OVERRIDING THE PHASE

Elizabeth Cowper and Daniel Currie Hall
University of Toronto

The syntax and semantics of infinitival *to* have yet to receive a satisfactory analysis in generative grammar. Most work on verbal inflection and clause structure has simply assumed that *to* occupies the head of the clause, and that it projects a functional category such as IP or TP. Recent work by Susi Wurmbrand (1998), in which so-called restructuring infinitival clauses are shown to lack any functional projections whatsoever, calls this assumption into question and necessitates a more careful look at infinitival *to*.

We show in this paper that, given a rather unorthodox approach to phase-based Minimalist syntax, it is possible to construct a coherent account of the syntactic and semantic contribution made by *to*.

1. The syntax of *to*

Wurmbrand (1998) argues that the infinitival complements of verbs like *try*, called 'restructuring infinitives,' lack all inflectional material above VP, even the light verb projection *v*P. Nonetheless *to* is obligatory in these clauses, as shown in (1). While Wurmbrand acknowledges that the status of *to* is unclear, she makes no explicit claims about its syntactic category or position.

(1) David tried *(to) play the clarinet.

Verbs like *make* take *v*P complements. Here, *to* is absent when the matrix clause is active (2a), and obligatory when it is passive (2b). Richards (2001) discusses this alternation, but does not provide an analysis of the full range of data to be discussed here.

(2) a. We made the teacher (*to) smile.
b. The teacher was made *(to) smile.

Following Travis (1994), we divide INFL into two projections; the lower one (Event Phrase) encodes properties of events, and the higher (IP) propositionality, finiteness and temporal deixis. Travis places *to* in the head of EP, but this is incompatible with Wurmbrand's structures for sentences like those in (1) and (2).

With EP, *to* has the same distribution as with *v*P; with IP, *to* is obligatory. Note that (3a) with *to* would be grammatical if the complement were an IP rather than an EP.

(3) a. We heard [$_{EP}$ Frans (*to) play the recorder].
b. Frans was heard [$_{EP}$ *(to) play the recorder].

(4) a. We believe [$_{IP}$ Marion *(to) have left the country].
b. Marion is believed [$_{IP}$ *(to) have left the country].

To also appears when the complement clause is a non-finite CP, as in (5):

(5) a. Amy wondered [$_{CP}$ what *(to) play].
b. [$_{CP}$ Where *(to) go] was the real question.

As the examples above show, there is no one syntactic category whose presence is consistently associated with *to*.

2. The semantics of *to*

Cowper (1998) and Cowper and Hall (1999) claimed that *to* encodes the morphosemantic feature Proposition in the absence of finite verb morphology. Evidence for this claim comes from verbs like *see* and *hear*. These verbs can describe either sensory perception of an eventive complement or cognitive perception or a propositional complement. Complements denoting propositions appear with *to*, while complements denoting bare events do not.

(6) a. We heard the children be rude. (event)
b. We heard the children to be rude. (proposition)

(7) a. *We saw the answer be 8. (impossible event)
b. We saw the answer to be 8. (proposition)

Counterexamples to this generalization can be found in passive sentences with non-propositional complements, as in (8) and (9).

(8) a. We made [the children wash their hands]. (non-propositional *v*P)
b. The children were made [to wash their hands]. (non-propositional *v*P)

(9) a. We heard [Max play the recorder]. (non-propositional EP)
b. Max was heard [to play the recorder]. (event or proposition)

We conclude from these examples that *to* does not encode propositionality.

Since infinitive clauses frequently denote events that have not yet occurred, as in (10), another possible hypothesis is that *to* encodes irrealis. However, *to* also appears in realis clauses like those in (11).

(10) a. We want [the children to wash their hands].
b. We expect [the students to do their homework].

(11) a. We know [the children to be in the classroom].
b. The students were seen [to leave the room].
c. The students managed [to leave the room].

Nor does *to* encode dependent tense. Dependent temporal interpretation is associated with the absence of finiteness generally, not with *to* specifically, as shown in (12). Furthermore, given Wurmbrand's analysis of sentences like those in (13), *to* can appear in the absence of any syntactic projections corresponding to

tense. *To* therefore cannot be straightforwardly associated either with dependent time reference in the semantics or with dependent tense in the syntax.

(12) a. We saw them laughing.
b. We had them leave early.

(13) a. She tried to leave. (VP)
b. She was made to leave. (*v*P)
c. She was seen to leave. (EP)

It therefore appears that no particular semantic content is always and only associated with *to*.

