GROUP SUMMARY: DIAGNOSING XP-MOVEMENT[1]

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The present survey reviews some prominent strategies for detecting *phrasal movement* by the use of diagnostic tests. Just as in the sciences, applying a test requires preparation before conducting the actual experiments. In the case at hand, it is necessary to answer various questions about the entities that are suspected to have been manipulated by movement, among them: What is the base order of the expressions that the category resides in? How can the size of the moved string (feature, head, phrase) be determined? At which point in the derivation does movement apply (overt, covert, overt covert)? Does the node contain descriptive content that can be accessed by tests that evaluate interpretative properties? Which competing analytical options are available and why do they fail (binding, control, Multiple Dominance, ellipsis)? It is these and related questions that will be addressed in the first part of this contribution. The second part briefly catalogues a variety of standard tests that react to properties of dislocation.

1. Movement and diagnosis

1.1. Movement

In its most general form, the term *syntactic movement* denotes a mapping between two distinct linguistic representations r_1 and r_2, such that (i) r_1 includes an occurrence of a subtree α in position p_1 and (ii) r_2 includes an occurrence of α in position p_2 (where $p_1 \neq p_2$); and (iii) p_1 and p_2 are in a designated graph theoretic relation, usually defined in terms of the first branching node version of c-command. 'Position of α' is defined as 'irreflexive mother node of α'. In r_2, α therefore resides in the two positions p_1 and p_2:

(1) r_1: $[_{p1}\ \alpha \ldots]$ $\Rightarrow_M$ r_2: $[_{p2}\ \alpha \ldots\ [_{p1}\ \alpha \ldots]]$

There is a number of criteria that are commonly taken to restrict the mapping relation M. Even though providing a complete list is difficult, given that theories of displacement are still evolving, a first group of requirements arguably includes the axioms in (2). Thus, each application of movement targets a single node only ((2)a), is subject to bounding and island conditions ((2)b), proceeds upward[2] ((2)c), and is usually taken not to alter the label of the landing site ((2)d).

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[1]This paper was initially commissioned at the *Diagnosing Syntax* workshop (Utrecht University/Leiden University, January 29-31, 2009) to provide a summary of the presentations held in the XP-Movement section, but grew somewhat out of proportions. A shorter version is to appear in Lisa Cheng and Norbert Corver (eds.). *Diagnosing Syntax.* Oxford: Oxford University Press.

I am grateful to Elena Anagnostopoulou, Lisa Cheng and Norbert Cover for valuable comments. This survey also profited from discussions with Hamida Demirdache, David Pesetsky and Maria Polinsky at the occasion of a group meeting during the workshop. All errors and inaccuracies are my own.

[2]For explorations into downward movement see Richards (1999); for sideway movement see Bobaljik and Brown (1997) and Nunes (2001).

(2) *Axioms of movement*

a. Movement is an operation that targets a single node (at a time).
b. Movement is bounded by locality conditions.
c. Movement proceeds to a position that c-commands the launching site.
d. Movement does not change the label of the landing site.

In addition, there are also conditions on the nature of the trees which include α, specifying that r_1 and r_2 must not be part of distinct levels of representations (Chomsky 1981). While it is also possible to define mappings across different levels (Williams 2003), such operations have been devised precisely in order to avoid commitment to one or more of the core assumptions associated with movement, and are therefore in practice not subsumed under the latter notion.

The extensional manifestations of movement vary widely, depending in particular on specific choices for four variables: (i) possible dissociations between pronunciation and interpretation; (ii) architecture of the grammar; (iii) size of the dislocated category and (iv) ontological commitments. Since the logical space generated by these parameters also defines the alternative analytical options that phrasal movement competes against, each of the four factors introduced above will be briefly addressed in turn.

To begin with, a node that has been overtly shifted may be pronounced in a derived or a lower position. The latter option results in silent (a.k.a. covert or backward) movement. Just like audible dislocation, silent movement comes in various different flavors which have been argued to include Quantifier Raising (QR), covert extraposition, covert scrambling, and some less common manifestations such as Backward Raising or backward A-scrambling (see Polinsky and Potsdam 2007, to appear).

Second, partially cross-cutting the first determinant, all dislocation may proceed in a single cycle, or the operations may be partitioned into an overt and an abstract, covert component.[3] A node can accordingly undergo silent movement either overtly (*overt covert movement*) or following pronunciation, at LF.

A third factor regulates the size of the displaced entity. Together, these three dimensions generate the matrix in (3):

(3)

	I. Move before Spell-Out		*II. Move after Spell-Out*
	pronounce higher copy	*pronounce lower copy*	
a. Features	n/a	n/a	n/a
b. X°	✓	?	see left cell
c. XP	*wh*-movement, topicalization, scrambling, Raising, passive,...	QR, Backward Raising, Backward Scrambling,...	see left cell
d. λ-binders	n/a	n/a	n/a

[3]Single output models have been advocated by Bobaljik (1995); Fox and Nissenbaum (1999); Groat and O'Neil (1996) and Pesetsky (2000), among others.

(3) documents that apart from features, heads and phrases, movement has also been hypothesized to affect categories that lack descriptive content ((3)d). In particular three semantically motivated operations fall in this group: derived predicate formation by silent raising of pied-piped relative pronouns ((4)); movement of PRO in order to provide control predicates with suitable property-type arguments (λ_1 in (5)b; Heim and Kratzer 1998), and the creation of intensional expressions by raising of λ-binders ranging over situations (λ_2 in (5)b; Percus 2000).

(4) a. a person [about which you might have heard]
b. LF: a person $_{<e,t>}$ [λ_1 [you might have heard about t_1]]$_{<e,t>}$

(5) a. Sam wanted PRO to call
b. LF: Sam wanted [λ_2 [λ_1 [$t_{1,\ PRO}$ to call(s_2)]]]$_{<s,\ <e,t>>}$

In all three cases, the analysis starts from the premise that movement is interpreted as λ-abstraction, and is motivated by the idea to strengthen this relation also in the other direction, rendering contexts which are interpreted by λ-abstraction amenable to a movement account.

