Some Issues in English Wh-Questions: A Constraint-Based Perspective

Abstract

There exist several important empirical and theoretical issues in dealing with English wh-questions. Among these are syntactic connectivity between the *wh*-filler and its putative gap, so-called *that*-trace effect, and constraints in the formation of infinitival wh-questions. Many attempts have been made to account for these, but few succeeded in obtaining satisfactory support. This paper offers a lexicalist, constraint-based attempt and shows that it can answer these questions in a simpler and more straightforward way.

1   Introduction

In dealing with English wh-constructions, there are several empirical and theoretical issues that any proper theory needs to consider.

The first issue relates to movement operations. A well-observed constraint in English *wh*-question is that the *wh*-phrase (filler) and the missing phrase (gap) must have an identical syntactic category as a way of ensuring their connectivity as observed from the following contrast:

(1) a. [$_{\text{NP}}$ Which man] [did you talk to __]?

    b. [$_{\text{PP}}$ To which man] [did you talk __]?

(2) a. *[$_{\text{PP}}$ To which man] [did you talk to [$_{NP}$ __]]?

    b. *[$_{\text{NP}}$ Which man] [did you talk [$_{PP}$ __]]?

Traditionally, there have been two different ways to link the filler wh-phrase with its missing gap. One traditional way of linking the two is to assume that the filler wh-phrase is moved to the sentence initial position from its allegedly original position. However, such an approach runs into an immediate problem with data like the following (Gazdar 1981, Gazdar et. 1982):

(3) a. Who did Kim work for __ and Sandy rely on __ ?

   b. *Who did Kim work for __ and Sandy rely on Mary?

If we adopt a movement process for examples like (3a), there must be an operation that the two NP gaps are collapsed into one NP and become *who*. We cannot simply move one NP, because it will generate an ill-formed sentence like (3b).

The second complication arises from the so-called *that*-trace effect (Chomsky 1981, Haegeman 1984, Johnson and Lappin 1999):

(4) a. Who do you believe that Sara invited __ ?

   b. *Who do you believe that __ invited Sara?

(5) a. Who do you believe Sara invited __ ?

   b. Who do you believe __ invited Sara?

The data show us that the subject can function as a gapped element when there does not exist the complementizer *that*. In other words, the extraction of the subject is sensitive to the presence or absence of the complementizer *that* whereas that of the object is not.

The final issue this paper discusses has to do with the constraint in infinitival indirect questions (Chung 1997, Kim and Sells 2008). In addition to the finite indirect questions, English allows infinitival indirect questions:

(6) a. Fred knows [which politician to vote for].

   b. Karen asked [where to put the chairs].

Just like the finite indirect questions, these constructions also have bipartite structures: one *wh*-phrase and an infinitival clause with one missing element. Notice here the prohibition of having the VP's subject:

(7) a. *Fred knows [which politician <u>for Karen</u> to vote for].

b. *Karen asked [where <u>for Washington</u> to put the chairs].

As observed here, in infinitival indirect questions, the subject of the infinitival VP cannot appear. It has been a puzzle why only the infinitival wh-question have such a constraint.

Many attempts have been made to address such issues, but to our knowledge, a few succeed in receiving full support. In this paper, I tackle these issues with a rather traditional perspective within an HPSG and construction approach, incorporating the traditional idea such as that of Gazdar et al. (1985) and Sag et al. (2003).

2   Movement vs. Non-movement

As we have seen earlier, there is a syntactic linkage between the *wh*-phrase filler and the presumed gap. The connectivity condition further holds for the agreement facts too:

(8) a.   Which person/*people do you think __ is late?

b.   Which people/*person do you think __ are late?

The observations indicate that the *wh*-filler behaves as if it is in the original position. There have been two competing views to link the filler *wh*-phrase with its missing gap. One traditional way is to link the two by a movement process, assuming that the filler *wh*-phrase is moved to the sentence-initial position by movement operations as represented in (9) (cf. Chomsky (1981)):

(9)
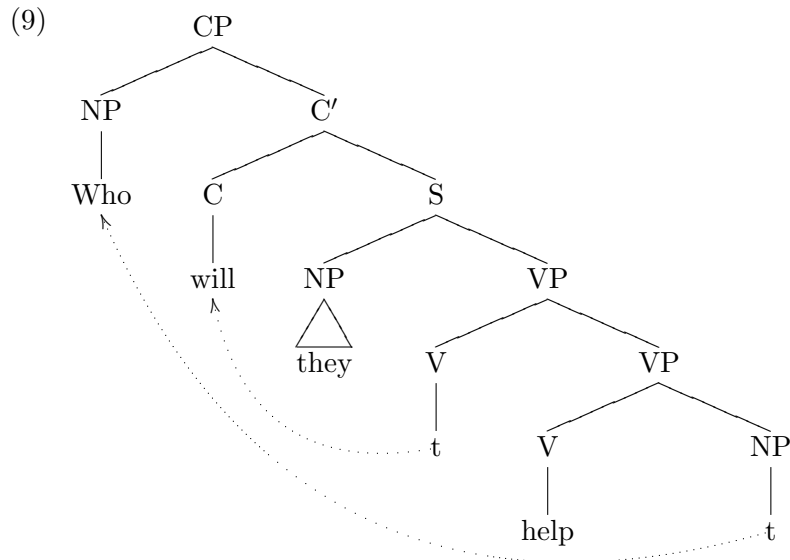
The *wh*-phrase *who* is originally in the object position of *help* and then moved to the specifier position of the intermediate phrase C′.[1] The auxiliary verb *will* is also moved from the V position to the C.

This kind of movement operation is quite appealing in capturing the connectivity between the filler and the gap. However, it immediately runs into problems, when considering coordination examples like the following:

(10) a. Who did Kim work for __ and Sandy rely on __ ?

     b. *Who did Kim work for __ and Sandy rely __ ?

     c. *Who did Kim work for __ and Sandy rely on Mary?

Within a movement approach, there must be an operation in which the two NP gaps are collapsed into one NP and become *who*. We cannot simply move one NP, because it will generate ill-formed examples like (10c).

The movement approach raises another issue with the so-called 'movement paradox' examples, noted by Bresnan (2000) and others. First, consider the following topicalization example, which also displays the relevant type of 'long distance' movement relationship:

(11) a. You can rely on [Edward's help].

     b. [Edward's help], you can rely on __

(12) a. We talked about [the fact that he was sick for days].

     b. [The fact that he was sick for days], we talked about __ .

