

# Probes, Goals and Syntactic Categories\*

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## 1. Introduction

In this paper, we propose that when any two syntactic units are combined by the operation Merge, a "probe-goal" relation (Chomsky 2000; 2001) must be established between these elements. We call this the *Vehicle Requirement on Merge*, reflecting the conjecture that the probe-goal relation serves as a "vehicle" for Merge and for the semantic or phonological relations established by Merge:

### (1) **Vehicle Requirement on Merge (VRM)**

If  $\alpha$  and  $\beta$  merge, some feature  $F$  of  $\alpha$  must probe  $F$  on  $\beta$ .

Merge comes in two types, Internal Merge (movement) and External Merge. External Merge takes two elements that are independent (lexical items or outputs of previous Merge operations) and combines them to form a larger unit. Internal Merge does the same thing, except that the two elements are not independent; one of the elements is a subpart of the other. For Internal Merge, VRM is not a new idea. It has been argued in much recent literature (following Chomsky (2000)) that for  $\beta$  to move to  $\alpha$ , a probe-goal relation must hold between at least one feature of  $\alpha$  and a corresponding feature of  $\beta$ . In this sense, Internal Merge does not "come for free". VRM extends to External Merge this familiar precondition for Internal Merge. If VRM is true, *no* instance of Merge is free.

If Chomsky (2000) is correct that only unvalued features may probe, it follows from VRM that whenever an element  $\alpha$  merges with an element  $\beta$ ,  $\alpha$  must bear at least one unvalued feature  $F$ , and  $\beta$  must bear an instance of the same feature. If  $F$  on  $\beta$  is valued, one might expect that the probe-goal relation between  $\alpha$  and  $\beta$  would provide  $F$  on  $\alpha$  with a value — the phenomenon called *agreement*. The probe-goal relations that we will discuss here, however, are different. Unlike those that have been studied previously, they quite crucially do *not* value features on the probe. Thus, agreement does not obtain.

We will argue for VRM by showing that it helps answer a fundamental question that we have raised in our own previous work: why the various syntactic categories display characteristic — and characteristically *different* -- patterns of combination with other syntactic units. In this paper, we ask in particular why the categories  $N$  and  $V$  show distinct patterns of complementation and (clausal) modification. We suggest that these differences arise from differences in the list of features that are valued on each syntactic category — with implications for the kinds of features that may be *unvalued*, and thus may serve as probes to satisfy VRM.

This is where the work makes a clear connection with the deeper goals of theoretical and experimental linguistics. Over the past few decades, there has been considerable research on statistical properties of naturally occurring text that can be used to sort words according to their part of speech. Much of this work has a practical, engineering focus rather than a psycholinguistic orientation. Nonetheless, hovering over the effort is the conjecture that the child acquiring language also performs a part-of-speech sort of the type under investigation. This work leaves open (and often unasked), however, the question of *why* the parts of speech should have the distribution that they do. *Why* do words with the semantics of nouns, for example, occur in syntactic environments different from those characteristic of words with the semantics of verbs?

Our answers to this question will also serve as the paper's principal argument for VRM. We begin with a discussion of complementation, and conclude with a discussion of relative clause modifiers. In the final section of the paper, we will situate VRM in the context of a more general view of the relation between Merge and agreement. We will suggest that probe-goal relations are the "vehicle" for Merge (hence our choice of terminology), and we will offer some speculations about the reasons why certain probe-goal relations might not yield agreement.

## 2. Complements of N vs. complements of V

As is well-known, V and N differ in their ability to take PPs or DPs as complements. Pesetsky and Torrego (2004a; henceforth *P&T*), following work by Stowell (1981; 1982), Pesetsky (1991), and others, extended the picture by observing differences in CP complementation as well. We will briefly survey the relevant facts first for V, and then for N, focusing on English.

Verbs allow DP complements, but do not freely allow PP complements.<sup>1</sup>

### (2) PP bad, DP good

- a. \*Sue destroyed of the city      b. Sue destroyed the city

When V allows a finite CP complement, the clause-introducing element *that* may be omitted:

### (3) V: finite CP complement, with *that*: ok

- a. We proved that Mary could not have committed the crime.  
b. They demonstrated that John was insane.

- (4) **V: finite CP complement, omission of *that*: also ok**
- a. We proved Mary could not have committed the crime.
  - b. We demonstrated John was insane.

When V takes a non-finite CP complement, it may (in English) be introduced by the element *for*, which may also be omitted in certain environments — obligatorily in the presence of PRO. Clauses with overt or omitted *for* can be identified by their characteristic irrealis (or generic) semantics (Bresnan (1972); Carstairs (1973); Pesetsky (1991)), as also discussed by P&T (2001; 2004a):

- (5) **V: infinitival CP complement, *for*-infinitives (irrealis semantics)**
- a. **with *for*: ok**  
Mary desired for Sue to win.
  - b. **V: infinitival CP complement, *for* deleted before PRO: ok**  
Mary desired to win.

V may also take as a complement an infinitive that lacks the semantics of a *for*-clause — for example, a factive or implicative clause:<sup>2</sup>

- (6) **V: infinitival CP complement, factive or implicative (no *for*)**
- a. **factive: ok**  
Mary hated to have to leave.
  - b. **implicative: ok**  
Mary managed to leave early.

Nouns contrast with verbs on each of these points. The most familiar observation is the fact that N disallows DP complementation, but does allow corresponding PPs instead:

- (7) **N: complement PP good, DP bad** [compare (2)]  
 a. Sue's destruction of the city                      b. \*Sue's destruction the city

Another contrast in English (Stowell (1982)) can be found in the domain of finite CP complementation. The clause-introducer *that* may not be omitted in a CP complement to N:

- (8) **N: finite CP complement, with *that*: ok** [compare (3)]  
 a. your proof that Mary could not have committed the crime  
 b. the demonstration that John was insane
- (9) **N: finite CP complement, omission of *that*: bad** [compare (4)]  
 a. \*your proof Mary could not have committed the crime  
 b. \*the demonstration John was insane

A parallel contrast is found in the domain of non-finite CP complementation (Pesetsky (1991); P&T (2004a)). Here, infinitival complements with overt or omitted *for* are acceptable, but infinitival complements without the characteristic semantics of *for*-clauses (i.e. factive and implicative clauses) are systematically impossible.

