

# From trace theory to copy theory

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## 1. From traces to copies

A fundamental property of human languages is that syntactic constituents are interpreted in positions different from the ones where they are phonetically realized. Within the generative tradition that culminated in the Government and Binding (GB) model (Chomsky 1981), this “displacement property” was standardly analyzed as involving an operation moving a given element from one structural position to another, leaving behind a coindexed trace. A trace was conceived of as a phonetically unrealized category that inherited the relevant interpretation properties of the moved element, forming with it a discontinuous object – a so-called chain. A considerable amount of research within GB was devoted to properly characterizing the properties of movement, traces, and chains. This research led among other things to a typology of traces (and empty categories, more in general), distinguishing three types of traces: (i) wh-traces, i.e. traces resulting from A-bar movement (cf. (1a)), (ii) NP-traces, i.e. traces resulting from A-movement (cf. (1b)), and (iii) traces resulting from head movement operations such as V-to-T movement in French (cf. (1c)).

- (1) a. I wondered who<sub>i</sub> John kissed t<sub>i</sub>  
b. John<sub>i</sub> was kissed t<sub>i</sub> by Mary  
c. Jean embrasse<sub>i</sub> souvent t<sub>i</sub> Marie  
Jean kisses often Mary  
'Jean often kisses Mary.'

In the context of the Minimalist Program (Chomsky 1993, 1995), all the questions about the nature of movement and the properties of traces arise anew, in face of the elimination of much of the rich theoretical apparatus previously available. In particular, only the interface levels LF and PF are assumed, and LF objects are built from the features of the lexical items of the array that feeds a derivation (Chomsky's 1995 Inclusiveness Condition). Under the standard theory of movement stemming from Chomsky (1973), however, traces and their indices are not part of the initial array, but are introduced in the course of the derivation. As such, trace theory does not meet minimalist requirements.

Addressing traditional issues in movement theory, Chomsky (1993) incorporates the “copy theory of movement” into the Minimalist Program. According to the copy theory, a trace is a copy of the moved element that is deleted in the phonological component (in the case of overt movement), but is available for interpretation at LF. Under the copy version of trace theory, then, the patterns in (1) look as in (2) at LF. In the corresponding PF structures of these sentences, only the highest copy is spelled out phonologically. The lower copy is erased in the phonological component and consequently is not realized at PF.

- (2) a. I wondered [who] John kissed [who]

- b. [John] was kissed [John] by Mary
- c. Jean [embrasse] souvent [embrasse] Marie

Besides being compatible with the Inclusiveness Condition, the copy theory has the advantage of allowing binding theory to be stated solely in LF terms and dispensing with the operation of reconstruction, i.e. the LF-operation that “puts back” the moved constituent into the position of its trace. The latter advantage is exemplified in (3). Under trace theory, the moved *wh*-phrase *which picture of himself* must be reconstructed in its trace position ( $t_i$  in (3b)) in order for the anaphor *himself* to be bound by *John*. Under the copy theory, a full copy of the displaced *wh*-phrase is available at LF (see (3c)). Consequently, the anaphor *himself*, being part of the copy in the “trace” position, can be locally bound by *John*. In short, under a copy version of trace theory there is no need for an operation like reconstruction in the grammar.

- (3) a. Which picture of himself did John destroy?
- b. [Which picture of himself]<sub>i</sub> did John destroy  $t_i$
- c. [Which picture of himself] did John destroy [which picture of himself]

A further advantage of the copy theory of “traces” is that they are not discrete theoretical primitives by themselves. They are either lexical items or phrases built from lexical items.

By making it possible to promote this overall simplification of the theoretical apparatus in GB theory, the copy theory has thus become a solid pillar of the Minimalist Program. However, it is fair to say that the bulk of the research on the copy theory thus far has mainly focused on interpretation issues at LF (reconstruction, chain binding, quantifier-variable binding, construal, *et cetera*), leaving issues on the PF side almost untouched. This by no means entails that such issues are uninteresting; the adoption of the copy theory raises many nontrivial questions about the mapping from Spell-Out to PF. A major question obviously concerns the pronunciation of the copies that make up a chain. It appears that it is only heads of chains that are available for phonetic realization. On the LF side, it seems that different chain links or even different pieces of different links are in principle available for interpretation (see Chomsky 1993, for instance). The question therefore arises whether there are cases with “traces” (lower copies) pronounced instead of the head of the chain or cases with more than one chain link or all the links phonetically realized? What, in short, regulates phonetic realization of copies?