The size of a dislocated expression α is of particular significance for the purposes of diagnosing movement as it has direct consequences for the choice of test. This is so because the size of α covaries with the descriptive content of α, and most diagnostics for movement react to the position of the descriptive content relative to other nodes in the tree. As a result, while head and phrasal movement can in many cases be detected by inspecting word order or interpretive properties of the lexical content of α and its parts (for details see section 2), movement of features and λ-binders is uninformative in this respect. Furthermore, due to their limited capacity to embed lexical material, head movement remains in all but very few circumstances invisible to the semantic component (Lechner 2007). Thus, movement of nodes without descriptive content (features and λ-binders) must be diagnosed by different, more fine grained instruments than head movement - which in turn is less easily detectable than phrasal movement. Consequently, diagnosing movement of this latter type is contingent on detecting traces of the movement procedure itself such as island conditions or ordering restrictions on movement (see section 2.3 for detailed discussion).

Finally, theories of movement may vary across a fourth dimension which is defined by considerations concerning the ontological status of the operation. Notably, movement denotes a method for modeling a relation between two nodes, as in (1). Whether this model is taken to be ontologically grounded or remains a meta language description of the mapping operation (1), much like colored beans are used to model DNA, depends on one's theoretical inclinations. On a strict *literalist* interpretation (Phillips and Lewis 2009), movement resides within the object language, understood as a cognitive module with concrete biological manifestations. For adherents of this position, the mapping operation (1) can therefore be diagnosed by inspecting physiological correlates of linguistic representations. By contrast, it is also possible to conceive of movement as a mere tactic to provide an adequate description of a system of data, with no commitment as to how well the linguistic model reflects underlying biological properties of the language module. Under this *extensionalist* view, incorporating extralinguistic, experimental

evidence into the theory requires explicit assumptions about how the linguistic model relates to mental states and their measurable physiological correlates. These and related considerations need to be taken into account when evaluating psycholinguistic, patholinguistic and other types of external evidence for movement (see Demirdache, to appear.)

Ontological commitment (of a different type) also informs the long standing debate between a derivational vs. representational interpretation of movement. A strictly derivational theory of movement incorporates features that prevent a representational re-interpretation (i.e. such that $r_1 = r_2$ in (1)).To defend this position, it needs to be shown that the grammar generates *opaque* representations, which are subject to conditions that cannot be replicated at later stages of the derivation. Since such evidence has so far by and large proved evasive (but see Lechner, to appear), 'movement' is in practice often broadly construed as an operation that provides a characterization of certain dependencies in derivational as well as representational theories. In line with this tradition, such an inclusive, liberal definition of the term will be adopted here, which contrasts movement with binding, ellipsis, control, or treatments of the dislocation property in monostratal, categorial models of the grammar ('wrapping').

1.2. Diagnosing movement

In the prototypical cases, output representations in which a category has been dislocated (r_2 in (1)) do not match their input (r_1). Movement can therefore be interpreted as a distortion, an aberration which adds new properties to - or removes them from - linguistic representations. Using medical terminology, one might also conceive of movement as a *condition* affecting trees which reveals itself on the basis of various associated *symptoms*. These symptoms are causally related to movement and can therefore be used in the procedure of diagnosing dislocation.

In order to expose more transparently the evolution and internal composition of diagnostics it is instructive to consider more closely the nature of symptoms first. The changes introduced in the transition from r_1 to r_2 systematically correlate with the emergence of specific properties in designated locations of the raw data which, adopting the nomenclature of bioscience, will be referred to as *markers*. It is by virtue of such markers that symptoms express themselves. For the concrete study of syntactic movement, three different types of linguistic markers are of particular relevance, each associated with a distinct effect of movement. The first two classes emerge as the result of changes in form or interpretation, respectively, and are - *modulo* reconstruction - visible in the output representation r_2. The third group of markers tracks conditions which regulate the mapping from r_1 to r_2, recording the sensitivity of movement to islands, order preservation constraints (Superiority), the prohibition on improper movement and others.

Yet, not all markers are symptoms. This is so because the correlation between a marker and an associated condition might either be accidental or caused by other, unrelated conditions. For instance, while word order alternation is often the product of movement, there are notable

exceptions to this generalization that do not lend themselves to a derivational analysis.[4] Thus, changes in linearization in isolation do not provide a reliable symptom of movement. Evidently, demonstrating that a marker actually expresses a symptom requires to establish a causal link between the condition (movement) and the marker. This is attained by the application of *(diagnostic) tests* under experimental conditions. Concretely, a test involves two components: (i) systematic modification of the raw data which controls for spurious correlations between marker and condition (the experiment), and (ii) the formulation of predictions as to which changes in the data this modification will trigger. If the changes reflected in the marker match these predictions, the marker can be used as a symptom in a diagnostic test.

Conditions such as movement generally express themselves in more than just a single symptom. Furthermore, many symptoms can be due to a variety of causes. In practice, obtaining a successful *diagnosis* therefore necessitates the deployment of more than one test in order to be able to eliminate all but one cause for the convergence of symptoms under consideration. Such a conspiracy of multiple symptoms is for instance responsible for the classic paradigm in (6), which documents the interaction between object fronting and overt participle morphology in French (Kayne 1989).

(6) *Participle agreement in French as a symptom of movement*
- a. J'ai construit/*construites *les maisons*
  I have constructed the houses$_{fem}$
- b. *les maisons$_1$* que nouns avons *construit/construites /t$_1$
  the houses$_{fem}$ which we have constructed
- c. Ils *les$_1$* ont construites t$_1$
  they them$_{fem}$ have constructed
  'They constructed them'
- d. *Elles$_1$* ont été construites t$_1$
  they$_{fem}$ have been constructed
- e. *Quelles maisons$_1$* as tu construites t$_1$
  which$_{fem}$ houses have you constructed?