- (10) **N: infinitival CP complement, *for*-infinitives (irrealis semantics): ok**  
 [compare (5a)]

- a. Mary's desire for Sue to win  
 b. Bill's arrangement for Tom to take the exam

- N: infinitival CP complement, *for* deleted before PRO: ok**  
 [compare (5b)]

- c. Mary's desire to win                      d. Mary's need to intervene  
 e. Mary's agreement to return              f. Mary's arrangement to take the exam

(11) **N: factive or implicative infinitival CP complement (no *for*): not ok<sup>3</sup>**

[compare (6a-b)]

- a. \*Mary's hate/hatred to have to leave    b. \*John's dislike to go home  
c. \*Sue's love to solve problems            d. \*Mary's bother to leave early  
e. \*Mary's luckiness to win the lottery    e. \*Mary's condescension to leave

It appears then that the complement of N must be headed by *that*, *for* or P, and that the requirements imposed on the complement of V are different. The question we must now ask is what *that*, *for*, and P have in common.

An answer that we have offered in previous work (P&T 2001; 2004a) is the following: they all show "X-trace effects", as shown in (12)-(14):

(12) **"That-trace effect"** (Perlmutter (1971))

[non-subject wh --> optional *that* ]

- a. What do you think [Mary read \_\_\_]?  
b. What do you think [that Mary read \_\_\_]?

[subject wh --> no *that*]

- c. Who do you think [\_\_\_ read the book]?  
d. \*Who do you think [that \_\_\_ read the book]?

(13) **"for-trace effect"** (Chomsky and Lasnik (1977))

[non-subject wh --> optional *for* (sort-of...)]

- a. What do you want [us to read \_\_\_]?  
b. What would you prefer [for us to read \_\_\_]?

[subject wh --> no *for*]

- c. Who do you want [\_\_\_ to read the book]?  
d. \*Who would you prefer [for \_\_\_ to read the book]?

(14) **"P-trace effect"** (Kayne (1979))

[non-subject wh --> P ok ]

a. How much headway did he anticipate [Mary making \_\_\_ on the issue]?

b. How much headway did he talk [about Mary making \_\_\_ on the issue]?

[subject wh --> P bad ]

c. How much headway did he anticipate [\_\_\_ being made on the issue]?

d. ??How much headway did he talk [about \_\_\_ being made on the issue]?

We drew a link between these X-trace effects and a similar phenomenon found with Tns-to-C<sup>4</sup> raising in such constructions as the Standard English matrix questions in (15) (Koopman (1983)), as well as certain embedded declaratives in Belfast English (Henry (1995, pp. 108-109; and personal communication), which space prevents us from reviewing here:

(15) **"Tns-trace effect"**

[non-subject wh --> "optional" Tns-to-C]

a. What a nice book Mary read \_\_\_!

b. What did Mary read \_\_\_?

[subject wh --> no Tns-to-C]

c. Who \_\_\_ read the book?

d. \*Who did \_\_\_ read the book?/\*What a nice person did read the book!

We argued that the X-trace effects seen in (12)-(14) are *literally* the same effects as the Tns-trace effect seen in (15). In particular, we proposed that the clause-introducers *that* and *for* seen in (12) and (13) are not complementizers (as generally assumed), but are actually instances of Tns moved to C. English C itself, on this view, is a null morpheme (though languages may differ in this respect, and may have an overt C).<sup>5</sup> On this view the impossibility of *that* and *for* when the local subject undergoes A-bar movement becomes *the very same fact* as the impossibility of *do* moving to C in (15).

As for the prepositions that produce the P-trace effect seen in (14), we argued in P&T (2004a) that prepositions (at least those that introduce clausal gerunds) bear T-features akin to those borne by Tns.<sup>6</sup> The P-trace effect thus identifies P as essentially an instance of Tns that raises to its surface position by Tns-to-C (or Tns-to-D) movement. They are thus expected to show the same X-trace effects as *that*, *for* and finite verbs, as they do.

Space prevents us from reviewing the actual *reasons* why movement of Tns to C in all these constructions is not compatible with local A-bar movement of the subject — that is, the reasons for the X-trace effect. For this, see P&T (2001). What is important here is simply the overall generalization: *that*, *for* and P pattern together because they are all bearers of T-features.

This generalization allows us to return to the question we asked above. We saw that the complement of N must be headed by *that*, *for* or P, and we asked what these elements have in common. We may now offer an answer: they all bear interpretable -- (in fact, valued) T-features. The facts in (7)-(11) amount to a requirement that the complement of N bear valued T on its head.

As we saw, the complements of V are subject to a completely different set of requirements. The complement to V may be a DP or any type of CP (whether or not Tns has moved to its head), but may not be a PP. We may naturally characterize this set of phrases as those that bear a different set of features: not T-features in this case, but interpretable, valued  $\varphi$ -features.

Note that a CP in which Tns has moved to C will show valued T on its head (as a result of Tns-to-C movement) as well as  $\varphi$ , and is thus expected to serve as an acceptable complement to both N and V. This is a correct prediction. Though V and N impose different requirements on their complements, the result is not complementary distribution among their complements, but an overlapping pattern, summarized below:



(16) **Key observations about the complements of N and T**

a. A complement of N must be headed by valued T.

[*Consequence*: PP complement and CP with T moved to C (*that, for*) are ok;  
bare DP or CP without T in its head are unacceptable.]

b. A complement of V must be headed by valued  $\varphi$ .

[*Consequence*: DP complement and any sort of CP complementation is ok;  
PP complementation is in general unacceptable. ]

### 3. Probing the complement

The requirements in (16) are properties that distinguish nouns from verbs, and therefore reflect differences in their intrinsic features. These must be features that are sensitive to their syntactic environment. The theory of agreement developed by Chomsky (2000; 2001) and others has suggested that *unvalued features* are sensitive to their syntactic environment in just the manner required. An unvalued feature F acts as a *probe*, and searches its c-command domain for another instance of F, which provides the probe with a *goal*. As we noted at the outset, in the cases most studied, a probe and its goal enter an agreement relation, (which, if the goal is valued, valued the probe as well). We propose that the requirements seen in (16a-b) also reflect the action of probes, even though valuation does not result from these kinds of probe-goal relations and no agreement ensues.

