks any modal reading. However, the sentence converges with a dynamic (telic) reading associated with the verb. In (13b), focus along with present tense triggers an implicit modal reading ('only John is able to understand') and the same holds in (13c) where the modal particle *tha* facilitates the modal reading. Irrespectively of whether modality or some aspectual modification is available, the wh-complements in (13) converge in lacking an embedded exclamative readings.

The examples discussed so far from Greek and English show the following: the exclamative reading is not a by-product of the wh-complement and the selecting predicate. Instead, this reading arises in the presence of the wh-complement provided the verb is modified (or embedded) by a modal in the scope of negation or question. Construing in this case the wh-complement as an exclamative further assigns a factive reading to the matrix predicate. In this respect, the data examined so far support White's (2021) and White and Rawlins' (2018) conclusions that factivity (and veridicality) are triggered by the predicate and the syntactic environment. In the next section we consider the case of the verb *think*.

2.3 The case of 'think'

The verb *think*, which is also an antirogative, is taken as a typical case where a wh-complement is excluded. However, White (2021) provides data where a *whether*-complement is possible, as below (his (14a-b)):

(14)   a.   When Jan Brown completed her safety briefing for the passengers, she tried to think *whether* she had covered everything.
        b.   I'm trying to think *whether* I'd have been a star today or not.

Özyildiz (2021) offers a thorough discussion of the conditions under which *think* can take a wh-complement. In particular, his argument is that when 'think' takes a 'question' (a wh-clause in our terms), it gives rise to dynamic eventuality; on the other hand, when it takes a 'declarative' (a *that*-clause), the eventuality may be stative or dynamic (see also Dayal 2016). This is clearly manifested in the following pair of sentences:

(15)   a.   #Anna thinks who she should invite.
        b.   Anna is thinking who she should invite.

In (15b), the progressive tense creates a licit context for the wh-complement, consistent with a dynamic eventuality. On the other hand, the simple past retains the stative reading. The different readings are tested through various aspectual tests. One of them regarding adverbial modification is given below, which support the dynamic eventuality reading in the presence of the wh-complement.

(16)   a.   Anna was *carefully/intentionally* thinking who she should invite to the party.
        b.   Anna *carefully/intentionally* thought who she should invite to the party.

Özyildiz (2021) further argues that as a dynamic verb, *think* further allows for a telic vs atelic distinction, as in (17). This further distinction provides two readings for *think*, the 'decisive' (telic) vs the 'deliberative' atelic:

(17) a. It took Anna an hour to think who she should invite. [Telic - decisive]
          → Anna has decided who she should invite.
      b. Anna is thinking who she should invite. [Atelic - deliberative]
          → Anna is deliberating about who she should invite.

The above suffice to support the claim that the type of the complement clause affects the reading (aspectual) of the selecting predicate. Furthermore, the different senses attributed to the predicate, e.g., decisive or deliberative, are, or at least can be, syntactically conditioned. Note that there is no exclamative reading associated with the wh-complement, thus supporting the argument being made so far that the exclamative reading arises from properties of the matrix clause in connection with the wh-complement.

Before leaving this section, it is worth noting that the corresponding verb in Greek, namely *nomizo*, does not permit a wh-complement. Instead, the readings associated with *think* + wh-clause require a different verb, namely *skeftome*. This can only be accounted for as a lexical idiosyncrasy: the English verb 'think' can have multiple senses, while this is not the case for its Greek counterpart. Another point has to do with the eventive vs stative readings attributed to the predicate depending on the properties of its complement. Greek distinguishes between two declarative complementizers, i.e., *oti* and *pu*. The latter is restricted to factive complements, while the former is found in factive and non-factive complements. According to Angelopoulos (2019) the alternation between *oti* and *pu* with cognitive factive verbs gives rise to different eventualities: stative with *pu* vs stative or eventive with *oti*. Due to space limitations, we do not elaborate on this issue any further.