3. The Distribution of *to*

The syntactic and semantic conditions under which *to* appears can be stated disjunctively as follows.

Sufficient but not necessary condition 1: If an embedded clause containing a verb lacks an overt subject, *to* appears. This condition appears to be sensitive only to the presence or absence of phonological material, not to the empty categories traditionally posited in the embedded subject positions in (14). Under Wurmbrand's (1998) analysis of restructuring infinitives, the embedded clause in (14a) lacks a subject position altogether. For now, we set aside the potential distinctions between absent subject positions, subject positions filled by traces, and subject positions filled by PRO; we will return to this question in section 6.1.

(14) a. David tried [to play the clarinet].
b. The children were made [to laugh].
c. Frans was heard [to play the recorder].
d. Fiona wants [to play the guitar].
e. Amy wondered [what to play].

Sufficient (but not necessary) condition 2: If an embedded clause containing a verb is propositional but non-finite, *to* appears:

(15) a. We believe [two plus two to equal fifteen].
b. We want [Fiona to play the guitar].
c. Amy wondered [what to play].

The embedded clauses in (14) and (15) are all in some sense incomplete—they lack either a subject or a temporal index—and they are arguments of verbs.[1] Typically, the semantic complement of a verb is either a syntactically and semantically saturated DP or CP, which the verb takes as its semantic argument, or a generalized quantifier, which is syntactically saturated, but semantically unsaturated, and takes the verb as its semantic argument.

An incomplete embedded clause, however, is neither of these. Although it must serve as the semantic argument of the verb to which it is the complement, it is

[1] *To* also appears in clausal adjuncts, but we set these aside.

syntactically unsaturated. *To* somehow permits a syntactically incomplete clause to be a syntactic and semantic argument.

Although the requirement that complements be saturated has an obvious semantic motivation, the requirement itself is not purely semantic. Condition 1 above refers not to the absence of a subject, but to the absence of an overt subject. Moreover, an overt subject without obvious semantic content, like the expletive in (16a), is sufficient to eliminate the need for *to*.

(16) a. We made it seem surprising that she won.
b. It was made *(to) seem surprising that she won.

The relevance of syntactic saturation suggests that whatever contribution *to* makes is relevant at the syntax-semantics interface. One possibility is that *to* itself saturates the embedded clause. In embedded clauses with a missing subject, such as the one in (14a), *to* would function essentially as PRO. In clauses with a missing temporal index, as in (15a), *to* would function as the temporal index.

The problem is that some infinitival clauses, like the one in (15c) (= (14e)), lack both an overt subject and a temporal index. We would, under this approach, wrongly expect that such clauses would contain two instances of *to*, one providing the temporal index and the other saturating the subject position. Instead, an unsaturated argument clause, whether it lacks one or two elements, requires only a single instance of *to*. The next section explores another possibility: that *to* obviates rather than fulfills the need for saturation.

4. Interpretation by phase

The notion of saturation is crucial in theories with Multiple Spell-Out (Chomsky 1998, 1999, 2001). Syntactic structures are submitted for LF and PF interpretation, not all at once, but at various well-defined points in the derivation. These points are determined by the completion of a syntactic unit known as a phase.[2] A structure submitted to the interfaces must contain all the material necessary for its interpretation, since it is interpreted independently of any larger structure in which it appears, apart from operators to its immediate left.

For Chomsky, phasehood is determined by syntactic category. We propose a different definition of phasehood based on the relation between a constituent and the structure in which it is embedded. If a constituent occupies an A-position, it is a phase. Matrix clauses and at least some clausal adjuncts are also phases, but we will be concerned in this paper only with clauses that serve as arguments to verbs.

Given Multiple Spell-out, phases are required by the syntax-semantics interface to be syntactically saturated. *To* indicates that an clause is not to be treated as a phase, thereby allowing a syntactically unsaturated complement clause to be interpreted as part of the same phase as the larger structure in which it appears. Material in the higher clause is thus available during the interpretation of the embedded clause, and can be used to saturate it semantically.

[2] For Chomsky, it is not the entire phase, but rather the complement of the head of the phase, that is submitted for interpretation. In the proposal to be made here, it is the entire phase that is interpreted.

For the sake of exposition, we will assume that interpretation proceeds top-down rather than bottom-up. While it may be possible to define an equivalent bottom-up procedure, if an XP is built from the bottom up, then its status as an argument cannot be determined until the head above XP is merged.