Given (16a), then if this requirement of N is related to probe-goal interactions, it must be the case that N bears unvalued T features. In fact, this is exactly what we have proposed in earlier work, for entirely independent reasons. In P&T (2001; 2004a), we argued that the property of nominals usually called *structural case* is actually unvalued (and uninterpretable) T on N (as earlier suggested by Williams (1994, 11) and argued independently by Haerberli (2002)). This argument played a key role in our account of X-trace effects, and

was supported in P&T (2004b) by a discussion of the properties of raising constructions that involve so-called "defective T".

Likewise, given (16b) (and, once again, if this requirement of V is related to probe-goal interactions), then it must be the case that V bears unvalued  $\varphi$ -features. In fact, subject agreement in the verbal system of languages like Spanish and English may reflect unvalued  $\varphi$ -features on V of just this sort.<sup>7</sup> Thus it is also not unreasonable to propose — for reasons independent of (16b) — that V itself bears unvalued  $\varphi$ -features.

We propose, then, that the complement of N must provide a goal for unvalued T on N, and that the complement of V must provide a goal for unvalued  $\varphi$  on V. At this point it should be clear why we conclude that these probe-goal relations do not yield agreement. If structural case is indeed unvalued T on N, and if this T-feature could agree with the complement of N, a noun with a complement would bear valued T simply as a result of taking a complement. Any noun with an appropriate complement would in effect behave in the manner often attributed to nouns that bear "inherent case". Unvalued T on such a noun — i.e. its case feature — would get valued internally. The noun and its DP would be licensed even in non-case positions. The external syntax of nouns with complements would thus differ radically from the external syntax of nouns that lack complements. This is contrary to fact, and shows that the probe-goal relation that we posit between the T-features of N and N's complement must not yield agreement.

Likewise, if the unvalued  $\varphi$ -features of V could agree with the complement of V in languages like Spanish or English, we would expect object agreement, rather than subject agreement, in transitive clauses.<sup>8</sup> Once again, this is contrary to fact. Thus, the probe goal relations that underlie (16a-b) do not yield agreement. We return below to why this should be the case.

What might be the reason for the requirements in (16a-b)? We can begin to explore this question by noticing that it is surely no accident that — if any features of N or V are required to probe the complement — it is the T-features of N and the  $\varphi$ -features of V that accomplish this task, and not the other way around. It is *unvalued* features that probe, not valued features, and it is T on N and  $\varphi$  on V that is lexically unvalued.

By contrast, a salient property of N is the fact that the  $\varphi$ -features of N (unlike its T-features) are lexically *valued*. (See P&T (2004b) for arguments.) When a child learns a noun like Spanish *mesa* 'table', the noun is learned in connection with its gender (in this case, feminine). Nouns also may have a characteristic number, as is the case with pluralia tantum like English *aerobics*. This suggests that number, like gender, is specified in the lexicon (as also argued in P&T (2004b)) — sometimes by optional morphology, and sometimes by lexical stipulation. Nouns also appear to bear person features (though this observation is complicated by such questions as the D vs. N status of pronouns). On the other hand, as we have just noted, the T-features of N (its case features) are clearly *unvalued* in the lexicon, the fact that serves as the source of case-filter effects for nominals. Thus, if any features of N are going to act as probes, it must be its T-features, and not its  $\varphi$ -features.

Similar reasoning holds for verbs. As also discussed in P&T (2004b), a verb may also be restricted to particular tenses or aspectual categories. This type of restriction does not appear to be found for subject agreement properties of a verb. Thus, it is reasonable to suppose that a verb is learned with a particular value for its T-features, in contrast to its  $\varphi$ -features, which are lexically unvalued. Thus, if any features of V are going to act as probes, it will be its  $\varphi$ -features, and not its T-features.<sup>9</sup>

It is thus likely that the language faculty does not stipulate which features of N or V must act as probes in order to license complementation. It merely

requires *some* feature of N or V to act as a probe. The features that can play this role will necessarily be the unvalued features. This suggests the more general hypothesis that a probe-goal relation is a necessary *vehicle* for Merge in both verbal and nominal domains — a hypothesis that we have so far discussed for complementation, and which we will also explore in the domain of modification. This is the hypothesis that we have stated as *VRM* in (1).<sup>10</sup>

This overall approach, then, allows us to explain aspects of the external syntax of N and V as direct consequences of independently observable differences in their internal makeup. It is a truism that nouns pick out "persons, places, things and abstract ideas", while verbs denote things like events and states. We suggest that this truism is simply a slightly less formal way of observing the difference between items whose  $\phi$ -features are lexically specified and items whose T-features are lexically specified. We are thus able to derive certain seemingly arbitrary differences in the complementation properties of verbs and nouns directly from their most fundamental properties.<sup>11</sup>

#### 4. Clausal Modifiers of N

As stated in (1), *VRM* is not a requirement on complementation in particular, but on Merge more generally. If *VRM* is indeed a general condition on Merge, we expect to detect its effects in a variety of environments. This section offers a brief argument that this expectation is fulfilled.