In a movement approach, both of the (b) examples are derived from the (a) examples by moving the NPs to the sentence initial position. However, not every putatively 'derived' example has a well-formed source:

(13) a. *No theory can capture that some passives lack active counterparts.

     b. That some passives lack active counterparts, no theory can capture __

---

[1]In transformational analyses, the movement of a *wh*-phrase is often referred to as A′-movement in the sense that the *wh*-phrase is moved to an non-argument position, e.g., CP's specifier position. Meanwhile, passive constructions are referred to as involving A-movement, since the object is moved to the subject position. In addition, the movement of the auxiliary verb to C is called 'head-movement' in the sense that it is movement from a lexical head to another lexical head C. See Chomsky (1981).

(14) a. *We talked about [that he was sick for days].

b. [That he was sick], we talked about __ for days.

(15) a. *This theory captures that arrows don't stop in midair.

b. [That arrows don't stop in midair] is captured __ by this theory.

If we take the same rationale as for (12), the question is then why the putative source example is ungrammatical while a derived form is grammatical. The mismatch or inconsistency between the filler and the putative source casts doubt on the existence of movement operations.

Instead of postulating movement as an operation, we can assume that there is no movement process at all, but posit a mechanism of communication through the tree, known as feature percolation, to generate such *wh*-questions (cf. Gazdar 1981, Gazdar et al. 1982, Pollard and Sag 1994, Sag and Fodor 1994, Kim and Sells 2008). For example, the information that an NP is missing or gapped can be shared within the tree so that the gap and its filler have the same information:

(16)
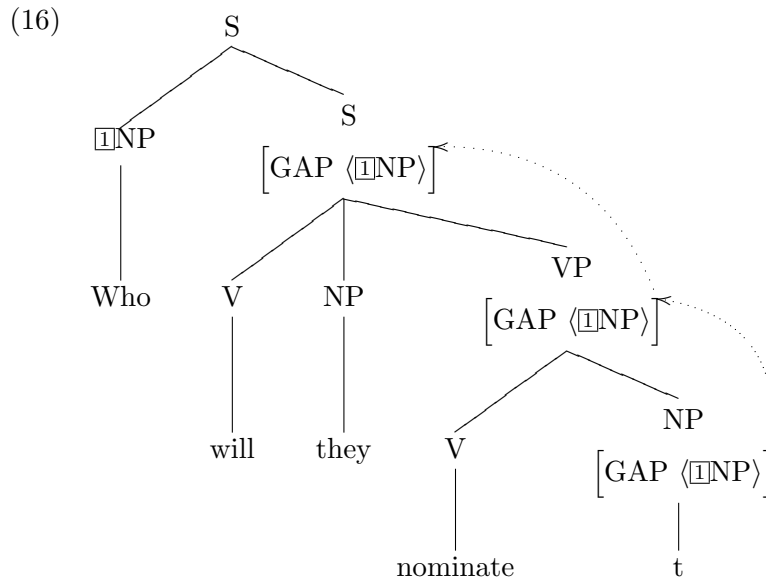
The trace NP introduces the feature GAP value.[2] This missing information is percolated up to the point where it meets its filler *who* which matches

---

[2]In much of the literature, this GAP feature is known as 'SLASH'.

with the GAP (denoted by the $\boxed{1}$). There is thus no notion of movement here, but just a feature percolation up to the point where the missing gap meets its filler. One thing to note here is that the treatment of long distance dependency within the feature percolation system involves three parts: top, middle, and bottom (cf. Pollard and Sag 1994, Levine and Sag 2004). The bottom part introduces the gap or empty element. The middle part ensures the gapped or slashed value is inherited 'up' to the mother. Finally, the top level terminates the slashed value. All that the grammar then needs to ensure is that these three parts are properly licensed.

This kind of feature percolation system can account for the contrast given in (10a) and (10b) (cf. Gazdar 1981 and Gazdar et al. 1982). Let us look at partial structures of these two examples:

(17) a.

b.   * S
     [GAP ⟨①NP, ②PP⟩]

         S   S
     [GAP ⟨①NP⟩] and   [GAP ⟨②PP⟩]

   NP   S   NP   NP
         [GAP ⟨①NP⟩]   [GAP ⟨②PP⟩]

   Kim   work for __ Sandy   rely __

In (17a), we have two NP GAP phrases whereas in (17b), we have an NP and a PP missing GAP. The mechanism of feature unification allows two nonconflicting phrases to be unified into one, and two S with the NP missing in (17a) are thus merged into one S with the NP missing. However, in (17b) we cannot unify the two different Ss since they have conflicting GAP values.

3   A Non-movement, Lexicalist Approach

3.1   Non-subject Wh-questions

To state the feature percolation system in a more formal way, we have introduced the feature attribute GAP for an empty phrase and passed this up to the point where the gap value is discharged by its filler. However, even within such an approach, an issue remains of positing an empty element. An empty element is an abstract entity introduced for a theoretical reason (for example, the GAP feature may 'start off' at the bottom of the tree in virtue of an invisible element t (trace) of the unrealized category NP. Though the introduction of an empty element with no phonological value might be reasonable, examples like the following raise issues that are not easily solved (Gazdar et al. 1985, Sag and Fodor 1994):

(18) a. *Who did you see [NP[NP __] and [NP a picture of [NP __]]]?

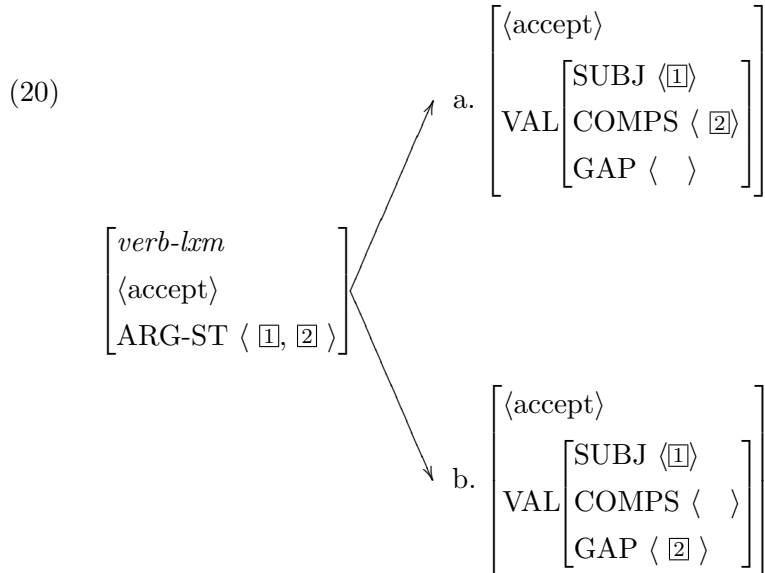b. *Who did you compare [NP [NP __] and [NP __]]?

On the assumption that empty elements are identical to canonical phrases except for the fact that they have no phonological values at all, nothing would block us from coordinating two empty phrases, leading to incorrect predictions. If we can avoid positing empty elements that we cannot see or hear, it would be better in theoretical as well as empirical terms (cf. Pullum 1991, Sag and Fodor 1994).