We assume, then, that at the syntax-semantics interface there is a function Interpret Phase that prepares syntactically complete constituents for semantic interpretation. This function is called at the beginning of the calculation, with the matrix clause as its argument. Within this main procedure, the function is called again whenever a phase is encountered. Each time the function is called, it has access only to the phase on which it is operating, and to any values passed down by operators (A'-elements). The function can therefore give well-formed results only for saturated constituents. The operation of the function is illustrated in (17); Greek letters indicate phases.

(17) $[_{\alpha}[_{\beta}$ We] know $[_{\gamma}$ that $[_{\delta}$ Mary] is happy]].

Interpret Phase (α)
α = declarative β know γ
Interpret Phase (β)
β = we
Interpret Phase (γ)
γ = that δ is happy
Interpret Phase (δ)
δ = Mary

While we will not articulate in detail what happens when a phase is interpreted, we assume that the semantic relation between a predicate and its arguments is one of the things that must be determined, and that this is accomplished at least in part by connecting a moved element to its θ-position. In a simplex passive sentence, the relation can presumably be established straightforwardly, since the moved element is in the same phase as its θ-position.

An element that has undergone A-movement into a higher clause, however, will not be interpretable if the lower clause is a phase. If Interpret Phase is called on the lower clause, then the moved element will not be in the same phase as its θ-position. However, clauses from which an element has been extracted by A-movement are always marked with *to*. This means that Interpret Phase will not be called on the lower clause, and the moved element will indeed be in the same phase as its θ-position.

Example (18) illustrates a straightforward case of raising to subject position. Phase boundaries are indexed with subscript Greek letters; constituents that would be phases but for the presence of *to* are enclosed in ⫲ doubly struck-through square brackets ⫳.

(18) $[_{\alpha}\ [_{\beta}$ Mary] seems ⊦ to have seen $[_{\gamma}$ the leprechaun]⊣].

Interpret Phase (α)
α = declarative β seems β to have seen γ
Interpret Phase (β)
β = Mary
Interpret Phase (γ)
γ = the leprechaun

Now consider (19) and (20). In (19), the presence of *to* blocks Interpret Phase just as it did in (18). *Bill* is thus available to be interpreted as the subject of *book*. In this example, *Bill* has not been raised from the lower clause, but must still saturate that clause by serving as a semantic argument of the lower verb. In (20), there is no *to*, and Interpret Phase is called on γ. Since γ is saturated, it can be interpreted without access to other material in α.

(19) $[_{\alpha}\ [_{\beta}$ Bill] tried ⊦ to book $[_{\gamma}$ the band]⊣]

Interpret Phase (α)
α = declarative β tried β to book γ
Interpret Phase (β)
β = Bill
Interpret Phase (γ)
γ = the band

(20) $[_{\alpha}\ [_{\beta}$ Bill] heard $[_{\gamma}\ [_{\delta}$ the band] play]]

Interpret Phase (α)
α = declarative β heard γ
Interpret Phase (β)
β = Bill
Interpret Phase (γ)
γ = δ play
Interpret Phase (δ)
δ = the band

The sentences in (21)–(23) contain expletives. In (21) the expletive δ and its associate ε are contained in the same phase γ. In (22a), the presence of *to* makes it possible to establish the expletive-associate relation, by eliminating the phase boundary between the expletive β and the associate γ. In (22b) the expletive β and the associate δ are in different phases, and the sentence is ill-formed. In (23), the fact that *there* and its associate are in the same phase makes it possible to realize agreement on *seem*.

(21) $[_{\alpha}\ [_{\beta}$ We] made $[_{\gamma}\ [_{\delta}$ it] seem surprising $[_{\varepsilon}$ that $[_{\zeta}$ she] won]]].

Interpret Phase (α)
α = declarative β made γ
Interpret Phase (β)
β = we
Interpret Phase (γ)
γ = δ seem surprising ε → Lexical properties of *seem*, available expletive property of δ, and phasehood of ε give expletive-associate relation between δ and ε.
Interpret Phase (ε)
ε = that ζ won
Interpret Phase (ζ)
ζ = she

(22) a. $[_{\alpha}\ [_{\beta}$ It] was made ⊧ to seem surprising $[_{\gamma}$ that $[_{\delta}$ she] won]⊧].