(6) involves two symptoms which, taken together, result in the diagnosis of successive cyclic movement. Audible inversion in (6)b-e represents a first symptom of displacement, while a second one comes from morphology. Specifically, overt gender/number marking in (6)b-e (underlined) signals the presence of an abstract agreement relation between the object and the participle. Assuming that agreement is a reflex of - that is, caused by - feature valuation and that valuation requires a local specifier head relation (Koopman 2006), the constellations in (6) can only have been produced by movement. (7) provides relevant parts of the derivation:

(7) [object$_{[\Phi\text{-features}]}$ ... [$_{XP}$ t$_{object,\ [\Phi\text{-features}]}$ [$_{X'}$ participle+suffix$_{[\Phi\text{-features}]}$ [... t$_{object}$ ...

On this view, overt agreement constitutes a second symptom of movement.

[4]Alternations that have resisted a derivational analysis include the double object construction (*give John a book /a book to John*) and attributive modifiers (*visible stars* vs. *stars visible*).

The finding that agreement indicates movement also provides a diagnostic test that can be used in the analysis of new data. For one, the agreement test confirms the hypothesis that subjects of unaccusative verbs (see (8)) originate in VP-internal positions, to the right of the participle:

(8) Elles sont venues
they$_{fem}$ are come
'They have arrived'

As was seen above, diagnosis is a complex procedure that starts from specific areas in the raw data (markers), proceeds to a theoretical interpretation of these markers, yielding symptoms, and collects a sufficient number of symptoms in order to reach at a concrete diagnosis. Moreover, tracing the actual cause of a symptom proceeds by process of elimination on the basis of tests which expose possible alternative explanations to falsification. Tests thereby act as filters for probable causes, linking causes to their symptoms.

In reality, it is hard to devise a simple deterministic diagnostic algorithm for this procedure, though. Even the brief discussion above revealed that each filter is itself an artifact that needs to be designed, and design is subject to choices. Among others, this renders tests vulnerable to what has been called *observation selection effects*. The size of the smallest fish that can be sampled from a pond e.g. depends on the choice of net, to use an example from Bostrom (2002). Tests, *qua* being filters, therefore reflect the nature of ancillary assumptions which enter into the analysis and determine, among others, which symptoms or properties are actually held to constitute a valid test. To illustrate, the agreement symptom introduced above is not fine-grained enough to detect all instances of movement through XP. In (9), the object presumably passes through the specifier of XP1 as well as XP2, but gender agreement is only triggered on the lower participle (Chomsky 1995: 325):[5]

(9) la jupe$_1$ qu'il a [$_{XP2}$ t$_1$ dit/*dite que Pierre a [$_{XP1}$ t$_1$ faite/*fait t$_1$]]
the skirt$_{fem}$ which he has said that Peter has made

Depending on the particular choice of assumptions, one and the same set of data can therefore be assigned radically different epistemological values. As such interdependencies between tests and theoretical assumptions are by no means isolated cases, many components of diagnosis are open to interfering factors. It follows that conditions very rarely reveal themselves when approached by mechanical, step-by-step diagnostic procedures.

2. Tests for syntactic movement

Above, symptoms were grouped into three classes, depending on whether the marker is associated with changes in form, changes in meaning or properties of the movement operation. This classification finds a corresponding tripartite taxonomy in the standard syntactic tests which react to movement ((10)a-c). (10)d and (10)e add two new groups of quantitative,

[5]E. Anagnostopoulou (p.c.) points out that the absence of agreement with the higher participle is probably due to the fact that the relative pronoun reaches the relevant specifier by Ā-movement.

psycholinguistic diagnostics that look for physiological correlates (symptoms) of movement in brain states, child language, language disorders and related areas:

(10) a. Tests which correlate with changes in form (phonology or morphology)
b. Tests which correlate with changes in interpretation
c. Tests which reflect properties of the movement procedure
d. Tests from ontogenetic language development
e. Tests which react to mental and/or physiological correlates of movement

Below, some of the main exponents of the first three classes will be briefly reviewed (on (10)d/e, see Demirdache, to appear). As the internal mechanics of the tests is more important than their extensional manifestations, I will not attempt to provide a comprehensive catalogue of diagnostics, though, which can be found in introductory texts and handbooks. Moreover, due to limitations of space, the phenomena to be discussed will be presented in a compressed manner.

2.1. Movement and form

Displacement is known to induce changes in form which can either affect (i) the moved item α itself or (ii) nodes that α has temporarily entered a local relationship with. The former type of modification results in changes of precedence relations, while classic manifestations of the latter property are found with movement into intermediate positions and include French participle morphology ((6)); quantifier float in West Ulster English ((11); McCloskey 2000) *wanna* contraction (Pesetsky, to appear), Irish complementizer agreement (McCloskey 2002) and many others. The view that movement proceeds successive cyclically is further confirmed by doubling phenomena in adult and child language ((12); Crain and Lillo-Martin 1999):

(11) What$_1$ did he say [$_{CP}$ all t_1 (that) he wanted t_1] (West Ulster English)

(12) What$_1$ do you think [$_{CP}$ what$_1$ Cookie Monster eats t_1] (age 5;0)

Finding any of the markers above signals the presence of a symptom of movement.

2.2. Movement and interpretation

Movement of α across β leads to changes in the c-command relations between α and β, with concomitant consequences for structure sensitive principles of interpretation such as quantifier scope, pronominal variable binding, coreference patterns, polarity licensing, idiom interpretation and ellipsis resolution. In principle, there are three possible options to be considered, listed in (13), which are often referred to as contexts of *optional reconstruction*, *anti-reconstruction* and *obligatory reconstruction*, respectively:

(13) In configuration [α ... [β..., nodes reflexively dominated by α are interpreted
a. above β or below β (optional reconstruction)
b. only above β (anti-reconstruction)
c. only below β (obligatory reconstruction)

Detecting any of these constellations indicates that α has reached its position by movement.