One way to do without an abstract element is to encode the missing information in the lexical head (Sag et al. 2003). For example, the verb *accept* can be realized with different overt complements:

(19) a. The conference accepted his abstract.

    b. What will they accept __ ?

In (19a), the verb *accept* is realized in canonical uses whereas the one in (19b) is not. That is, in (19a), the object of the verb is present as its sister, whereas in (19b) the object is in a nonlocal position. These two different realizations can be represented as lexical information:

(20)

$$
\begin{bmatrix} \textit{verb-lxm} \\ \langle \text{accept} \rangle \\ \text{ARG-ST } \langle \text{ } \boxed{1}, \boxed{2} \text{ } \rangle \end{bmatrix}
$$

a.
$$
\begin{bmatrix} \langle \text{accept} \rangle \\ \text{VAL} \begin{bmatrix} \text{SUBJ } \langle \boxed{1} \rangle \\ \text{COMPS } \langle \text{ } \boxed{2} \rangle \\ \text{GAP } \langle \text{ } \rangle \end{bmatrix} \end{bmatrix}
$$

b.
$$
\begin{bmatrix} \langle \text{accept} \rangle \\ \text{VAL} \begin{bmatrix} \text{SUBJ } \langle \boxed{1} \rangle \\ \text{COMPS } \langle \text{ } \rangle \\ \text{GAP } \langle \boxed{2} \rangle \end{bmatrix} \end{bmatrix}
$$

In (20a), the two arguments of the verb *accept* in the ARG-ST are realized as the SUBJ and COMPS value respectively, whereas in (20b) the second argument is realized not as a COMPS value but as a GAP value. The realization of the ARG-ST elements as the syntactic elements SUBJ, COMPS, and GAP is licensed by the following constraint (Kim and Sells 2008):

(21)   Argument Realization Constraint (ARC, to be revised):
        The first element on the ARG-ST list is realized as SUBJ, the
        rest as COMPS or GAP in syntax.

The main role of this ARC is thus to initiate the 'bottom' of the long distance
dependency from the lexical information.

    Each of these two different realizations will project the following struc-
tures for examples like (19a) and (19b), respectively:

(22) a.

                              S
                   ┌──────────┴──────────┐
                  NP   VP[*fin*]
                 /\   [GAP ⟨ ⟩]
                / \   ┌──────┴──────────┐
               /____\   V[*fin*]   ②NP
         The conference ┌─────────────┐   /\
                         │COMPS ⟨②⟩   │   / \
                         │GAP ⟨   ⟩   │   /____\
                         └─────────────┘   his abstract
                                │
                            accepted

      b.   S[GAP ⟨   ⟩]
                 ┌─────────┴──────────┐
               ①NP   S[GAP ⟨①NP⟩]
                │   ┌───────┼──────────┐
              What   V   NP   VP
                │   │   │   [GAP ⟨①NP⟩]
               will   they   │
                                              V
                                        ┌──────────┐
                                        │COMPS ⟨ ⟩│
                                        │GAP ⟨①NP⟩ │
                                        └──────────┘
                                              │
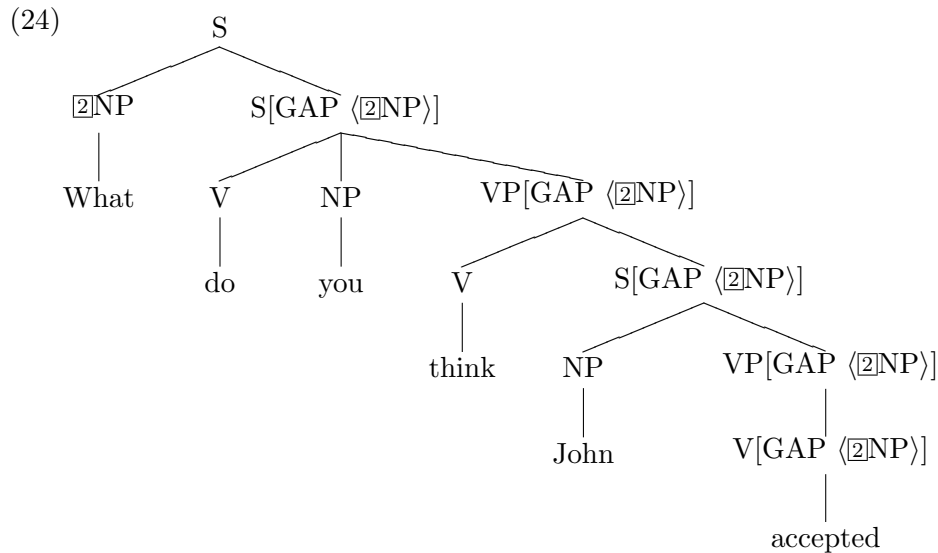   accept

9

The main difference between the two is that in (22a), the object of *accept* is its sister whereas in (22b) it is not. That is, in the former the object is local to the verb whereas in the latter it is nonlocal. In (22b), the verb *accept* contains a GAP value which is identified with the object. This GAP value is passed up to the VP and then to the lower S. At this level, this GAP value is discharged by the filler *what*, more specifically, by the following Head-Filler Rule (Kim and Sells 2008):

(23)   Head-Filler Rule:

$$\text{S}\Big[\text{GAP} \; \langle \quad \rangle\Big] \rightarrow \boxed{1}\text{XP}, \quad \text{S}\Big[\text{GAP} \; \langle \boxed{1}\text{XP}\rangle\Big]$$

This grammar rule says that when a head expression S containing a nonempty GAP value combines with its filler value, the resulting phrase will form a grammatical head-filler phrase with the GAP value discharged. This completes the 'top' of the long-distance or unbounded dependency.

This kind of feature percolation system, involving no empty elements, works well even for long-distance dependency examples. Consider the following structure:

(24)

The GAP value starts from the lexical head *accepted* whose second argument is realized as a GAP value. Since the complement of the verb *accepted* is realized as a GAP value, the verb *accepted* need not combine with its complement in the local domain (as its sister node). The GAP information

10

on the verb will be passed up to the embedded S, which is a nonhead daughter. It is the principle in (25) that ensures that the GAP value in the head daughter or nonhead daughter is passed up through the structure until it is discharged by the filler *what* by the Head-Filler Rule:[3]

(25)   Nonlocal Feature Inheritance Principle (NIP):
        A phrase's nonlocal feature such as GAP and QUE is the union of its daughters' nonlocal feature values minus any bound nonlocal features.

The role of this principle is thus clear from the embedded S in (24): The principle allows the GAP in this nonhead S to pass up to the VP, controlling the 'middle' of the long distance dependency.