Interpret Phase (α)
α = declarative β was made β to seem surprising γ → Lexical properties of *seem*, etc., give expletive-associate relation between β and γ.
Interpret Phase (γ)
γ = that δ won
Interpret Phase (δ)
δ = she

b. * $[_{\alpha}\ [_{\beta}$ It] was made $[_{\gamma}$ seem surprising $[_{\delta}$ that $[_{\varepsilon}$ she] won]]].

Interpret Phase (α)
α = declarative β was made γ
Interpret Phase (β) → β gets internal θ-role of *make* (not expletive).
β = it
Interpret Phase (γ)
γ = * → No expletive to associate with δ; γ can't be an adjunct because not saturated.

(23) $[_{\alpha}\ [_{\beta}$ There] seem ⊧ to be $[_{\gamma}$ three cats] on $[_{\delta}$ the windowsill]⊧].

Interpret Phase (α)
α = declarative β seem β to be γ on δ → Lexical properties of *seem* etc., give expletive-associate relation between β and γ, permitting agreement between *seem* and γ.
Interpret Phase (γ)
γ = three cats
Interpret Phase (δ)
δ = the windowsill

5. Temporally unsaturated clauses

We now turn to cases where the *to* clause has an overt subject, but lacks a temporal index. The lack of a temporal index causes interpretive problems only when the clause is propositional.

According to Cowper and Hall (1999), a proposition is a cognitive manifestation of a state or event. A bare state or event need not be temporally anchored (*sensu* Cowper 1996, adapted from Enç 1987); an EP whose temporal location is unspecified (such as (24a)) is analogous to a DP that happens to refer to an event (such as (24b)).

(24) a. Susana saw [$_{EP}$ the waves destroy the sandcastle].
b. Susana saw [$_{DP}$ the destruction of the sandcastle by the waves].

A proposition, however, is the realization of a state or event in a consciousness. A consciousness is a temporo-personal index pointing to a particular stage (Carlson 1977, Kratzer 1988) of an individual, and thus to the set of propositions believed by that stage of that individual (Hall 2001). For example, a matrix declarative sentence asserts the presence of a proposition in the consciousness representing the speaker at the moment of speech.

A propositional clause must therefore be temporally indexed. If it lacks finite verb morphology, which would directly associate it with the speaker and the moment of speech, then it must receive its temporal index from a higher clause.

The link beween the temporal index of the higher clause and the inflectional head of the infinitival is like A-movement—and unlike A'-movement—in that the higher element is not inherently an operator that must bind a variable in the lower clause. It is thus not surprising that *to* is found when a propositional clause lacks an internal temporal index. By preventing the lower clause from being treated as a separate phase, *to* ensures that the temporal index of the higher clause is available to be copied into the lower clause. In the representation in (25) the temporal index is shown as a subscript t.

(25) [$_{\alpha}$ [$_{\beta}$ John] believes$_t$ ⫲[$_{\gamma}$ Mary] to be$_t$ happy⫳].

Interpret Phase (α)
α = declarative β believes$_t$ γ to be$_t$ happy
Interpret Phase (β)
β = John
Interpret Phase (γ)
γ = Mary

A series of infinitival clauses with *to* will be treated as a single phase, permitting both A-moved elements and temporal indices to be copied as many times as necessary. An example of this is given in (26).

(26) $[_{\alpha}\ [_{\beta}$ She] seems_t ~~[~~ to be_t likely ~~[~~ to be_t made ~~[~~ to laugh~~]]]~~].

Interpret Phase (α)

α = declarative β seems_t β to be_t likely β to be_t made β to laugh

Interpret Phase (β)

β = she

6. Further questions

6.1 PRO and trace

So far, we have ignored the distinction between A-traces and controlled PRO, saying simply that *to* is required when a clause lacks an overt subject. The structures produced by Interpret Phase as shown here are equivalent to LF structures generated under a copy theory of movement. If we assume, following Hornstein (1999), that both trace and PRO can be generated by copying, then there is no need to distinguish between the two notationally. If no material from a higher clause is available for copying into the empty subject position of a *to* clause, as in (27), the empty position is interpreted as PRO_{arb}.[3]

(27) To leave now would be foolish.

6.2 Syntactic category

The analysis outlined in the preceding sections accounts for the distribution of *to* and its contribution to semantic interpretation, but leaves open the question of its syntactic category. Since *to* cannot be shown to belong to any existing syntactic category, and yet determines crucial syntactic-semantic properties of the clauses in which it appears, one obvious possibility is that it heads a unique projection: *to* Phrase (*to*P). A *to*P would consist of the head *to* and its complement, an unsaturated VP, *v*P, EP, IP, or CP.