2.2.1. Optional reconstruction

To begin with, (13)a describes configurations in which movement generates new meanings but preserves previously established interpretations, resulting in ambiguity. This option is exemplified by inversion in scope rigid scrambling languages such as Hungarian, Korean or German, where scope ambiguity is contingent upon overt reversal of the quantifiers ((14)).

(14) a. weil irgendeiner jedes Buch gelesen hat — *some* ≻ *every* / **every* ≻ *some*
"since somebody read every book"
b. weil [irgendein Buch]$_1$ jeder t_1 gelesen hat — *some* ≻ *every* / *every* ≻ *some*
"since everybody read some book"

The emergence of ambiguity in non-canonical word orders accordingly furnishes a test signaling movement (or, to be precise, a symptom thereof).

While the surface interpretation of (14)b can be directly read off overt syntax, the inverse scope reading is produced by reconstructing the subject into a position below the object.[6] More generally, reconstruction refers to a set of operations that repair level ordering conflicts which arise as the result of movement. Hence, reconstruction represents an important criterion for confirming the diagnosis of movement. Conversely, pervasive absence of reconstruction effects is commonly held to constitute an argument for base generation, i.e. the absence of movement. A textbook illustration of how this divide discriminates between two related constructions comes from control and raising. As exemplified by the contrast in (15), only raised subjects behave as if they are part of the lower clause w.r.t. the computation of relative quantifier scope:

(15) a. Some unicorn is likely to kill every knight. — *some* ≻ *every* / *every* ≻ *some*
b. Some unicorn is willing to kill every knight. — *some* ≻ *every* / **every* ≻ *some*

Other tests for movement are based on markers which react to anaphor licensing ((16)), selectional restriction of predicates ((17)), idiom interpretation ((18)) and referential opacity ((19)). The latter pair is informative inasmuch as (19)a can be used as a notional *de dicto* report conveying the information that John misidentified his new neighbor, whereas (19)b exclusively expresses a false *de re* proposition. On the assumption that *de dicto* readings are contingent upon reconstruction, this indicates that control subjects can not be generated in the complement clause, and that, as a consequence, control must not implicate movement:

(16) a. [Friends of each other$_3$]$_1$ seemed t_1 to amuse the men$_3$ (exx. from Bailyn 2009)
b. *[Friends of each other$_3$]$_1$ promised/wanted PRO$_1$ to amuse the men$_3$

(17) a. There$_1$ seemed t_1 to be a commotion
b. *There promised PRO to be a commotion

(18) a. All hell$_1$ is likely t_1 to break loose
b. *All hell is eager PRO to break loose

[6]Lowering can be achieved by different strategies, i.e. in semantics, in syntax or by mapping representations to more than a single interpretation.

(19) a. A Martian$_1$ seemed to John t_1 to have moved in next door. *de dicto / de re*
b. A Martian$_1$ threatened John PRO$_1$ to move in next door. **de dicto / de re*

Polinsky and Potsdam (2007, to appear) furthermore demonstrate that the interpretive contrasts between raising and control also obtain if it is the lower, and not the higher, position of the dependency which is spelled out. In the North West Caucasian language Adyghe, for one, inverted scope readings are attested with Backward Raising, i.e. contexts structurally identical to (15)a, except that the notional subject is construed *in-situ*. Similarly, Backward Control displays the properties familiar from 'forward' control. This corroborates the view that the interpretive characteristics of the construction (raising vs. control) covaries with the semantic class of the superordinate predicate, and is not contingent upon superficial properties of pronunciation. In addition, Polinsky and Potsdam's findings strengthen the case against eliminating the distinction between raising and control, as suggested by Hornstein (1999).

A further important set of diagnostics for derivational syntactic relations is supplied by ellipsis. Concretely, there are two ways in which ellipsis can be used as a sign of movement. On the one hand, movement provides a strategy for parts of the ellipsis site to escape the consequences of phonological deletion. For instance, in the pseudogapping examples (20), at least one category has been evacuated from VP prior to the application of VP-ellipsis:

(20) a. John sent flowers to Lucy before Max did [chocolates]$_1$ [to Sue]$_2$
($\triangle$ = [$_{VP}$ sent t_1 t_2])
b. John sent flowers to Lucy before Max did [chocolates]$_1$
($\triangle$ = [$_{VP}$ sent t_1 to Lucy])
c. John sent flowers to Lucy before Max did [to Sue]$_2$
($\triangle$ = [$_{VP}$ sent flowers t_2])

(21) illustrates that the movement operation reconstructs, thus falls into group (13)a:

(21) *While some believed him$_3$ everything, others did only [the story that John$_3$ had met aliens]$_1$.
($\triangle$ = [$_{VP}$ believe him$_3$ t_1]) (Sauerland 1998: 114; (78))

But movement may also affect the entire ellipsis, as most prominently seen in the interaction between covert QR and VP-ellipsis in antecedent contained deletion ((22)a). Moreover, the contrast between (22)a and (22)b also documents that whatever process is responsible for transporting the quantificational object into its scope position in (22)a obviates disjoint reference effects. This property is also well-known from overtly fronted relative clauses ((22)c):

(22) a. You showed him$_3$ every book [$_{CP}$ that Sam$_3$ wanted you to $\triangle$]
($\triangle$ = [$_{VP}$ show him$_3$])
b. *You showed him$_3$ every book [$_{CP}$ that Sam$_3$ wanted you to show him$_3$]
c. Which book [$_{CP}$ that Sam$_3$ wanted you to show him$_3$] did you show him$_3$

Thus, not all types of movement partake in reconstruction. Those that don't, instantiate manifestations of anti-reconstruction, to be discussed in the next subsection.