Relative clauses in the Romance languages and infinitival clauses in English, present an unsolved puzzle that has generally been viewed as an idiosyncratic phenomenon particular to these constructions. When viewed from the perspective of the previous sections of this paper (and within the context of our earlier work), however, this puzzle can be seen as another straightforward effect of *VRM* — an effect found with instances of Merge that result in modification rather than complementation. In section 5, we will briefly argue that finite relative clauses in English, which superficially appear not to display the

effects of this puzzle, actually do show its effects, and therefore provide additional indirect evidence for VRM.<sup>12</sup>

The puzzle for English infinitival relatives was noted (perhaps first) by Emonds (1970, 200-204) and was discussed further by Emonds (1976, 192-193) and Chomsky (1977, 98). An infinitival relative in English may be introduced by *for*, which may be either overt (as in (17a)) or covert when the subject is PRO (as in (17b)):

(17) **Infinitival relative clause introduced by *for*: ok**

a. **overt *for***

a person [**for** Mary to invite \_\_\_ to the conference]

b. ***for* deleted before PRO**

a person [∅ PRO to invite \_\_\_ to the conference]

An English infinitival relative may also be introduced by a pied-piped *wh*-PP:

(18) **Infinitival relative clause introduced by a pied-piped *wh*-PP: ok**

a. a person [**with whom** [PRO to speak \_\_\_ at the conference]]

b. a topic [**on which** [PRO to work \_\_\_]]

In the context of a discussion in the 1970s about the clausal status of infinitival phrases, Emonds and Chomsky used examples like (18a-b) to demonstrate the existence of *wh*-movement in an infinitival relative clause (and therefore to demonstrate their clausal status). They proposed that A-bar movement of a similar sort is found in (17) as well, despite the absence of an overt *wh*-phrase. The possibility of overt *wh*-movement of a PP in (18) leads us to expect that comparable examples introduced by a *wh*-nominal will be acceptable. The puzzle is the fact that such examples are actually unacceptable, as seen in (19):

(19) **Infinitival relative clause introduced by a bare DP (*which, who*): not ok**

- a. \*a book [**which** [PRO to read \_\_\_]]
- b. \*a person [**who** [PRO to invite \_\_\_ to the conference]]

The unacceptability of (19a-b) is especially surprising because seemingly parallel finite examples are acceptable in English (a point to which we return in the next section), and also because of the acceptability of parallel infinitival interrogatives, as seen in (20):

(20) **Infinitival interrogative introduced by a bare DP: ok**

- a. Mary asked [which (one) [PRO to read \_\_\_]].
- b. Bill wondered [who [PRO to invite \_\_\_ to the conference]]

Strikingly, a puzzle very much like that seen in (17)-(19) is found in the *finite* relative clauses of a variety of Romance languages (Kayne (1977); Cinque (1981)).<sup>13</sup> Examples (21)-(23) illustrate the puzzle for French and Spanish, respectively:

(21) **Finite relative clause introduced by *que* 'that': ok**

- a. l'homme [**que** Marie a invité \_\_\_]  
the man that Marie has invited
- b. el problema [**que** María ha resuelto\_\_\_]  
the problem that Maria has resolved

(22) **Finite relative clause introduced by a pied-piped *wh*-PP: ok**

- a. l'homme [**avec qui** Marie a parlé \_\_\_]  
the man with whom Marie has spoken
- b. la mujer [**con quien** María ha hablado\_\_\_]  
the woman with whom Maria has spoken

- (23) **Finite relative clause introduced by a bare DP (*which, who*): not ok**
- a. \*l'homme [**qui** Marie a invité \_\_\_]  
       the man     who Marie has invited
- b. \*la mujer [**quien** nos han     dicho que \_\_\_ ha escrito la novela]<sup>14</sup>  
       the woman [who us   have+3pl told   that    has written the novel]  
       'the woman who they have told us has written the novel'

The context in which these puzzles were discussed in the 1970s was the hypothesis that A-bar constructions uniformly reflect *wh*-movement, whether or not the moving element appears overtly. The contrasts between (17) and (19) and between (21) and (23) were viewed as circumstances in which a special filter (or obligatory deletion rule) enforces the non-overtness of the *wh*-phrase. Since these proposed rules and filters were ad hoc, however, the phenomena themselves remained essentially unexplained. Nothing actually predicted, for example, that putative *wh*-deletion is obligatory in a nominal environment, but not in a verbal environment like (20).

In the present context, an entirely different generalization about the phenomenon can be offered. Each acceptable relative clause in (17)- (23) is introduced by *for*, *that* (*que*) or a PP. Let us now make the non-standard assumption that the moved *wh* in a relative clause projects after movement.<sup>15</sup> If we accept this assumption, then we may state the generalization more sharply: the relative clauses under discussion must actually be *headed* by *for*, *that* (*que*) or P.

*For*, *that* and P is a list of elements that we have, of course, encountered before. These are the elements that are acceptable in English as heads of complements to N, a fact explained by VRM. Now, however, we are not dealing with complements, but with *modifiers*. If VRM is the reason why complements to English N must be headed by *for*, *that* or P, then the puzzle just discussed

provides us with an argument that the effects of VRM extend to modification structures as well.

This is where it matters that the moved *wh*-phrase in a relative clause projects. If the moved *wh*-PP projects in examples like (18), VRM predicts the contrast with cases like the unacceptable (19), in which a DP has been *wh*-moved and projects. In the latter case, the T-features on D are uninterpretable and will delete once the relative clause (a phase) has been constructed (Chomsky (2000); Chomsky (2001)). When a relative clause like (19) is merged with N, the T-features of N, acting as a goal, will not find T-features on the relative clause itself. Therefore no probe-goal relation will provide a vehicle for the modification relation that Merge would otherwise create. By contrast, in a P-headed relative clause, the interpretable T-features of P will not delete, and will be accessible as goals for T on N, thus satisfying VRM.

In the case of clauses introduced by *for* or *that*, we have already argued (on the basis of our own previous work) that these elements are instances of Tns (a bearer of interpretable, hence undeletable T-features) that have moved to C.<sup>16</sup> That is why *for*-relatives and *that*-relatives (*que*-relatives) also satisfy VRM when merged with N as modifiers. They satisfy VRM in precisely the same way *for*-clauses and *that*-clauses satisfy VRM when merged with N as complements.