Some other questions that arise in relation to the PF side of the grammar are the following: (a) What principles of grammar regulate the deletion of copies? (b) Does the principle of the Cycle, which regulates the order of movement rules, also play a role in the order in which copy deletion takes place? (c) How does deletion of phonological features interact with other computations of the phonological component? (d) Must the pronunciation of the “trace” necessarily be identical to that of the highest copy, or can traces also be spelled out differently, e.g. as a resumptive pronoun or a reflexive pronoun? And if a different pronunciation is permitted, what sorts of operations are involved in the conversion of a *bona fide* copy into a resumptive/reflexive pronoun? (e) To what extent is the internal structure of complex “traces” accessible to operations of the grammar, e.g. Agree?

In order to get a better understanding of the PF side of the copy theory (and the copy theory more in general), this volume has congregated recent work that deals with empirical and conceptual consequences of the copy theory of movement for the computations on the PF side of the grammar. We have organized the chapters in four parts. Part I presents an overview of the various theoretical issues the copy theory brought to forth, as well as its empirical advantages. Part II is devoted to pronunciation of multiple copies, i.e. the phenomenon that more than one copy of the movement chain surfaces at PF. Part III focuses on pronunciation of lower copies, i.e. the phonetic realization of chain links other than the head of the chain. Finally, Part IV deals with issues that arise as the copy theory interacts with other grammatical computations in general, and computations on the PF side, in particular. In the next section, we summarize the chapters in each part.

## **2. A brief tour through this volume**

### **2.1 The copy theory of movement on the PF side (Part I)**

Based on previous work by Bošković (2001, 2002, 2004a,b) and Nunes (1999, 2004), Bošković and Nunes's chapter discusses a considerable amount of evidence involving A-movement, A'-movement, head movement, and remnant movement that points to the conclusion that "traces" (i.e. copies structurally lower in the syntactic representation) may be phonetically realized. In addition, the issues regarding phonetic realization of copies are shown to be determined by conditions of the phonological component and not of syntax (movement) *per se*. As a result, the chapter is able to explain a variety of complex phenomena that cannot be captured by trace theory. The chapter starts by reviewing several pieces of evidence that show that the phonetic realization of copies is similar to the LF interpretive procedure in the sense that it allows activation of lower copies, as well as instances of "scattered deletion", where different pieces of different chain links are realized. It is argued that convergence requirements related to linearization and morphological fusion interact with economy computations regarding applications of deletion, yielding a complex crosslinguistic pattern whereby chains in the general case have only their highest link phonetically realized, but they may also trigger pronunciation of a lower link or even pronunciation of multiple links if convergence so demands.

### **2.2 On multiple realization of copies (Part II)**

Martins' chapter discusses European Portuguese sentences where a finite verb occurs twice. Such sentences express emphatic affirmation and are either elliptic structures produced as replies to a yes/no question presupposing a negative answer or full declaratives which contradict a preceding negative statement. The approach to European Portuguese emphatic verb reduplication developed in this chapter views the two phonologically indistinguishable verb forms as copies of the same item from the numeration, i.e. as two links of a nontrivial chain. Martins' analysis relies on Nunes's (2001, 2004) idea that the phonetic realization of multiple links of a chain is permitted as far as linearization – understood as the application of Kayne's (1994) Linear Correspondence Axiom (LCA) – can still operate. In particular, multiple copies may be allowed when morphological reanalysis makes some copy invisible to the LCA. In the case of emphatic affirmation in European Portuguese, it is argued that verb reduplication

results from the combination of verb movement to  $\Sigma_{[+af\bar{t}]}$  and (subsequent) verb movement to  $C_{[+emph]}$ , followed by morphological reanalysis of  $C$ , which renders the adjoined verb copy invisible to the LCA and immune to deletion.

Focusing on the case of verbal repetition in Nupe, a Benue-Congo language spoken in central Nigeria, Kandybowicz's chapter shows that verbal repetition constructions are mono-clausal syntactic objects in which the participating verbs are neither independently base-merged, as in the case of verb serialization for instance, nor are they related through reduplicative copying in the morphology/phonology. Rather, it is argued that these constructions involve chain formation and post-syntactic morphological reanalysis, which allows phonetic realization of multiple links/copies at PF. The chapter also adds some refinements to Nunes's (1999, 2004) proposal on the interaction of the syntactic component with the PF wing of grammar as far as phonetic realization of multiple copies is concerned.