2.2.2. Anti-reconstruction

Anti-reconstruction, which corresponds to combinatorial option (13)b, supplies a test for unmasking derivational dependencies that is qualitatively different from the diagnostics introduced so far. More precisely, on an influential view, (22)a and (22)c lend themselves to a uniform treatment in terms of a sequential ordering of operations which is only compatible with a movement analysis.[7] The mechanics of the account for (22)c are outlined in (23). In a first step ((23)a), the bare object moves to its surface position. Then ((23)b), the common noun is combined with the relative clause by an operation known as *counter-cyclic Merge* or *Late Merge* (Lebeaux 1990). Late Merge has the desirable consequence that there is no point in the derivation at which the name resides within the c-command domain of the coreferential pronoun:

(23) a. *Step I: Move object*
[Which book]$_1$ did you show him$_3$ t$_1$

b. *Step II: Late Merge relative clause to NP*
[Which [$_{NP}$ book [$_{CP}$ that Sam$_3$ wanted me to ⌂]]]$_1$ did you show him$_3$ t$_1$

Hence, a further symptom of movement can be isolated from its ability to feed the application of Late Merge in environments which display the signature of anti-reconstruction effects.

Note in passing that there are also exponents of the anti-reconstruction class (13)b which are - at least at first sight - not suitable for the purpose of detecting movement, as their analysis does not depend on Late Merge or related operations. Raising with negative quantifiers, shown in (24)a, typifies such contexts in which reconstruction fails for different reasons.[8] (24)b paraphrases the reading which is unavailable for (24)a (Partee 1971; Lasnik 1972):

(24) a. Nobody is certain to pass the test — *no* ≻ *certain* / ***certain** ≻ *no*
b. It is certain that nobody will pass the test — *certain* ≻ *no*

The contrast in (24) will be taken up again later (see (46)).

2.2.3. Obligatory reconstruction

The defining property of the third and last option (13)c is that a moved node is necessarily interpreted below its surface position, resulting in *obligatory reconstruction*. In (25), for one, a positive principle (Condition A) imposes conditions on an expression which cannot be met by the surface representation. By contrast, (26) is ruled out by a negative statement (Condition C), even though the offending relation cannot be inferred from cues overtly present in the signal:

(25) [Which pictures of each other$_3$]$_1$ do you think that they$_3$ like best t$_1$
(26) *[Which pictures of John$_3$]$_1$ do you think that he$_3$ likes best t$_1$

[7]To be precise, the analysis is not compatible with a strictly surface oriented, monostratal, model of the grammar. It can be recast in representational terms, if the theory admits traces or copies.

[8]For discussion and analysis see Lechner (2007); Iatridou and Sichel (200?) and Szabolcsi (2011).

Obligatory reconstruction is closely tied to a particular type of *rule opacity* known as *overapplication* or *counter-bleeding* opacity (Kiparsky 1973). In general, overapplication provides a particularly useful tool for detecting movement of α because in such contexts, the well-formedness of an expression is contingent upon lower occurrence properties of α.[9]

The Crossover paradigms in (27) and (28) demonstrate that pronominal variable binding is subject to a condition dictating that pronouns are c-commanded by the A-traces of their binders (Postal 1971; Wasow 1972). That is, the structural conditions on pronominal variable binding are calculated prior to Ā-movement, rendering crossover an instance of obligatory reconstruction in an opaque context. The impression that these environments implicate reconstruction is confirmed by the fact that the matrix subject of the Strong Crossover example (28)b also induces a disjoint reference effect.[10]

(27) a. Who$_1$ t_1 likes his$_1$ mother
b. ?*Who$_1$ does his$_1$ mother like t_1 (Weak Crossover)

(28) a. Who$_1$ t_1 thinks she likes him$_1$
b. *Who$_1$ does he$_1$ think she likes t_1 (Strong Crossover)

The crossover condition has also been recruited in another context for the purpose of diagnosing movement. Chierchia (1992) argues that crossover - and therefore movement - underlies the distribution of functional and pair-list readings, as shown by (29) and (30).

(29) *What$_1$* did everyone$_2$ buy *$t_{1(2)}$*
a. Single answer: Everyone bought apples
b. Pair-list/functional answer: Ann bought apples, Ben bought beer, ...

(30) *Who$_1$ $t_{1(2)}$* bought everything$_2$
a. Single answer: Ann bought everything
b. *Pair-list/functional answer: Ann bought apples, Ben bought beer, ...

(31) *Who$_1$ *everything$_2$* $t_{1(2)}$ bought t_2 (Alternative LF for (30), after object QR)

In (29), the distributive subject overtly c-commands the object trace and may therefore bind the (implicit) variable (index 2) inside the object trace t_1, resulting in the pair-list answer (29)b. By contrast, such an interpretation becomes possible for (30) only if the distributor, in this case the object *everything*, has undergone silent movement across the internally complex trace of the

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[9]Obligatory reconstruction can also be enforced by certain types of NPI licensing (see (i) and (ii)) and selectional properties such as idiom interpretation; on criticism of arguments based on the latter see Runner (1997).

(i) [A doctor who knew anything about acupuncture]$_1$ was *(not) t_1 available. (Uribe-Etxebarria 1994)

(ii) a. ?[Pictures of anyone] aren't likely t_1 to be at the exhibit (Lee 1993)
b. *[Anyone] isn't likely t_1 to be at the exhibit

[10]For discussion see Ruys (2000). Movement reconstructs only for the purposes of variable binding, but not for question semantics (Reinhart 2006) and other interpretive aspects.

subject, as detailed in (31). But object QR in (31) offends the Weak Crossover condition, accounting for the absence of the pair-list interpretation (30)b. In this sense, crossover signals the presence of covert movement in (30)b.

In sum, obligatory, optional and anti-reconstruction effects are strong indicators of movement. This holds at least if movement is understood as an operation that is not reducible to plain variable binding. It should be noted that the tests summarized above do not decide between derivational and competing, representational accounts of movement, though. This is so because the descriptive content of moved expression can also be recovered by representational devices such as copies. For factors that might aid in adjudicating between these two options see Lechner (to appear).