However, *to* can appear to the right of the specifier of an IP or CP that would be its complement under a *to*P analysis, as shown in (28).

(28) a. We want $[_{\text{IP}}$ Elan to play the recorder].

b. Elan wondered $[_{\text{CP}}\ [_{\text{DP}}$ which instrument] to play].

We propose instead that *to* is adjoined to the head of the category whose phasehood it overrides. In (28a), then, *to* is adjoined to I; in (28b), to C. In the absence of any independent evidence that *to* projects syntactic structure, there is no reason to assign it a syntactic category.

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[3] There is clearly more to be said about the conditions under which an arbitary interpretation is possible, and why *to* is required when the interpretation is arbitrary. For cases like (27), it has been proposed (Kimball 1971) that the empty subject position does not receive a truly arbitrary interpretation, but is coreferential with an implicit dative in the matrix clause. Overriding the phase boundary between the two clauses may be necessary for the establishment of this coreference. In addition, clauses with PRO_{arb} are always propositional and non-finite, and thus depend on higher clauses for their temporal anchors. See Landau (1999) for a detailed discussion of the conditions governing the interpretation of PRO.

Split infinitives like (29) might be thought to constitute evidence against the claim that *to* adjoins to the left of the head of its clause. However, we assume, following Travis (1988), that adverbs capable of intervening between *to* and a verb in the absence of EP or IP are also X° elements adjoined to the verb, as in (29). Thus *to* in (29) is in fact adjoined to the head of VP.

(29) She tried [$_{VP}$ [$_{V°}$ to quietly sneak] out of the house].

Taking *to* to be left-adjoined to a head permits a new explanation of what has traditionally been thought to be a selectional restriction on *if*. While *whether*-clauses can be infinitival, *if*-clauses cannot. This is illustrated in (30).

(30) a. Elan wondered [$_{CP}$ whether to play the harmonica].
b. Elan wondered [$_{CP}$ if he should play the harmonica].
c. *Elan wondered [$_{CP}$ if to play the harmonica].

Assuming that *whether* is the specifier of its CP, and that *if* is a Cº, we expect *whether* to appear to the left of *to*, as it does in (30a). If *to* were to appear with *if*, we would predict that *to* should precede *if* as it precedes other heads. The ungrammaticality of (30c) is thus entirely expected; this, however, raises the question of why (31) is also ill-formed.

(31) *Elan wondered [$_{CP}$ to if play the harmonica].

The ill-formedness of (31) suggests that phonological adjacency to Vº is a morphological requirement of *to*. In other words, *to* is, unsurprisingly, a verbal clitic. Treating *to* as a clitic also correctly predicts that while (29) is grammatical, the sentences in (32) are not.

(32) a. *She tried to [$_{VP}$ [$_{PP}$ without a sound] sneak out of the house].
b. *We expect [$_{IP}$ her to [$_{PP}$ without a sound] sneak out of the house].

In (29), *to* is phonologically adjacent to a Vº to which *quietly* has been adjoined; in (32), the PP *without a sound* intervenes between *to* and the verb, and the sentences are ungrammatical.

6.3 *Tough*-movement

The analysis proposed in this paper suggests that the presence of *to* can be used to distinguish A-movement from A'-movement. This casts a well-known restriction on *tough*-movement in a new light. As Berman (1973) points out, every clause between the surface position and the theta-position of a *tough*-moved element must lack an overt subject. Such clauses therefore cannot be finite, as illustrated in (33).

(33) a. Mary is easy to convince Bill to talk to.
b. *Mary is easy to convince Bill that he should talk to.

The contrast between (33a) and (33b) is unsurprising if *tough*-movement is A-movement, but completely unexpected if it is A'-movement. By overriding the phase, infinitival *to* permits A-moved elements to be associated with their θ-positions; an A'-trace, however, is typically bound by an operator in the left periphery of a phase, and so should not require that intervening clauses be non-finite. The similarities between *tough*-movement and Wh-movement (Chomsky 1977 *inter alia*) remain to be accounted for.

7. Conclusion

To is a morpheme with no denotation. It has no discernible syntactic category, though it does have morpho-phonological selectional properties. Its sole effect is to block a procedure of the syntax-semantics interface. While it is not part of the LF representation, it is part of how LF is computed. *To*'s apparent lack of semantic content can be attributed to the fact that it is an instruction to the semantic computation rather than part of the material on which that computation operates.

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