To summarize the discussion so far, in the present section we have shown that the distinction between predicate classes based on the type of their complement clause is not so strict as it appears to be. Specifically, antirogative predicates may also allow for different types of complement clauses, as is the case with responsives, exhibiting variable behavior regarding their argument structure. In the presence of a wh-complement, the otherwise stative predicate can be interpreted as eventive, while further readings in terms of veridicality and factivity can emerge. The latter depend on the presence of other elements in the clause structure, such as modals in the scope of negation or question, focus, etc. In the next section we turn to the syntactic properties of the wh-complement irrespectively of the selecting predicate. We argue that the embedded C has no specialized sub-features such as Q or E, but a generalized Operator feature that triggers movement of the wh-phrase via IM.

3. The wh-complement

As was shown in section 1, different predicates can embed a wh-complement, as repeated below:

(18) a. I *wonder* who John saw.   (Rogative)
      b. I *know* who John saw.   (Responsive)
      c. I *can't believe* who John saw! (Antirogative)

While the wh-clause in (18a) is interpreted as an interrogative (inquisitive), this is not the case in (18b) and (18c). This suggests that at least in the latter two cases, movement of the wh-phrase cannot be due to a Q feature; we also saw the limitations of postulating an E feature for (18c).

Let us consider the derivation of the wh-clause in (18). Movement or displacement is ana-lyzed as the output of Internal Merge (IM), a subcase of Merge which requires at least two copies of the same element derivationally related. Internal Merge requires an Agree relation between a Probe and a Goal. In cases under investigation, C is the Probe due to some feature, and the lower wh-copy is the Goal.[3] As a result of this, the higher copy is the one that is externalized (EXT), while both copies count for the purposes of interpretation (INT). At this point we need to elaborate on the feature of C which is responsible for IM. Ideally, we would like to dissociate wh-fronting from clause-typing (see also Tsoulas and Yeo 2017, and references therein) and attribute it to some generalized property. For present purposes, we assume that the wh-phrase is an indefinite which acquires quantificational force under IM, forming an Operator-variable dependency. Suppose then that C, as the head that defines the left periphery where information and discourse-related properties are expressed, is endowed with a generalized Operator feature, which allows it to define a scope domain over the clause.[4] Under IM with C, the wh-phrase also acquires scope. In other words, what the wh-phrase and C share is this property. Translating this in criterial terms, as in Rizzi (2015), we could say that the wh-phrase reaches a criterial position. Note that for Chomsky (2013, 2015) criterial positions have a freezing effect which arises from labeling. Specifically, in the case of wh-clauses, the wh-phrase and the CP share some feature (under Agree); this shared-feature determines the label of the new syntactic object (SO). Once the features of the wh-phrase label SO, they freeze.

Consider then the structure in (19) below. The wh-phrase merges with C(P), and assuming that they share an Op property (wh, Op), the new SO carries the corresponding label.

(19) $V_{\{wonder, know, believe\}}$ [wh [C_{Op} [...V ~~wh~~]]]   where Op is a generalized feature

What the matrix verb sees at the next of the application of merge is the label of the SO it embeds. More precisely V sees a SO with propositional content introduced by a quantifica-tional phrase. Let us elaborate on what sort of implications this has for the sentences in (18). Regarding the rogative predicate in (18a), when the predicate *wonder* merges with the wh-clause, the latter becomes its argument. This follows from EM, which is the operation responsible for introducing arguments in the derivation, according to what Chomsky (2021) calls "Duality of Semantics". Given that the matrix verb is rogative, i.e., inquisitive, the wh-clause converges as an interrogative. This essentially means that the value of the wh-phrase remains unknown. The case of *know* in (18b) is also rather straightforward. The derivation proceeds in the same way: merger of *know* with the wh-clause, turns the latter to an argument. Since *know* is responsive (or Q-agnostic), it does not trigger an interrogative (inquisitive) reading. The wh-clauses con-verge with a declarative reading, i.e., it is a declaration that the value assigned to the variable introduced by the wh-phrase is known (thus informative in this respect).