Cheng's chapter examines the ambiguity in resultative constructions with verb copying in Mandarin Chinese (resultative *de*-clauses and resultative compounds) and argues that the ambiguity is the result of two different derivations, which have in common the fact that more than one copy of the verb is phonetically realized. It is argued that both standard movement and sideward movement (in the sense of Nunes 2001, 2004) are used for verb copying in resultative *de*-clauses, leading to different interpretations. In the case of standard movement, the subject of the resultative clause is raised to the matrix clause, accompanied by verb movement, yielding an object-result reading. In the case of subject-result reading, ergativity shift is involved and the subject of the resultative clause becomes the subject of the matrix clause. In the latter case, the verb is copied to accommodate a thematic noun phrase associated with a verb (via sideward movement). For both readings, due to a modified structure in the lower copy, both copies are allowed to be pronounced, without violating the LCA. Using data from verb copying in resultatives, the chapter further examines how copying is restricted to avoid unwanted copying, lending independent support to Hornstein and Nunes's (2002) proposal that the copy operation may be triggered by  $\theta$ -requirements.

Corver's chapter investigates Dutch expressions involving two instances of the bound morpheme *-s*, which is traditionally analyzed as a genitival case suffix, as in *blootshoofds* (lit.: bare-s-head-s; 'bare headed; with the head bare') or 's *Zondags* (lit.: -s Sunday-s; 'on Sundays'). The first instance of *-s* in these expressions is traditionally qualified as being proleptic in that it anticipates the occurrence of the final *-s* that is right-attached to the noun. Corver proposes an analysis of *-s*-prolepsis in terms of the operations movement/copying. More specifically, it is argued that in expressions like *blootshoofds*, for instance, *-s* is not a genitival case suffix but rather a small clause head that establishes a predication relationship between a predicate and a subject (schematically: [<sub>XP</sub> hoofd [<sub>X'</sub> -s [<sub>AP</sub> bloot]]]). The surface order is derived by movement of the predicate to a position preceding the subject and concomitant head movement of the small clause head *-s* to the functional head into whose specifier position the displaced predicate has moved (schematically: [<sub>FP</sub> bloot<sub>j</sub> [<sub>F'</sub> -s<sub>i</sub>+F [<sub>XP</sub> hoofd [<sub>X'</sub> -s<sub>i</sub> bloot<sub>j</sub>]]]]]). The multiple realization of the two *-s* copies is accounted for in terms of Nunes's (1995, 2004) theory about the linearization of movement chains. Cases like 's *Zondags* are subject to the same basic account, with the difference that *-s* is analyzed as a (weak) demonstrative pronoun (i.e. a reduced variant of the word *des*) rather than a small clause

head. A parallel is then drawn with phenomena of demonstrative-doubling in prepositional structures in German dialects.

### **2.3 On lower copy realization (Part III)**

Stjepanović's paper discusses the derivation of certain apparent cases of free word order in Serbo-Croatian, in particular those involving new information focus and neutral intonation patterns. The chapter starts by examining an apparent paradox concerning the position of the subject in Serbo-Croatian. While there are data indicating that the subject must raise to the highest position of the split IP in overt syntax, there are also data indicating that it appears in [Spec,VP] on the surface. Based on work by Franks (1998) and Bošković (2001, 2002), among others, the paper argues that the subject does indeed raise to the highest position of the split IP in overt syntax, but when the subject represents new information focus, a lower copy is pronounced at PF to satisfy requirements on sentential stress assignment (see Zubizarreta 1998). The proposed analysis thus captures the extremely free word order of Serbo-Croatian as well as discourse effects of scrambling, and sheds light on how copy deletion works on the PF side.