2.3. Properties of the movement procedure

The third class of linguistic symptoms for movement does not reflect changes in form or meaning, but is caused by properties of the movement operation itself. Concretely, it is possible to distinguish among three different types of diagnostics that fall in this group: (i) dominating islands; (ii) intervention effects; and (iii) manifestations of economy.

2.3.1. Dominating islands

The first group of diagnostics comprises of tests which respond to purely configurational properties of trees and characteristically involve a particular combination of nodes *dominating* the launching site of a moved category (Ross 1967; Chomsky 1973). Syntactic entities that fail to abide by the conditions set up by these *strong islands* display symptoms of sharp unacceptability. Standard manifestations of strong islands include the Subject Condition ((32)a), the Adjunct Condition ((32)b), the Complex NP Constraint ((32)c), and the Coordinate Structure Constraint ((32)d):

(32) a. *Which picture$_1$ did [the claim that they like best t_1] surprise you.
b. *I wonder which picture$_1$ Sally was abroad [while you bought t_1]
c. *I wonder which picture$_1$ you met the painter [who sold t_1]]
d. I wonder which picture$_1$ [[you bought t_1] and [I will have to pay the bill *(for t_1)]]

Closely related to the analysis of islands is the question of how legitimate instances of apparently unbounded movement as in (33) are made compatible with the dictate of locality theory (e.g. Phase Impenetrability Condition; Chomsky 2000):

(33) Which picture$_1$ did you [$_{vP}$ t_1 say [$_{CP}$ t_1 that Mary [$_{vP}$ t_1 bought t_1]]]

On the prevalent view, movement proceeds successive cyclically in small incremental steps. These steps lead through intermediate landing sites currently thought to include CP and vP. Since locality entails that most - if not all - movements create intermediate landing sites, finding traces of these positions consequently adduces strong evidence for the claim that a tree was assembled with the help of movement. For some tests which have been designed to record such intermediate steps see discussion in section 1.2 ((6)) and section 2.1 (quantifier float in Ulster English (11)).

For evidence for successive cyclicity from interpretation see Fox (1999) and Lebeaux (1990), among many others.

2.3.2. Intervention effects

In an attract based model (Chomsky 2000), the representation of strong islands includes a single feature (e.g. [+wh]) on the attractor and a single, matching, feature on the attractee. As a consequence, movement invariably proceeds to a fixed position. Adding a third feature generates a more complex class of phenomena which fundamentally differ from strong islands in that well-formedness is not only sensitive to the dominance relations separating the *actual* attractor from the *actual* attractee, but also contingent upon the position of other *potential* attractors/attractees. Failure to observe conditions on admissible feature combinations results in *intervention effects*.

In general, intervention effects are caused by moving an expression across nodes with similar feature specification, possibly in the presence of another attractor. Since it is possible to assign different values to the notions 'intervening node' (c-command vs. domination) and 'similar feature' (identity vs. subset relation), and since the number of attractors is potentially unbounded, the logical space circumscribed by this class of phenomena is large. The discussion below will be restricted to some rudimentary manifestations of intervention effects (c-commanding interveners; economy; and structures with dominating interveners).[11]

In the simplest set of contexts, regulated by Relativized Minimality (RM; Rizzi 1990), there is only a single attractor, the intervener is c-commanding the trace and similarity is construed as the feature subset relation. (34) lists three representative cases (intervener set in *italics*):

(34) a. *How$_{1,\,[wh]}$ did she wonder [*who*$_{[wh]}$ met the king t$_1$] (*wh*-island)
(cf. How did she say [she met the king t$_1$]
b. *Someone$_1$ seems that [*it* [is likely t$_1$ to win]] (Superraising)
c. *Eat$_1$ John *will* t$_1$ meat? (Head Movement Constraint)

Sensitivity to RM effects has been widely used as a gauge for movement relations.

Expressions that qualify as interveners for RM (e.g. *who* in (34)a) are often *defective* in that they have moved but are not eligible for further displacement (Chomsky 2000; Hiraiwa 2000). The classic illustration of this poorly understood phenomenon comes from the interaction between dative experiencers and raising in Italian, as in (35):

(35) Maria sembra (*a Gianni) essere felice
Mary seemed to John to be happy

As a group of markers that has only recently been explored, defective intervention effects provides an important new class of tests for movement which have for instance been used to gain a new perspective on the perennial puzzle of *tough*-constructions. Hartmann (2009) noticed that the well-formedness of (36) inversely correlates with the presence of a matrix experiencer.

[11]At least some intervention effects such as Negative Islands are semantic in nature. Moreover, it is not known at the moment whether all syntactic intervention effects can be reduced to economy (see below).

(36) Cholesterol$_1$ is important (*to Mary) [PRO to avoid t$_1$]

This strongly suggests that the surface subject of (36) has indeed reached its overt position by movement.

2.3.3. Economy

Apart from dominating islands and intervention effects, movement is also controlled by a variety of *economy* constraints minimizing complexity (in a broad sense). In fact, even phenomena captured by classic RM lend themselves to a re-interpretation in terms of economy if one adopts a metric favoring shorter over longer movement paths ('Shortest'; Chomsky 2000; Richards 1997). Applied to (34)a, this constraint would e.g. block movement across the closest possible attractor (the embedded SpecCP) or attraction across a closer attractee (*who*).