It will be useful at this point to make explicit what analysis we have in mind for *that*-relatives and *for*-relatives in English and in Romance more generally. We propose that these relative clauses are constructed as suggested by Bhatt (1999). He argues for the simplest variety of "head raising" analyses of such relative clauses (Vergnaud (1974)), in which the relevant projection of N moves to C (in response to an unvalued feature with an EPP property, which we will call *Rel*) — but then projects, rather than forming the traditional specifier of CP.<sup>17</sup>



(24) **NP-projecting analysis of *that*-relatives**

- a. the [<sub>NP</sub> person [**that**<sub>Tns+C</sub> I met \_\_\_]]
- b. the [<sub>NP</sub> book [**that**<sub>Tns+C</sub> I bought \_\_\_]]

In what follows, we will assume Bhatt's characterization of examples like (18) and (21).

**5. Finite relative clauses in English**

Finite relative clauses in English appear to pose problems for the proposals that we have offered in the previous section. Like infinitival relatives (and like Romance finite relatives), they accept *wh* movement of a PP:

(25) **Finite relative clause introduced by a pied-piped *wh*-PP: ok**

- the person [**with whom** Mary spoke \_\_\_ at the conference]

In contrast to infinitival relatives (and in contrast to their finite Romance counterparts), however, English finite relatives may be introduced by *who* and *which*. The examples in (26) thus contrast sharply with (18):

(26) **Finite relative clause introduced by a bare DP (*which*, *who*): ok**

- a. the person [**who** I met \_\_\_]
- b. the book [**which** I bought \_\_\_]

Previous analyses of the relative clauses in (26) have generally viewed *who* and *which* as elements that have undergone *wh*-movement to the same position as that occupied by *with whom* in (25). That is why the effects discussed in the previous section have seemed especially puzzling. If *who* and *which* in (26) are

moved *wh*-phrases (and if VRM is not true), then English finite relatives "make sense" in a way that their infinitival and Romance counterparts do not. Some special factor must then be assumed that blocks *who* and *which* in those relative clauses that differ from English finite relatives.

Our discussion inverts the traditional approach to these issues. Given VRM, it is the relative clauses of Romance and the infinitival relatives of English that make immediate sense, and it is English finite relative clauses that appear puzzling (with the caveat in footnote 17). In this section, we argue that the appearance of a puzzle stems from a misanalysis of *who* and *which* as moved *wh*-phrases in English finite relative clauses.

We adopted in the previous section a head-raising analysis of relative clauses introduced by *that*. In *that*-relatives, *that* is Tns+C, as in our previous work. The C component bears an additional Rel feature with an EPP property. It is this feature that triggers the raising of the head of the relative.<sup>18</sup> Because of the presence of interpretable valued T-features on the Tns component of *that*, a relative CP headed by *that* conforms to VRM when merged (by movement) with the raised head of the relative.

We would now like to argue that *who* and *which* in English finite relatives are not moved *wh*-phrases, but agreeing variants of relativizing *that*. If this proposal is correct, English finite relative clauses fall together with the relatives considered in the previous section, and none of the relatives under discussion appear to require any special explanation.

Just like relativizing *that*, relativizing *who* and *which* are realizations of C+Tns with a Rel-feature. *Who* and *which* in relative clauses differ from relativizing *that* in one respect only: *who* and *which* agree in animacy with the goal probed by the Rel-feature. The suggested syntax of *who* and *which* relatives in English is thus (27) (cf. (24)):<sup>19</sup>

(27) **Bare *who* and *which* as agreeing variants of *that***

- a. the [<sub>NP</sub> person [**who**<sub>Tns+C</sub> I met \_\_\_]]  
b. the [<sub>NP</sub> book [**which**<sub>Tns+C</sub> I bought \_\_\_]]

The difference in English between finite relatives like (27) and infinitival relatives, which disallow *who* and *which*, may then reflect nothing more than the familiar fact that non-finite forms are generally less rich in morphological expressions of agreement than their finite counterparts. That is, the fact that non-finite relativizing C lacks the animate-inanimate distinction found in finite clauses becomes an instance of the more general fact that English *to* and infinitival verbs in Spanish, French and many other languages fail to vary morphologically in tense or  $\varphi$ -features as its various finite counterparts do.<sup>20</sup>

(28) **Morphology of English Tns+C**

Tns moved to C is realized as:

- (i) *who* if +Rel, +animate and not infinitival; otherwise
- (ii) *which* if +Rel, -animate and not infinitival; otherwise
- (iii) *that* otherwise

The unavailability of counterparts to *who* and *which* in Romance relative clauses at present has no actual explanation, but does fall in line with known variation in morphological agreement among languages. We might speculate, in fact, that languages like French and Spanish fail to display agreement on C with the relativized expression because the Rel component of Tns+C (e.g. French and Spanish *que*) is agreeing with a different set of features — conceivably the neuter inanimate singular  $\varphi$ -features of the relative TnsP itself. English would,

on this view, show this pattern as an option, thus accounting for the *that*-variant of finite relative clauses.<sup>21</sup>

Our proposal about relativizing *who* and *which* might seem surprising, since it appears to ignore the fact that *who* and *which* in English relatives are phonologically identical to *wh*-words that do undergo *wh*-movement of the familiar sort (in relative clauses as well as questions). The phonological identity of these elements is actually not unexpected, given their featural similarity. Both the *who/which* that are variants of *that* and the *who/which* that undergo *wh*-movement bear the same value for Rel (after agreement) as well the same value as for animacy. A relative word that is [+animate] is realized as *who* whether these features are on the complementizer probe or on a *wh*-phrase goal in relative clauses like (25), precisely because the features that are realized are identical. Likewise for a relative word that is [-animate], which is realized as *which* regardless of its status as probe or goal.<sup>22</sup>

In the literature on child language acquisition, much the same proposal has been argued for by Thornton (1995) (also Thornton and Crain (1994); and Crain and Thornton (1998, chapter 22)) as an explanation for a phenomenon that is both common and as puzzling as the facts we have sought to explain. This is the pervasive use of *wh*-forms in the CP system of declarative clauses through which overt *wh*-movement has proceeded in languages like English (that do not otherwise show this type of "medial *wh*"):

- (29) a. Who do you think who Grover wants to hug? (4;9)  
b. What do you think what Cookie Monster eats? (5;5)  
c. Which boy do you think who Miss Piggy kissed? [no age given]
- [Crain and Thornton (1998, 187, 201)]

The use of *who* in (29c) (and the absence of comparable examples in which *which boy* is repeated) makes it clear that children are not using a copy of the

*wh*-phrase that has moved, but a single-word form that agrees in animacy with the moved *wh*-phrase. Thornton argues that such forms are in fact agreeing instances of C — essentially the same proposal we are offering for relative clauses.