    With this principle together, we can observe that the treatment of long distance dependency within the feature percolation system properly licenses the three parts: top, middle, and bottom. The bottom part introduces the GAP value according to the ARC. The middle part ensures the GAP value is inherited 'up' to the mother in accordance with the NIP. Finally, the top level terminates the GAP value by the filler in accordance with the Head-Filler Rule.

    Notice that this feature-based analysis can also offer a way of dealing with the movement paradox examples we observed before:

(26) a. You can rely on his help/*that he will help you.

     b. His help, you can rely on __ .
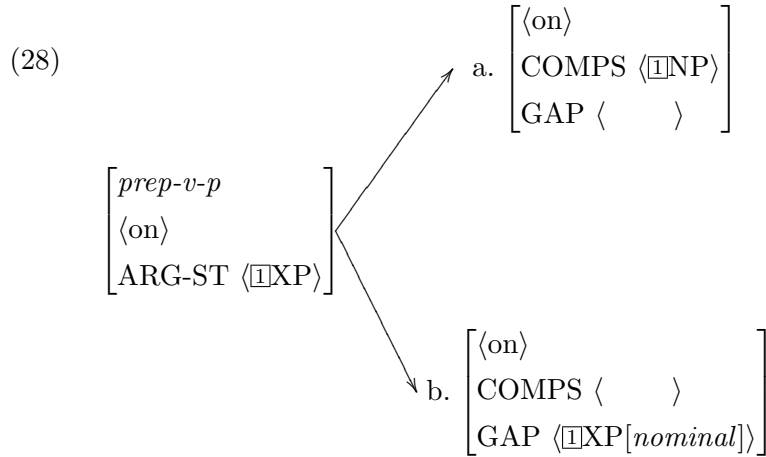
     c. That he will help you, you can rely on __ .

The introduction of a GAP value is a lexical realization process in the present system. The data tell us that the preposition can combine with an NP, but not a CP. However, when its NP complement is realized as a GAP, this value can be linked either as an NP as in (26b) or as a CP as in (26c). As noted by Kim and Sag (2005), nouns and complementizers can be subtypes of *nominal* in the sense that they can function as a nominal element:

(27) a. Cohen proved the independence of the continuum.

     b. Cohen proved that the continuum hypothesis was independent.
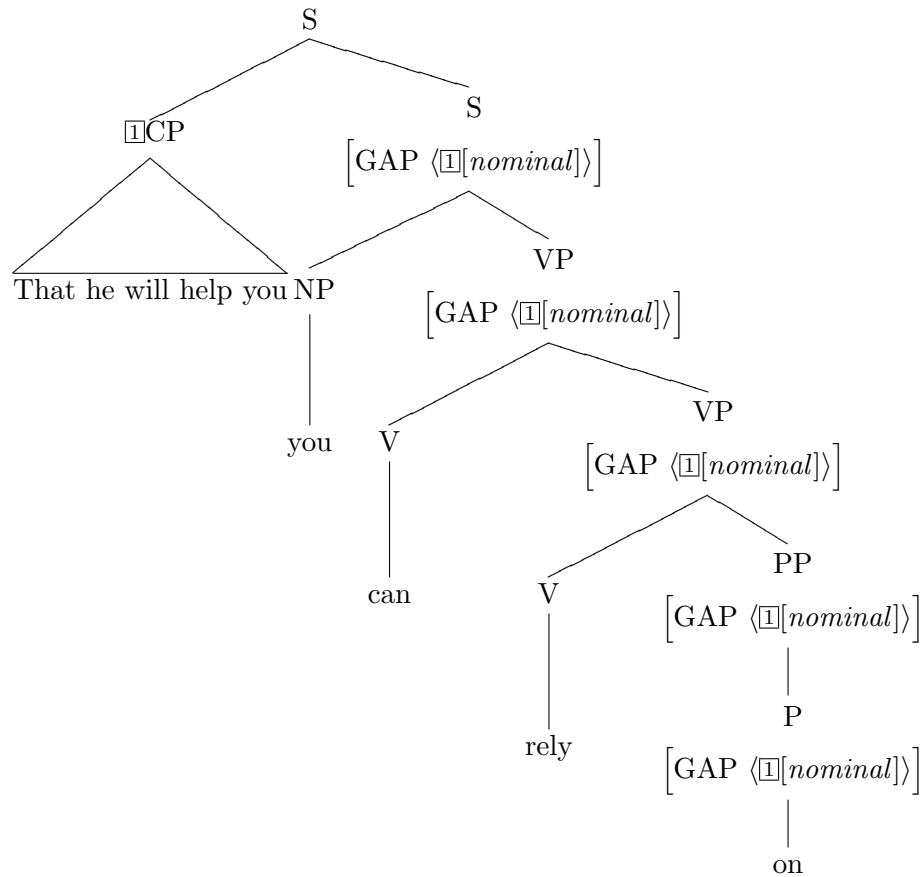
---

[3]The nonlocal features will be 'bound' either by a grammar rule like the Head-Filler Rule in (23) or a lexical constraint.

Accepting this view, we can assume that the complement of the preposition *on* in such a usage can be realized either as an NP in (28a), or as a *nominal* GAP element as in (28b):

(28)

$$
\begin{bmatrix} prep\text{-}v\text{-}p \\ \langle \text{on} \rangle \\ \text{ARG-ST } \langle \boxed{1}\text{XP} \rangle \end{bmatrix}
$$

a.
$$
\begin{bmatrix} \langle \text{on} \rangle \\ \text{COMPS } \langle \boxed{1}\text{NP} \rangle \\ \text{GAP } \langle \quad \rangle \end{bmatrix}
$$

b.
$$
\begin{bmatrix} \langle \text{on} \rangle \\ \text{COMPS } \langle \quad \rangle \\ \text{GAP } \langle \boxed{1}\text{XP}[nominal] \rangle \end{bmatrix}
$$

The two realizations mean that when the preposition *on* is serving as the part of a prepositional verb (*prep-v-p*) like *rely on*, its prepositional complement can be either realized as an NP or as a *nominal* GAP element. This has the consequence that if the argument of *on* is realized as a COMPS element, it must be an NP as in (27a). However, when its argument is realized as a GAP, the GAP value can either be an NP as in (27b) or a CP as in (27c). This is possible since the POS type *nominal* subsumes both *comp* and *noun* (cf. Kim and Sag 2005). This lexical realization in (28c) will then project a structure like the following:

(29)

$$S$$

$$\boxed{1}CP \qquad S\ \left[\text{GAP } \langle \boxed{1}[nominal] \rangle \right]$$

That he will help you

$$NP \qquad VP\ \left[\text{GAP } \langle \boxed{1}[nominal] \rangle \right]$$

you

$$V \qquad VP\ \left[\text{GAP } \langle \boxed{1}[nominal] \rangle \right]$$

can

$$V \qquad PP\ \left[\text{GAP } \langle \boxed{1}[nominal] \rangle \right]$$

rely

$$P\ \left[\text{GAP } \langle \boxed{1}[nominal] \rangle \right]$$

on

The present system, allowing some flexibility in argument realization, can capture these movement paradox examples, and its applicability suggests that movement is not the best mechanism to account for apparent displacement in syntax.