Recall at this point that the interveners in classic RM contexts such as (34)a are defective and frozen in place. As a result, there is no alternative, admissible version of (34)a - **Who did he wonder how t met the king* is equally deviant. Such derivations, do not produce a well-formed output lead to *ineffability* and therefore mask the inherently competitive nature of Shortest. The comparative aspect of economy manifests itself more transparently in Superiority phenomena, though, documented by (37):

(37) *Superiority*
a. Who$_1$ did John persuade t$_1$ [PRO to visit whom$_2$]
b. *Who$_2$ did John persuade whom$_1$ [PRO to visit t$_2$]

Unlike RM, Superiority by definition involves more than one potentially mobile ('active') wh-phrase, the closest of which is selected by Shortest. Furthermore, if a second node is attracted by a single head, Shortest creates the expectation that multiple movement leads to the formation of crossing, order preserving paths ($\alpha \prec \beta \prec t_\alpha \prec t_\alpha$; Richards 2001). This prognosis is indeed confirmed by the observation that order preservation effects are cross-linguistically attested in a wide range of constructions, among them multiple overt wh-movement in Bulgarian ((38)), Scandinavian object shift, multiple scrambling, clitic placement, and others:

(38) *Multiple movement: crossing path*
a. Koj$_1$ kogo$_2$ vižda t$_1$ t$_2$ (Rudin 1988:449)
who whom sees
'Who sees whom'
b. *Kogo$_2$ koj$_1$ vižda t$_1$ t$_2$
whom who sees

It has also been suggested that in some contexts, economy is calculated relative to a fixed interpretation. This concept is commonly referred to as *interface economy*, illustrated below:

(39) *Interface economy*
a. Who remembers [what$_2$ who$_1$ t$_1$ bought t$_2$] (Baker 1970)
b. Who remembers [who$_1$ t$_1$ bought what$_2$]

Even though (39)a violates Superiority, the question escapes the verdict of Shortest on the reading in which the embedded subject (who_1) is construed with matrix scope. This is so because the target interpretation cannot be generated by alternative means. Concretely, the requirement that interrogative CPs contain an overt wh-expression renders the matrix interpretation of who_1 unavailable for the alternative serialization (39)b. Thus, interface economy suspends the Superiority effect for (39)a. Further consequences of Scope Economy with covert movement are discussed in Fox (2000). Reflexes of interface economy are indicative of movement, since binding relations are generally not controlled by such a metric (but see (41)).

2.3.4. C-command and containment, nesting and crossing

So far, the discussion has been restricted to contexts in which the intervener c-commands the launching site of movement. But loosening the definition of 'intervener', so as to include dominating as well as c-commanding positions, has desirable consequences in at least two domains:

First, the economy based analysis of Superiority can also be extended to nesting configurations ((40); Takano 1994; Kitahara 1995; Müller 1998; Pesetsky, to appear):

(40) *Dominating intervener*
a. [Which book of who_2]$_1$ did you buy t_1?
b. *Who_2 did you buy [which book of t_2]$_1$?

(40)b and (37)b are both excluded by a general economy principle which bans movement of an wh-expression across another (c-commanding or dominating) node bearing the same feature specification. Furthermore, (40) parallels (37) in that multiple movement leads in both cases to the creation of dependencies which preserve the pre-movement order of the expressions (see e.g. Pesetsky 1982; Williams 1998). Thus, attraction by a single head correlates with order preservation effects and the formation of crossing paths.

It is interesting to note at this point that movement appears to differ in this respect from binding, which generally results in nesting, instead of crossing dependencies. This restriction expresses itself for instance in the distribution of bound variables inside elliptical VPs (*Dahl's Puzzle;* Dahl 1973; Fiengo and May 1994; Fox 2000):

(41) *Binding: 'nested' dependencies*
Max_1 said he saw his mother and $Oscar_2$ did, too.
a. Max_1 said he saw his mother and $Oscar_2$ said that he_2 saw his_1 mother $(2 \prec 2 \prec 1)$
b. *Max_1 said he saw his mother and $Oscar_2$ said that he_1 saw his_2 mother $(2 \prec 1 \prec 2)$

(41) can be assigned the 'nested' reading (41)a, in which the higher pronoun is locally identified, but lacks the crossing dependency interpretation (41)b. It is therefore tempting to employ this distinction between crossing vs. nested path formation as a criterial test for movement vs. binding along the following lines: movement elicits symptoms of crossing dependencies which can in turn be identified by order preservation effects.

Unfortunately, the characterization above is not entirely pervasive (Pesetsky 1982). In all

cases of order preservation discussed so far, movement was induced by attracting features on a single head. But as illustrated by the paradigms in (42)-(44), addition of a second attractor all of a sudden leads to nested, order reversing dependencies:

(42) *Moving intervener (subject): nested path*
a. ?What$_1$ did you wonder [who$_2$ t_2 saw t_1] (only weak island violation)
b. *Who$_2$ did you wonder [what$_1$ t_2 saw t_1]

(43) *Moving intervener (indirect object): nested path*
a. ?What subject$_1$ do you know [who$_2$ PRO to talk to t_2 about t_1]
b. *Who$_2$ do you know [what subject$_1$ PRO to talk to t_2 about t_1]

(44) *Tough-movement: nested path*
a. ?Which violin$_1$ are these sonatas$_2$ hard [PRO to play t_2 on t_1]
b. *Which sonatas$_2$ is this violin$_1$ hard [PRO to play t_2 on t_1]

Thus, the diagnostic of order preservation fails to generalize and does therefore not expose the full range of properties associated with movement.

Richards (2001) points out that this correlation is expected on an account that combines economy with the cycle, because Shortest ensures that the order in which (active) nodes are attracted mirrors the order in which they are introduced. Interestingly, it now becomes also possible to use this systematicity in designing a somewhat more reliable diagnostic tool by making tests for movement not only react to order preservation, but also take into account the number of attractors. It is evident that for this method to succeed, one must also be able to find independent evidence in the data for the number and position of attracting heads involved.

2.3.5. Improper Movement (C-command and containment II)

The discussion above suggested that movement is not only susceptible to feature intervention by c-command, but also by dominating interveners. Generalizing the notion of intervention from c-command to containment thereby considerably expands the range of possible contexts which can be screened for movement. Similarly promising results of extrapolating from principles defined in terms of c-command to principles defined in terms of containment have also been reported in the study of improper movement (IM). Following some general comments on orthodox manifestations of IM, these findings will form the closing part of this survey.