Our proposal that words like relativizing *who* and *which* are instances of C makes a prediction distinct from the predictions of earlier approaches that treat these words as moved *wh*-elements. If relativizing *who/which* is a moved *wh*-element, it should be capable of being merged (for example, by coordination) with other phrases — and (all things being equal) it should be able to pied-pipe this material to the left edge of the relative clause. Interrogative *who* and *which* do have this capability, as seen in (30a) and (31a) below. If relativizing *who/which* is an agreeing complementizer, however, nothing other than its complement TnsP should be capable of being merged with it, and in particular it should not be able to be coordinated with any other material. As (30b) and (31b) show, relativizing *who* and *which* do not behave like interrogative *who* and *which*, but do behave as predicted — if they are agreeing complementizers:<sup>23</sup>

(30) **Coordinating *who* with a full DP**

- a. I bet I know **who and his worries about global warming** you're about to discuss.
- b. \*the boy **who and his worries about global warming** you're about to discuss

(31) **Coordinating *what/which* with a full DP**

- a. **What and its matching tablecloth** do we need to put away?
- b. \*the table **which and its matching tablecloth** we need to put away

It is necessary, of course, to make sure that the contrasts in (30) and (31) concern the status of *who* and *which* in questions vs. relative clauses, and are not facts about questions vs. relative clauses more generally. In fact, relative clauses

that self-evidently show a moved *wh*-phrase do contrast with (30b) and (31b) as predicted. The examples in (32) form minimal pairs with those in (30b) and (31b), and contrast with them:<sup>24</sup>

(32) **Relative clauses with *who***

- a. the boy **whose mother and her worries about global warming** you're about to discuss
- b. the table **whose formica top and its matching tablecloth** we need to put away

The acceptability of (32a-b) is itself interesting, however, in another context. Indeed, simpler examples like *the person whose mother I met* raise the same issue. Such relative clauses show a clearly fronted DP and are therefore expected to be unacceptable, given VRM. In fact, across the languages and relative clauses discussed in this section, a DP whose left edge contains a *wh*-possessor is either fully or partially acceptable — as if the possessive part of the DP contained a preposition whose interpretable T is visible to the higher N, satisfying VRM:

(33) **Possessive *wh*:**

- a. the person [**whose** mother [I met \_\_\_]]
- b. %a person [**whose** virtues [PRO to praise \_\_\_ in your speech]]<sup>25</sup>
- c. la table [**dont** elle a cassé [le pied \_\_\_]] (French)  
the table whose she has broken the leg
- d. la persona [**cuya** madre he conocido el año pasado]] (Spanish)  
the person whose mother I-have met last year
- e. de man [**wiens** vader] ik ken (Dutch)  
the man whose father I know (De Vries (2006))

The ability of possessive and genitive case-marked elements to provide valued T-features visible to N in a manner relevant to VRM may lie behind other phenomena as well. *Galno* conversion in Japanese (Harada (1971); Harada (1976); Miyagawa (1993); Hiraiwa (2001); among many others) shows genitive subjects in precisely those environment (complements and modifiers to N) in which VRM would require unvalued T on N to find valued T on its complement . A similar requirement may be at work in the widespread phenomenon of genitive subjects in adnominal environments in Turkish and other Turkic languages (Lees (1965); Aygen (2002); Kornfilt (2000)). We leave the puzzle of (33) and its implications for future work.

## 6. VRM

In this final section, we offer some observations about the overall character of our proposal. We have argued that Merge (in particular External Merge) involves probe-goal interactions of a particular type. These interactions are initiated by unvalued features, but no agreement results.

The general fact that unvalued features behave as probes is not unexpected, since unvalued features must receive a value, and probe-goal interaction is the mechanism available for this. In this paper, we have argued that *all* instances of Merge involve a probe-goal relation between the merging elements. A more detailed characterization of this requirement might run as follows: Probe-goal relations precede Merge. (As so often in this paper, this is not a new proposal for Internal Merge; we are merely extending it to External Merge.) As lexical items and phrases are placed in the syntactic workspace, unvalued features on elements in that workspace search for their counterparts. If they find a counterpart on an independent element in the workspace, this licenses External Merge. Otherwise, the result is Internal Merge. Merge itself forms a phrase from the

elements whose features have established a probe-goal relation. It is in this sense that the probe-goal relations function as the vehicle for Merge.

Though the *purpose* of probe-goal interactions is valuation of the probe, we have focused in this paper on cases in which a probe-goal relation does not result in valuation. We may now view such a situation as a case in which an attempt at agreement fails.<sup>26</sup> The question we must ask is why agreement fails in these cases, but not in others.<sup>27</sup>

We do not have a firm answer to offer, but we can offer some speculations. These speculations reflect differences between the cases of Merge we have examined here (in which agreement fails) and better studied cases of Merge in which agreement succeeds. The cases of Merge (with agreement failure) that we have studied in this paper are those that license the semantic operations typical of lexical categories: operations such as  $\theta$ -marking and modification. Instances of Merge where valuation succeeds do not involve these semantic operations. They typically (perhaps exclusively) involve the unvalued features of functional categories such as Tns, C, D and perhaps  $v$ . If this distinction is significant, then perhaps it is the semantic relations characteristic of lexical categories such as V and N that block valuation.

This might suggest that valuation of an unvalued feature<sup>28</sup> may not take place on an element that has not yet assigned its  $\theta$ -roles and is still subject to modification. Valuation changes the featural make-up of such an element, and it is perhaps this "metamorphosis" that is incompatible with  $\theta$ -marking and modification. Once a lexical category has built its maximal projection (and no longer acts as a trigger for semantic operations), its unvalued features may (and ultimately must) be valued — but it will be elements external to that maximal projection that accomplish this task.