3.2 Subject Wh-Questions and the *That*-trace Effect

As Stromswold (1995), Hawkins (1999), and others noted, subject *wh*-questions are easier in processing and learning than object *wh*-questions. There may be a variety of factors involved in causing this difference. Observe a simple pair:

(30) a. Who is helping Mary?

     b. Who is Mary helping?

As noted here, unlike subject *wh*-questions, object *wh*-questions have the auxiliary inversion. Another difference may arise from the distance between the *wh*-filler and the possible gap within the assumption that both subject and object *wh*-questions have a gap:[4]

(31) a. Who __ is helping Mary?

   b. Who is Mary helping __ ?

Now issues arise with the treatment of subject *wh*-questions. We can either assume that the *wh*-phrase here remains in the subject position with no gap or posit that the phrase moves vacuously to the sentence initial position (cf. Chomsky 1981, 1986, Gazdar 1981):

(32) a. Who is helping John?

   b. Who __ is helping John?

Regardless of the supposition of subject gaps, there seems to be no difference in the distance between the *wh*-filler and the putative gap. This means that the complexity of subject *wh*-questions is lower than that of object *wh*-questions. This in turn means both gapped and gapless subject *wh*-question treatments are possible.

Our approach takes a middle road. That is, even though the subject element can be gapped, there is no syntactic gap visible in the tree structure. This follows from our approach avoiding the postulation of any invisible syntactic element. With this in mind, we first accept the view that like complements, the subject can be realized as a GAP element in accordance with the revised ARC:

(33)   Argument Realization Constraint (Revised):
        The first element on the ARG-ST list is realized as SUBJ or
        GAP, the rest as COMPS or GAP in syntax.

This revised ARC eventually guarantees that the values of the ARG-ST is the sum of that of SUBJ, COMPS, and GAP.

Let us consider how the system works with the verb *nominate*. According to the revised ARC, the system then allows the subject of *nominate* to be realized as the GAP value:

---

[4]Previous studies such as Wanner and Maratsos (1978) and Stromsword (1995) show that processing difficulty increases with the distance between the gap and its filler.

(34)
$$
\begin{bmatrix}
\langle\text{nominate}\rangle \\[4pt]
\text{VAL}\begin{bmatrix}
\text{SUBJ } \langle \quad \rangle \\
\text{COMPS } \langle \boxed{2}, \boxed{3}\rangle \\
\text{GAP } \langle \boxed{1} \rangle
\end{bmatrix} \\[18pt]
\text{ARG-ST } \langle \boxed{1}, \boxed{2}, \boxed{3} \rangle
\end{bmatrix}
$$

This realization in which the subject is gapped then projects the following structure for (32a):
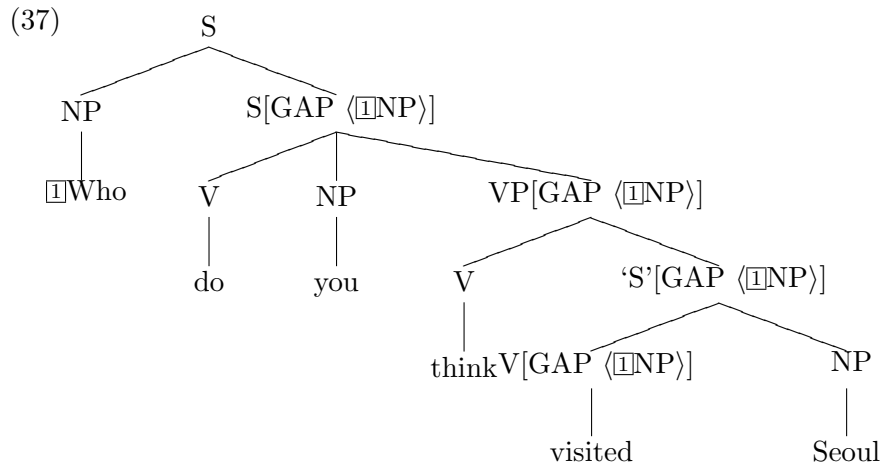
(35)
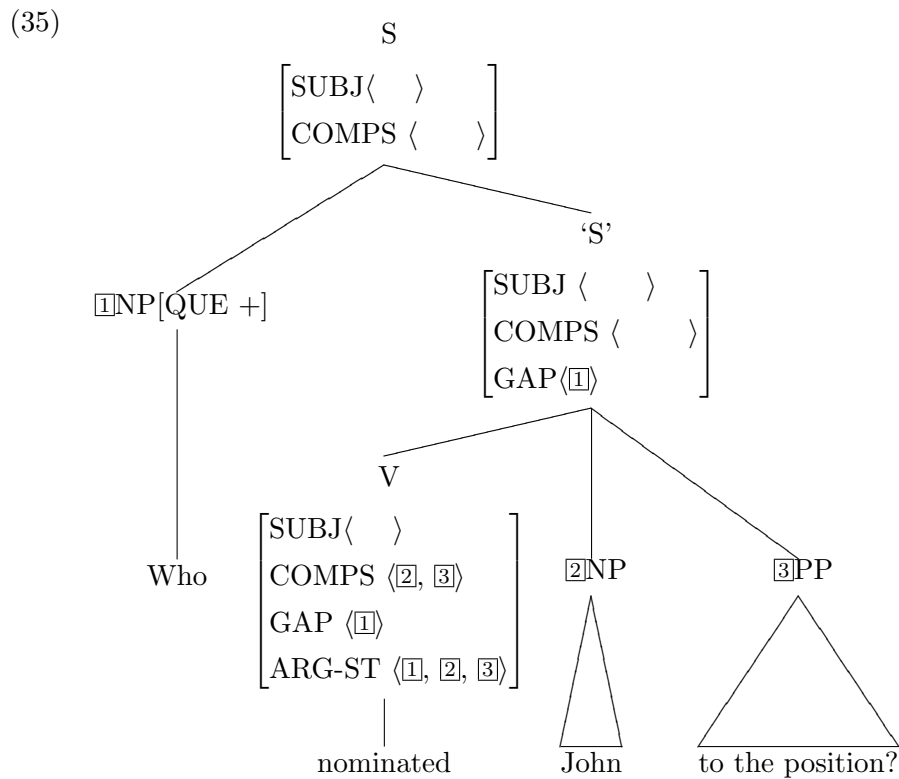
As shown in the structure, the subject of *nominated* is realized as the GAP value, passing up to the mother node. This node looks like a VP, but in fact it is a projection of V with an empty SUBJ list, and hence is effectively a kind of S (by definition, S is a projection of V which has an empty SUBJ and COMPS list). This incomplete sentence 'S' with the subject missing then can combine with the filler *who* according to the Head-Filler Rule.