Examining data from Coptic Egyptian, the last descendant of the Ancient Egyptian language, Reintges's chapter argues for a new type of *wh*-in-situ, in which the copy privileged for phonological realization is the lowest member of the *wh*-chain, while the head of the chain as well as the intermediate copies are left unpronounced. Coptic can be described as a *wh*-in-situ language in which *wh*-clefting and *wh*-fronting are available as marked *wh*-interrogative strategies. The *wh*-in-situ pattern is marked morphologically by "relative tenses", so called because a relative marker appears in front of the tense-aspect-mood inflection. Based on their parallelism in scope and interpretation, Reintges argues that *wh*-in-situ and *wh*-fronting structures in Coptic are both derived by applications of *wh*-movement in the narrow syntax, before Spell-Out. Under this perspective, Coptic relative tenses are interpreted as a morphological instantiation of "*wh*-agreement". It is proposed that the simultaneous pronunciation of the topmost *wh*-copy and the relative marker are prohibited by an economy filter on the morpho-syntactic encoding of *wh*-dependencies, which is reminiscent of the "Doubly-filled Comp" Filter in English. Deletion of the *wh*-element or the relative marker is then what yields the apparent distinction between *wh*-movement and *wh*-in situ constructions at the surface. Lower copy pronunciation of *wh*-elements is of particular theoretical interest, since it shows that the PF wing of the grammar permits the same range of realization sites for *wh*-chains at LF (Bošković and Nunes, this volume).

### **2.4 Further issues: Cyclicity, accessibility and unavailability of copying (Part IV)**

Based on new evidence having to do with binding and reconstruction, Fujii argues in his chapter that copy raising constructions in English such as *John seems like he is intelligent* are to be analyzed as involving A-movement of the subject of the embedded clause, coupled with pronunciation of the copy left in the embedded subject position as a resumptive of sorts. Using Chomsky's (2001) phase-based framework, the paper shows that copy raising constructions constitute an argument for taking the PF operation that deletes copies of a chain to allow Linearization (Nunes's 2004 Chain Reduction) to apply in a cyclic fashion. More specifically, it is proposed that Chain Reduction marks for deletion all the non-highest copies that are visible to the operation when it applies. The

domain that the operation affects is determined by the notion of the cycle, which is in turn characterized by the notion of phase. Thus, when the highest copy among those visible to the operation sits at the edge of a phase, it is not marked for deletion at that phase, but it can be deleted at the next higher cycle. By contrast, when the highest copy is not in the edge but somewhere inside the domain of the phase – as is the case of copy in the embedded subject position of copy raising constructions –, it cannot be deleted even if further movement takes place, because the domain of the phase will have been spelled-out before Chain Reduction applies.

Van Koppen's chapter discusses agreement between complementizers and coordinated subjects in Dutch dialects. In the relevant dialects, the complementizer must display agreement with the first conjunct if the coordinated subject remains in [Spec,TP]. However, if the subject is extracted, this agreement morphology on the complementizer leads to an ungrammatical result. Based on this asymmetry between heads of chains and lower copies, Van Koppen proposes that internal structures of copies left by movement operations are not accessible to the operation Agree. More specifically, she proposes that copies left by movement are reduced in the sense that they only consist of the  $\phi$ -feature set of the maximal projection of the moved item. This view of copies therefore provides an alternative account for why the lower copies in constructions with more than one copy phonetically realized must be "reduced" (Nunes 2004).

Hornstein's chapter examines the theoretical status of pronouns and principle B of the Binding Theory within the Minimalist Program, once it is assumed that reflexives should be formed by movement/copying. If reflexive structures are to be ultimately analyzed in terms of movement/copying, Principle A should be dispensed with. The question then is how to reanalyze Principle B, given that it imposes the opposite requirements of Principle A. Hornstein argues in favour of returning to the earliest approaches to pronominalization phenomena by Lees and Klima (1963), recast in a more contemporary setting in terms of derivational economy. More specifically, he proposes that the complementarity between reflexives and bound pronouns follows if derivations that resort to movement (understood in terms of copying) are more economical than derivations that resort to pronoun use. Under this view, pronouns are last resort items used when more favourable ("economical") grammatical options cannot be.

### **3. Conclusion**

The chapters summarized above provide reasonable answers for the conceptual questions raised in section 1 and also considerably broaden the empirical coverage of the model. The empirical material comes from a variety of languages and it is argued that most of phenomena discussed here cannot be accounted for in terms of the standard trace theory. Recall that the reintroduction of the copy theory of movement in Chomsky (1993) was motivated mainly by conceptual concerns regarding the architecture of the computational system and interpretation issues on the LF side of the grammar. The fact that the copy theory also receives substantial support from computations of the PF-side of the grammar, as amply shown by the contributions of this volume, renders it a solid pillar of the Minimalist Program.

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