This paper has discussed two issues in syntactic theory and has argued that they are connected. The first is the nature of Merge and its relation to feature valuation and agreement. The second is the nature of the syntactic categories,



and the relation between their internal constitution and their syntactic behavior. We have suggested that VRM, when combined with a theory of probes and goals, highlights a deep connection between these two issues.

## Notes

\* For comments and useful discussion, we are grateful to Lisa Cheng, Ángel Gallego, Heejeong Ko, Jaklin Kornfilt, Richard Larson, Norvin Richards and Alain Rouveret. We are grateful to the audience at the 7th Annual Tokyo Conference on Psycholinguistics for their contributions, and also benefited from the comments of audiences at MIT, SUNY Stony Brook, Instituto «Ortega y Gasset» (Madrid), the Workshop on Descriptive and Explanatory Adequacy in Linguistics (ZAS, Berlin) and the Workshop on Altaic in Formal Linguistics (Moscow State University). We also benefited from the opportunity to present an early version of this research at the 2005 Summer Institute of the Linguistic Society of America.

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<sup>1</sup> Of course many verbs appear to select for PP. See P&T (2004a, 513-514) for the proposal that in all or most such cases, the PP is actually a second object. We will not discuss this issue further here.

<sup>2</sup> For detailed discussion that challenges some of our proposals on this topic, see Wurmbrand (2007).

<sup>3</sup> See P&T (2004a) for a fuller set of examples. The only exception appears to be the noun *failure* (from implicative *fail*), as noted in our earlier paper.

<sup>4</sup> We use *Tns* to refer to the syntactic category and its position in structure, and *T* to refer to the Tense feature (in the extended sense discussed below).

<sup>5</sup> In P&T (2001) we noted that *that* and *for* cooccur with main and auxiliary verbs that bear full tense morphology — including elements like supportive *do* that are often analyzed as Tns. We suggested an analysis in which the relation between *that/for* and the finite verb mirrors the doubling relation seen in Spanish clitic doubling and elsewhere. On this view, a subordinate clause like ...*that Mary did not read the book* shows Tns pronounced in two places, both as *that* in C and as *did* in situ. A simpler proposal, made possible by the separation of interpretability and valuation discussed in P&T (2004b), would identify *that/for* more straightforwardly as the only pronunciation of Tns in such examples, containing an unvalued interpretable set of T-features that receive their value by Agree with a lower verb. On this view, *did* is the bearer of valued T features, but is otherwise just another auxiliary verb, not an instance of Tns itself as widely assumed (including in our previous paper).

<sup>6</sup> T-features can be thought of as features which, when interpretable, situate or characterize an entity in either time (the familiar semantics for T) or in space (the familiar semantics for P). In our earlier work, we argued that this is not an unreasonable generalization, since the same elements are often used for both functions (including dialects of English; see, for example, Cottell (2003) for Hiberno-English *after*+present participle where Standard English has *have*+past participle).

<sup>7</sup> These  $\varphi$ -features on V are independent of the  $\varphi$ -features on Tns that may also play a crucial role in subject agreement. We leave open the familiar question of zero morphology within systems that otherwise show agreement, and assume that certain unvalued features may be present even in the absence of overt morphological realization.

<sup>8</sup> Of course, object agreement is found in many languages. We leave open the obvious question of whether this morphology reflects the probe-goal relations discussed in this section, or arises from some other syntactic process.

<sup>9</sup> In P&T (2004b) we argued that V in a raising infinitival has certain unvalued T-features (unlike its finite and control-infinitival counterparts). This proposal, if combined with the present discussion, makes the incorrect prediction that V in such a clause could show the complementation properties characteristic of N (in particular, PP complements), in addition to those expected of V. It may be that there is a set of features that fall under the general category T, and that the ones that are unvalued in raising infinitivals are not the same features as the ones that are found on prepositions. If this is the case, then no probe-goal relation could be established between the relevant T-features of the infinitival and a complement PP. We leave this problem unsolved for now and return to it in future work.

<sup>10</sup> VRM recalls the suggestion that case-assignment makes an argument "visible" for  $\theta$ -marking, a suggestion credited by (Chomsky (1981, 117), citing Aoun (1979)). See also Platzack (2003) for similar ideas.

<sup>11</sup> Baker (2003) undertakes a similar task, focusing on properties distinct from those that we have paid attention to here. We have not yet explored in detail how our results might (or might not converge) with his.

<sup>12</sup> For reasons of space, we limit our discussion to restrictive relatives. When non-restrictive relatives are considered, the picture becomes slightly more complex. The Romance languages, in particular, present a more diverse picture.

<sup>13</sup> The similarity was observed in passing by Chomsky (1980, 23), and was discussed in greater detail by Pesetsky (1998).

<sup>14</sup> This example is excluded because of *quien*, not because of the subject extraction. If *quien* is substituted by *que*, the result is acceptable. The subject extraction is chosen to avoid complications with accusative animate nominals.

<sup>15</sup> This proposal extends to *wh*-relatives an idea more familiar from the analysis of free relatives (Iatridou, Anagnostopoulou and Izvorski (2001); Larson (1998)).

<sup>16</sup> We have not shown this independently for Romance languages. We in fact suggested in P&T (2001, 381) that Spanish *que* might be C rather than Tns+C. We leave this gap in our present discussion open for now. It is also conceivable that *que* is an instance of C that lexically bears *valued T* (in contrast to English), or lacks T entirely — in light of the absence of *that*-trace effects of the English sort in Spanish, at least. For extensive exploration of these and related issues (partly in the context of our earlier work), see Gallego (2006). His analysis differs from ours on a number of points, to which we hope to return in future work.

<sup>17</sup> English relative clauses that lack both *wh*-elements and *that* may have a similar analysis to *that*-relatives, with the difference that such relative clauses take as its basis Topicalization (which has a landing site lower than C), rather than movement triggered by C. Thus, a DP like *the student I met* would involve Topicalization of *student*, yielding a structure in which *student*, rather than TnsP (or TopP) projects. In a more extensive version of this paper, we argue that the anomalous status of *that* in subject relative clauses in English (*the student that I met*) follows from the interaction of our account of *that*-trace effects with the projection of the moving element.