Even though the incomplete 'S' with the subject gapped cannot function as an independent sentence as in **visited him*, the incomplete 'S' can

15

function as the complement of a verb like *think* as in sentences like the following:

(36) a. Who do you think [visited Seoul last year]?

   b. That's the UN delegate that the government thinks [visits Seoul last year].

The verb *think* can thus select either a finite S or a CP as in *I think (that) she knows chorus*. Examples like (36a) indicate that the verb *think* can also combine with an 'S' with the subject being gapped:
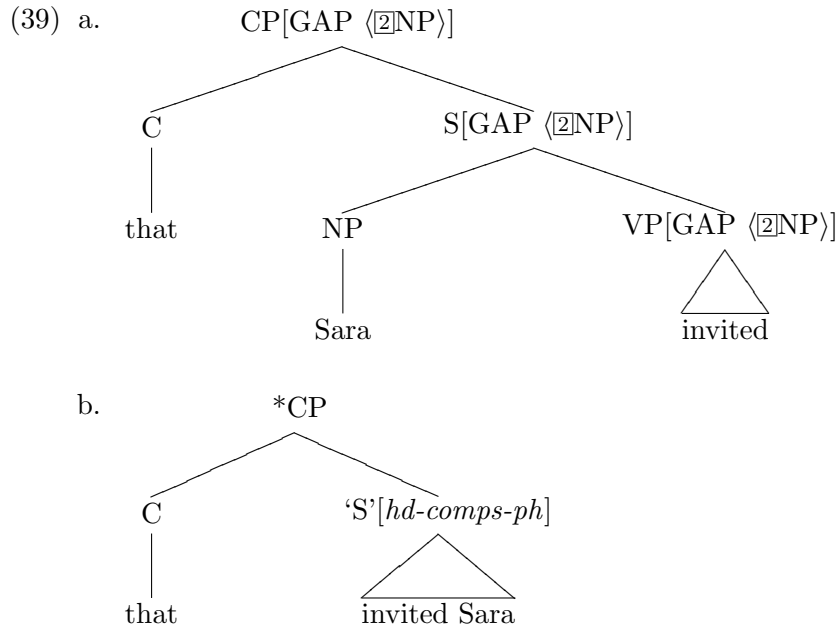
(37)

```
                    S
            _____|_____
           NP              S[GAP ⟨1NP⟩]
           |          _____|_____
         1Who       V      NP          VP[GAP ⟨1NP⟩]
                    |      |        _____|_____
                    do    you      V          'S'[GAP ⟨1NP⟩]
                               _____|_____    _____|_____
                             think V[GAP ⟨1NP⟩]        NP
                                      |                 |
                                   visited            Seoul
```

   This kind of analysis can provide a way of explaining the so-called '*that-trace effect*' we have seen before. Consider the relevant examples again:

(38) a. Who do you believe that Sara invited __ ?

   b. Who do you believe __ invited Sara?

   c. *Who do you believe that __ invited Sara?

Once again we can notice here that when the complementizer *that* is present, we cannot have the seemingly subject gap. The first simple observation we can make is that the complementizer *that* can combine with either an S which can be gapped, but not with an 'S' whose subject is gapped or whose GAP value is linked to the subject argument:[5]

---

[5]The italicized *hd-comp-ph* and *hd-mod-ph* here indicates the type name of the phrase 'S'.

(39) a.

```
                CP[GAP ⟨2 NP⟩]
               /              \
              C                S[GAP ⟨2 NP⟩]
              |               /            \
            that            NP              VP[GAP ⟨2 NP⟩]
                            |                    △
                          Sara                invited
```

b.

```
              *CP
             /     \
            C       'S'[hd-comps-ph]
            |            △
          that      invited Sara
```

A peculiar fact is that as discussed in Ginzberg and Sag 2000, Levine and Hukari 2006, and others, the subject gap can be salvaged by the presence of an intervening adverbial phrase:

(40) a. *Who do you think that __ would be nominated for the position?

b. Who do you think that [under these exceptional circumstances] __ would have anything to do with such a scheme?

As in such an example, when an adverb intervenes between *that* and a subject position, the subject gap is possible (Culicover 1993 and Bouma et al. 2001), whose structure is represented in the following:

(41)

```
                  CP[GAP ⟨1 NP⟩]
                 /               \
                C                 'S'[ hd-mod-ph        ]
                |                     [ GAP ⟨1 NP⟩       ]
              that               /                  \
                               PP                    'S'[GAP ⟨1 NP⟩]
                              /    \                 /        \
                  under normal circumstances    would have anything . . .
```

17
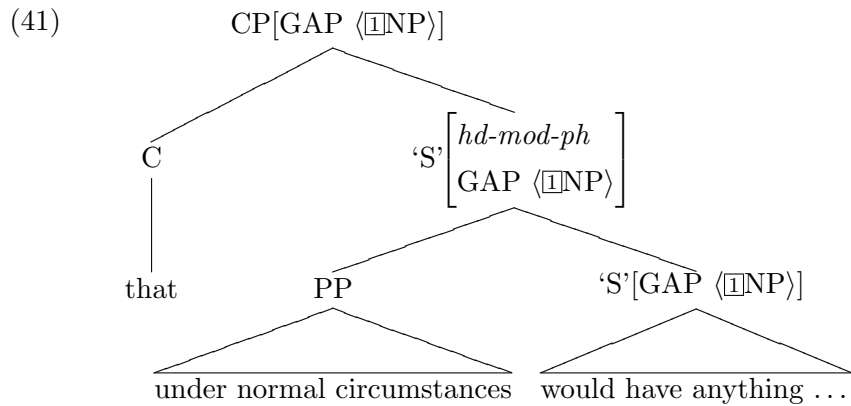
This kind of example then means that the subject gap is not the sole factor in determining the grammaticality: we basically needs to allow the subject to be gapped. A simple filter like the one in (42) will not work either.

(42)   The *that*-trace filter (e.g., Chomsky and Lasnik 1977)
         that __ (except in a relative clause)

In our system, we attribute these idiosyncrasies to the lexical properties of the complementizer *that*, as represented in the following negative constraint:

(43) $* \begin{bmatrix} \langle that \rangle \\ \text{HEAD} \mid \text{POS } comp \\ \text{COMPS } \langle [hd\text{-}comp\text{-}ph] \rangle \end{bmatrix}$

This constraint means that *that* cannot combine with a *head-comp-ph* directly, disallowing the *that*-trace effect examples while accepting the adverb amelioration examples. This lexicalist, construction-based approach has one clear advantage over the filter (42): it captures the adverb amelioration examples.