It was seen in section 2.3.1 that movement can be inferred from the presence of intermediate landing sites and properties of these positions. Such intermediate landing sites also reveal themselves indirectly, by way of interaction with other movement procedures. Arguably the most prominent interaction of this type falls under the reign of the ban on IM (Chomsky 1973), which prohibits Ā-movement from feeding A-movement ((45)).

(45) a. *Who$_1$ is believed [$_{CP}$ t_1 that it was told t_1 [that he will win the race]]
A-movement Ā-movement

b. *Who$_1$ seems that [$_{CP}$ t_1 it is likely [t_1 to win the race]] (Saito 2002)

The IM condition relies on the assumption that apparently non-local relations are the result of multiple applications of local movement steps. Constellations that display sensitivity to IM therefore alert to the possibility that they have been generated by movement. Deploying this diagnostic, it turns out that one plausible candidate for IM comes from the prohibition on scope reconstruction with negative quantifiers (24)a, repeated below.

(46) a. Noone is certain to pass the test. ¬ ≻ *certain*/ **certain* ≻ ¬
b. noone is certain [$_{NegP}$ t_1 Neg° [noone$_{[Neg]}$ to pass the test]]
A-movement Ā-movement

If negative QPs bear features that - in analogy to wh-features - need to be licensed in a local relation with a negative head, as detailed by (46)b, the unattested narrow scope reading of (24)a can be blocked by the requirement that raising must not follow Ā-movement. In this way, the application of a diagnostic gained from inspection of the IM phenomenon suggests a plausible analysis for an unrelated, previously unaccounted for condition on interpretation.

The IM restriction applies to contexts in which a single node has been subjected to more than one movement operation. There is interesting evidence suggesting that this condition can be further generalized and extended into two directions (Abels 2007). First, prohibitions similar to IM have been identified in contexts where the two movement processes target two distinct categories in a containment relation. Müller (1998) and Takano (1994) observe, for one, that subextraction of α out of a larger node β which itself moves yields well-formed results only if α and β are not targeted by the same movement type. It is for this reason that scrambling out of a node that is later topicalized, as in (47)a, is allowed, while scrambling out of a scrambled node, as in (47)b, is not:

(47) a. [t_α zu lesen]$_\beta$ hat keiner das Buch$_\alpha$ versucht
to read has nobody the book tried
b. *...daß [t_α zu lesen]$_\beta$ keiner das Buch$_\alpha$ versucht hat
that to read nobody the book tried has
"Nobody has tried to read the book"

A generalization in a second direction expands the typology of movement operations which fall under IM to include scrambling, topicalization and other processes not covered by the original prohibition (Takano 2000: 144; fn 5). Abels (2007) suggests that a more complete evaluation metric has to distinguish among at least the four different types of movement given in (48):

(48) A-movement ≻ Scrambling ≻ wh-movement ≻ topicalization

The ordering of these values in (48) moreover expresses the hypothesis that movements which are lower on the scale precede movements that are located higher (see also van Riemsdijk and Williams 1981; Williams 2003). Thus, A-movement may feed scrambling or wh-movement, but not *vice versa.*

The picture emerging from the discussion above thus looks as follows: First, movement properties that are sensitive to intervention effects reveal themselves in contexts of c-command as well as containment. The core cases of both are captured by economy (Reinhart 2006). Second, intervention effects themselves react to the composition of the features involved (Starke 2001). Third, it is possible to envision a theory that expresses restrictions on possible combinations of movement operations such as IM (and generalizations thereof) in terms of features and properties of attractors. On this view, locality falls into two groups: configurational conditions (strong islands) and conditions on intervention such as (49), which subsume classic RM, intervention by containment, conditions on subextraction and standard instances of IM.

(49) A node can be attracted by F_1 across F_2 as long as F_2 is lower than F_1 on the hierarchy of movement operations in (48).

3. Conclusion

There is a clear correlation between the theoretical advances in a field on the one side, which lead to a better understanding of causal relations between phenomena and the primitives of the theory, and the precision and ease with which it is possible to arrive at a diagnosis for certain underlying causes of these phenomena. At earlier stages of the development in a field, it is often possible to encounter generalizations that organize data by mere surficial appearance, grouping together what at a later stage turn out to be merely epiphenomenally related properties. Medical sciences usually reserves the term *syndrome* for these lesser understood combinations of symptoms, which cannot be traced to a single (set of) cause(s) yet, to distinguish them - with variable degrees of terminological consistency - from diseases, illnesses and conditions. Generalizing these notions, progress in a field can then be said to be marked by advancing from *syndromes* to *conditions*. It seems as if the concept of syntactic XP-movement is proceeding in this direction. The set of properties associated with phrasal displacement are arguably better understood at present than ever before. Extensionally, this finding manifests itself in the fact that linguistic analysis has by now at its disposition a comprehensive catalogue of diagnostic tools which can be deployed as tests for particular symptoms of phrasal movement.

Yet, many interesting and important issues still remain unresolved. Empirically, the debate whether *tough* movement, the various guises of resumptive strategies and Backward Raising and (for some) control involve movement or not is e.g. far from settled. And theoretical questions which have so far evaded a satisfactory answer abound. Trivial ones include: What are for instance the principles determining bounding nodes, phases and illicit combinations thereof (strong islands)? To which extent is movement motivated by semantic considerations? Can all (weak) islands be given a semantic reanalysis? Which conditions regulate the distribution of phonologically overt copies, and ensure feature transfer after checking or valuation (see fn. 4)? While recent incarnations of Multiple Dominance theories offer new perspectives on at least the last two puzzles for orthodox conceptions of movement (Bachrach and Kazir 2007), solid evidence that supports one alternative over the other has in this - as in so many other domains - not materialized so far.

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