Consider now the case of the antirogative *believe* in (18c). Assuming that the deriva-tional steps are those described above, merger of *believe* with the wh-clause, turns the latter to an argument. Given that the verb is neither rogative (inquisitive) nor responsive (Q-agnostic), the question that arises is how the SO formed by *believe* along with the wh-clause is to be interpreted. In other words, we need to account for the contrast below:

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[3] On a more recent proposal, IM is followed by Form Copy (FC) which essentially forms a chain with identical (or at least non-distinct) copies (Chomsky 2021).

[4] Chomsky (2013: 46) suggests that this could be a "force feature F, subsuming Q as well".

(20)   a.   *I believe [who John saw]
        b.   I can't believe [*who* John saw]

Given that the sentence in (20b) is grammatical, the natural assumption to make is that the ungrammaticality of (20a) does not arise at the point where the wh-clause externally merges with *believe*, but when the derivation is completed. Naturally this should extend to the other two cases we discussed so far. The sentence in (20b) converges with an exclamative reading. As we have already shown this arises from the function of the wh-clause, the matrix predicate and crucially the negated modal. If the negated modal is absent but the matrix predicate is modified in some other way, e.g., via focus as in the Greek examples in (13), the sentence converges with a modal reading but not an exclamative one. Once again, postulating some abstract feature on the embedded C to predict that reading that will arise, apart from being a look-ahead strategy, cannot go through unless there is an enrichment of the potential features C can bear.

To this end, EM between the verb and its complement does not yield ungrammaticality. In other words, EM satisfies some minimal requirement for INT at phase (vP) level, to the extent that the predicate takes a complement (argument) with propositional content, as part of its label.[5] However, the final reading assigned to the wh-clause and the matrix clause can only be computed once the derivation is complete; in other words, the INT interface evaluates the representation of the sentence. This has the crucial implication that while c-selection reduces to an application of EM, s-selection is not computed locally, that is at the point of EM, but on the output of the derivation which is a representation. That this interpretation is not computed at phase level is further supported from data like the following, where the trigger for the wh-complement splits across two clause-boundaries (see also the case of Greek in (12a-b)):

(21)   It is *unlikely* that John would believe who did it.

In this respect, Grimshaw's statement "a wh-complement interpreted as a question will be an instance of Q, while a complement interpreted as an exclamation will be an instance of E" (1979: 286) has only a descriptive value, with no formal status. In other words, once we dispense with the postulation of Q and E as features of the embedded C, we can take them to reduce to interpretations which are given as refinements of the generalized Op feature at the INT interface.

In short, in this section we have argued that wh-movement in embedded contexts at least is dissociated from clause-typing and emerges via a generalized Op feature which determines scope. The {wh, Op} label fulfills the minimum requirements regarding EM between the predicate and the complement clause. How the wh-complement and the predicate will be interpreted though is a matter that arises at the INT interface once the derivation is completed.

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[5] Note that in some cases, the wh-clause could be construed as a free relative:
(i)   I believe *what I see*.
In Greek this is excluded, since wh- and free relative pronouns differ (the former is the basis for the latter, i.e., *o-pjos, o-ti*). At this point variation is subject to lexical differences (of the wh-element) as expected. The sentences in (i) and (20b) in the text raise the question to what extent 'interrogative' wh-clauses differ from free relatives. We leave this issue open for future research (see Donati and Cecchetto 2011).

4. Concluding remarks

To summarize, the argument put forward is that any residues of s-selection are computed at the INT interface. This allows us to account for the variable behavior of predicates which extends to clausal complements as well. At the same time, dispensing with highly specified features on C, which predict the reading that will arise at later stages in the derivation, we dispense with the look-ahead strategy these features impose. The wider picture that emerges is that there are parts of the derivation that are interpreted locally, at phase level perhaps, such as the requirements on argument structure at the vP level, while others can only be computed representationally. Further issues remain open, such as to what extent other properties of the predicate can predict the availability of a wh-complement in the case of responsives and anti-rogatives for example and how wh-complements differ from free relatives.

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