3.3   Infinitival Indirect Questions

In addition to the finite indirect questions, English also has infinitival indirect questions:

(44) a. Fred knows [which politician to support].

     b. Karen asked [where to put the chairs].

As noted earlier, infinitival questions also have bipartite structures: a *wh*-phrase and an infinitival clause missing one element (Chung 1997).
    Notice at this point the structure of the following two in which the subject is realized as a PRO or a *pro*:
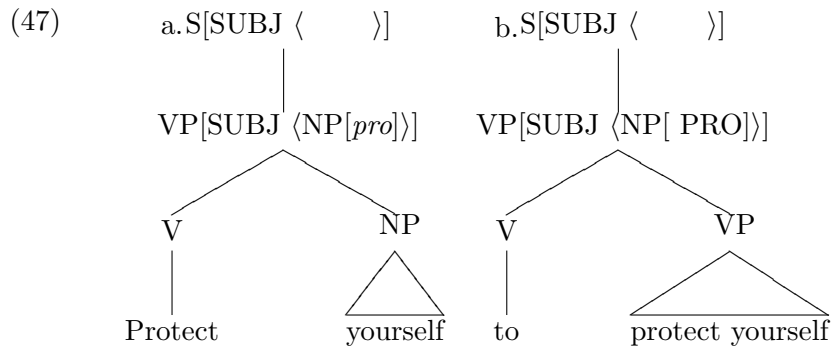
(45) a. To protect him is not an easy task. (PRO)

     b. Protect him! (*pro*)

In (45a), the infinitival VP has an understood, unexpressed subject PRO whereas the imperative in (45b) the subject is an unexpressed one, though

18

understood as the second person subject *you*. Traditionally, the unexpressed pronoun subject of a finite clause is called 'small *pro*' whereas that of an nonfinite clause is called 'big PRO' (Chomsky 1981)), as they have slightly different referential properties. To allow a VP with a non-canonical subject (*noncan-pro*) to be projected into a complete S, we can assume the following Head-Only Rule:

(46)   Head-Only Rule:

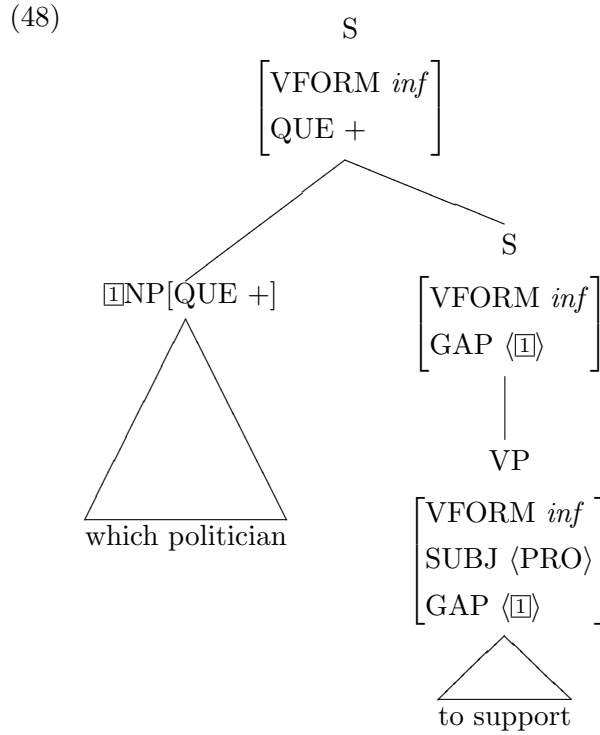S[SUBJ ⟨   ⟩] → VP[SUBJ ⟨NP[*noncan-pro*]⟩]

The rule says a VP whose subject is either a *pro* or a PRO can be directly projected into a complete sentence with the subject being discharged. A finite VP will, however, not be projected into an S, since it selects a canonical subject. The rule as given will license the following structures:

(47)   a. S[SUBJ ⟨   ⟩]   b. S[SUBJ ⟨   ⟩]

          VP[SUBJ ⟨NP[*pro*]⟩]   VP[SUBJ ⟨NP[PRO]⟩]

          V   NP   V   VP

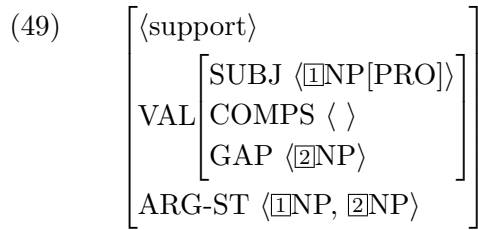   Protect   yourself   to   protect yourself

The subject of the VP here is *pro* or PRO: either can be licensed, and this rule in (46) allows a VP to form a complete sentence with no pronounced subject. With this new rule, we then can have the following structure:[6]

---

[6]The feature QUE is originated from an interrogative *wh*-word. See Kim and Sells 2008.

(48)

S
$\begin{bmatrix} \text{VFORM } inf \\ \text{QUE } + \end{bmatrix}$

⊡NP[QUE +]

which politician

S
$\begin{bmatrix} \text{VFORM } inf \\ \text{GAP } \langle \boxed{1} \rangle \end{bmatrix}$

VP
$\begin{bmatrix} \text{VFORM } inf \\ \text{SUBJ } \langle \text{PRO} \rangle \\ \text{GAP } \langle \boxed{1} \rangle \end{bmatrix}$

to support

Consider the structure from the bottom up. The verb *support* selects two arguments whose second argument can be realized as a GAP:

(49)
$$\begin{bmatrix} \langle \text{support} \rangle \\ \text{VAL} \begin{bmatrix} \text{SUBJ } \langle \boxed{1}\text{NP[PRO]} \rangle \\ \text{COMPS } \langle \ \rangle \\ \text{GAP } \langle \boxed{2}\text{NP} \rangle \end{bmatrix} \\ \text{ARG-ST } \langle \boxed{1}\text{NP}, \boxed{2}\text{NP} \rangle \end{bmatrix}$$
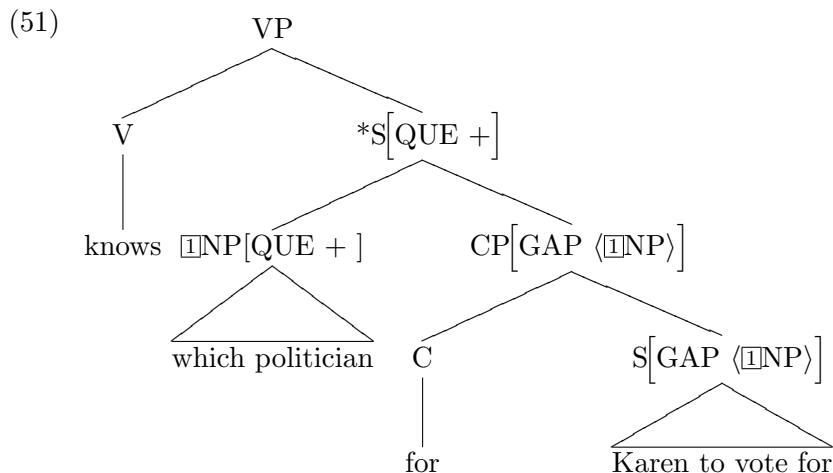
The verb will then form a VP with the infinitival marker *to*. Since this VP's subject is PRO, the VP can be projected into an S with the accusative NP GAP value in accordance with the Head-Only Rule in (46). The 'S' then forms a well-formed head-filler phrase with the filler *which politician*. The QUE value on the phrase ensures the whole infinitival clause to function as an indirect question which can be combined with the verb *knows*.