<sup>18</sup> More accurately, this is probably an unvalued but interpretable *wh*-feature, as discussed in P&T (2004b), with an EPP property.

19 For present purposes, we will assume that an unvalued feature *animate* is a subfeature of Rel, and is valued when Rel is valued. Alternatively, it may be that Rel bears an independent unvalued animacy feature, which does not agree with the relativized NP by acting as a probe in its own right. Rather, it is the higher D whose unvalued animacy feature probes both Rel and the raised NP. The agreement link between [animate] on D and its counterpart on Rel is initially an instance of agreement without valuation (Brody (1997); Frampton and Gutmann (2000); Frampton, Gutmann, Legate and Yang (2000); P&T (2004b)) which gets valued when the valued instance of [animate] on N is probed by D.

20 Just as some languages (e.g. Portuguese) have non-finite verb forms that nonetheless show  $\varphi$ -feature agreement, we might not be surprised to find languages with agreeing forms of Tns+C in which the finite/non-finite contrast in animacy agreement found in English does not appear. We are not at present aware of such cases, however.

21 The *that*-variant may reflect a choice of C that bears no animacy feature whatsoever. This in turn may explain the fact that so-called Amount Relatives (Degree Relatives) strongly prefer *that* to *which* as the element introducing the relative clause (Carlson (1977); Heim (1987); Grosu and Landman (1998)). Thus *the 10 euros that you have in your pocket* may refer either to a sum of money whose total value is €10 or to ten €1 coins, where the former reading indicates an amount relative. The corresponding example with *which* replacing *that* strongly favors the latter reading. On the analysis of relative clauses and of the *which/that* distinction offered here, the choice of *which* vs. *that* reflects the goal found by Rel on C, acting as a probe. In the Degree Relative, the goal was a Degree element, which lacks animacy entirely. That is why only *that* is possible as Tns+C. (It is pied piping that is responsible for the head of the relative

including the entire NP rather than just the Degree element.) In the non-degree relative clause, the goal was the entire NP, and either the [-animate] form (*which*) or the form that lacks [animate] entirely (*that*) can be chosen.

22 What is not reflected in the realization of *that* as *who* and *which* in relative clauses is the determiner/complementizer component — which in English might be expected to yield a word whose initial morpheme is orthographic *th-*. One can easily imagine a language that is like adult English (and unlike Romance) in showing agreement on C with the goal of Rel in finite relative clauses, but where the form that the complementizer takes reflects, not the *wh-* morphology associated with Rel, but the D-morphology otherwise characteristic of complementizers more generally. Such a language appears to be Dutch. In Dutch, relative clauses introduced by a moved *wh*-PP show an initial *v-* (orthographic *w*): e.g. *de man [over wie] ik sprak* 'the man about **whom** I spoke'; *het boek [waarover] ik sprak*. This is also the morphology characteristic of *wh*-question words.

The Dutch counterpart to English finite *who* and *which* relatives, however, does not show a *wh*-form, but instead displays a form that starts with *d-*, just like demonstratives and just like the normal declarative complementizer *dat*. This form agrees with the relativized head in gender (neuter vs. non-neuter) and in number. When the head is neuter singular, the form that introduces the relative clause is in fact *dat* (*het boek dat ik gisteren las* 'the book **that** I read yesterday'). In all other cases, it is *die* (neuter plural: *de boeken die ik gisteren las* 'the books **that** I read yesterday'; non-neuter singular: *de man die ik gisteren zag* 'the man **that** I saw yesterday'; non-neuter plural: *de mannen die ik gisteren zag* 'the men **that** I saw yesterday'). (All examples are from Broekhuis and Dekkers (2000).)

We suspect that the presence of *d-* rather than *w-* is significant. The bold-faced elements *die* and *dat* are agreeing complementizers, not *wh*-phrases — just like the English instances of *who* and *which* that we have discussed. Dutch finite relative clauses differ from Romance relatives (and from English infinitival relatives) in showing  $\varphi$ -feature agreement, but they are just like their Romance counterparts (and unlike English finite relatives) in showing C/D morphology rather than *wh*-morphology on its agreeing complementizers. A similar pattern may be observed in non-restrictive relatives in Spanish, where a form with an obvious instance of D may be observed (*el cual/la cual* etc.).

<sup>23</sup> Coordination of a *wh*-phrase with a full DP in Spanish is possible only when both DPs are *wh*-phrases, e.g. *Sé qué y las preocupaciones de quiénes está teniendo en cuenta el gobierno*. 'I know what and the worries of who (pl.) the government is taking into account' vs. \**Sé quién y sus preocupaciones está teniendo en cuenta el gobierno* 'I know who and his worries the government is taking into account'.

<sup>24</sup> In coordinating *wh*-phrases with a full DP in a relative clause with a *wh*-possessor, Spanish seems to disallow pronouns in the highest possessor position within DP (compare English (30a) and (32a)), but allows such examples when the pronoun is further embedded:

- (i) \**el niño cuya madre y sus preocupaciones sobre el cambio climático*  
'the child whose mother and her worries about climate change...'
- (ii) *el niño cuya madre y los parientes de su padre*  
'the child whose mother and the relatives of his (her) father'

The contrast may be related to the impossibility in many languages of resumptive pronouns in the subject position closest to a moved *wh*-phrase

(McCloskey (1979)), given the facts in footnote 23. Questions differ from relative clauses in that only the latter allow resumptive pronouns.

<sup>25</sup> There is significant speaker variation on examples of this sort, which may be the case in other languages as well. (See, for example, Kayne (1977) fn. 9.)

<sup>26</sup> It is important to keep in mind that the attempt at agreement fails *after* Merge has already taken place. That is why Merge displays sensitivity to probe-goal relations that is independent of the success of agreement.

<sup>27</sup> This too is an issue familiar from discussions of Internal Merge (cf. the "defective intervention effects" of Chomsky 2000), which we are extending to External Merge.

<sup>28</sup> Or agreement more generally; see P&T (2004b) and references cited there, for the distinction.

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