One constraint in the infinitival *wh*-questions as we have observed earlier is that the subject of the infinitival part cannot be overtly realized:

(50) a. *Fred knows [which politician <u>for Karen/her</u> to vote for].

b. *Karen asked [where <u>for Jerry/him</u> to put the chairs].

The data indicate that in infinitival indirect questions, the subject of the infinitival VP cannot appear. If we look at the structure, we can easily see why this is not a legitimate structure:[7]

(51)

```
                        VP
                   /          \
                  V            *S[QUE +]
                  |           /        \
               knows   ①NP[QUE + ]    CP[GAP ⟨①NP⟩]
                          /\            /        \
                  which politician     C        S[GAP ⟨①NP⟩]
                                       |            /\
                                      for      Karen to vote for
```

The structure indicates that the Head-Filler Rule licenses the combination of an S with its filler, not a CP with its filler.

4 Conclusion

In the paper, we have first observed some main issues in the analysis English *wh*-questions. There have been many attempts to capture the mismatch

---

[7]The grammar needs to block examples like (i) in which the infinitival VP combines with its subject:

(i) a. *Fed knows [S which politician [S her [to vote for]]].

   b. *Karen asked [S whom [S him [to vote for]]].

As in (23), the Head-Filler Rule allows an S (directly projected from an infinitival VP) to combine with its filler. The ungrammacality of such structure is rather independent. That is, the infinitival VP cannot combine with an accusative NP and projects into an S:

(ii) a. *Him to vote for Barak is unsurprising.

   b. For him to vote for Barak is unsurprising.

However, as seen in (b), the co-occurrence with the complementizer *for* saves the structure. This indicates that (a) is ruled out because of the case assignment. Cf. Chomsky 1981.

between the *wh*-filler and its putative gap, the *that-* trace effect. However, few have been really successful in addressing the answers.

This paper has tried to answer these questions from a nontransformational view. It relies on the flexibility of argument realizations: how arguments are realized in syntax. We have assumed that all arguments including the subject can be realized as a gap element as long as all the other conditions are met. However, this gap element is invisible in syntactic tree – it is visible only as a GAP feature starting as lexical information and then passing up to the point where it is discharged by the relevant grammar rules. This system classifies sentences into at least two subtypes: S and 'S' at least. The canonical sentences are differentiated from 'S' in that the latter one has the subject is gapped and cannot directly combine with the complementizer *that*.

References

Bouma, G., Malouf, R., and Sag, I. A. 2001. Satisfying constraints on extraction and adjunction, *NLLT* 19, 1–65.

Bresnan, J. W. 2000. *Lexical-Functional Syntax.* Oxford: Basil Blackwell.

Chomsky, N. 1981. *Lectures on Government and Binding.* Dordrecht: Foris.

Chomsky, N. 1995. Bare phrase structure, in G. Webelhuth (ed.), *Government and Binding Theory and the Minimalist Program*, 385–439, Oxford: Basil Blackwell.

Chung, L. 1997. *On the typology of Wh-questions.* Taylor and Francis.

Gazdar, G. 1981. Unbounded dependencies and coordinate structure. *Linguistic Inquiry 12*, 155–84

Gazdar, G., Pullum, G. K., Sag, I. A., and Wasow, T. 1982. Coordination and Transformational Grammar. *Linguistic Inquiry* 13.4, 663–677.

Ginzburg, Jonathan, and Ivan A. Sag. 2000. *Interrogative Investigations: The Form, Meaning and Use of English Interrogatives.* Stanford: CSLI Publications.

Haegeman, L. 1984. Parasitic gaps and adverbial clauses. *Journal of Linguistics* 20, 229–232.

Hawkins, J. 1999. Processing complexity and filler-gap dependencies across grammars. *Language,* 75: 244–285.

Kaplan, R. M. and Zaenen, A. 1989. Long-distance dependencies, constituent structure and functional uncertainty. In M. R. Baltin and A.

S. Kroch (eds.), *Alternative Con- ceptions of Phrase Structure*, pp 17–42.

Kim, J.-B. and I. Sag. 2005. English Object Extraposition: A Constraint-Based Approach. In *Proceedings of HPSG*, 192–212.

Kim, Jong-Bok and Peter Sells. 2008. *English Syntax: An Introduction.* CSLI Publications.

Levine, Robert D. and Thomas E. Hukari. 2006. *The Unity of Unbounded Dependency Constructions.* CSLI publications.

Levine, R. and I. Sag. 2004. *Wh*-nonmovement. In *Gengo Kenkyu.*

O'Grady, W. 1997. *Syntactic Development.* Chicago: University of Chicago Press.

Pollard, C. J. and Sag, I. A.. 1994. *Head-Driven Phrase Structure Grammar.* Chicago: University of Chicago Press.

Postal, P. M. 1998. *Three Investigations of Extraction.* Cambridge, MA: MIT Press.

Radford, A. 1997. *Syntactic theory and the structure of English.* Cambridge: Cambridge University Press.

Reinhart, T. 1997. Wh-in-situ in the framework of the Minimalist Program. *Natural Language Semantics* 6, 29–56.

Ross, J. R. 1967. *Constraints on Variables in Syntax.* MIT Ph.D. Dissertation.

Sag, I. and Fodor, J. D. 1994. Extraction without traces. IN *Proceedings of the Thirteenth Annual Meeting of the West Coast Conference on Formal Linguistics*, 365–384. Stanford: SLA, CSLI Publications.

Sag, I., T. Wasow, and E. Bender. 2003. *Syntactic Theory: A Formal Approach.* CSLI Publications.

Steedman, M. 1996. *Surface Structure and Interpretation.* Cambridge, MA: MIT Press

Stromswold, K. 1995. The Acquisition of subject and object *wh*-question. *Language Acquistion* 4, 5–48.