

## The Logical Structure of Linguistic Theory: Then and Now

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### I. Theory

- (1) General goals of linguistic theorizing: "...to develop an adequate explication of the notion 'grammatical sentence' in the infinite sense, and an explanation for the general process of projection by which speakers extend their limited linguistic experience to new and immediately acceptable forms." Chomsky (1955, p.519) [All page references are to the 1975 version.]
- (2) Linguistic theory:
  - A system of levels
  - A class of potential grammars
  - An evaluation ('simplicity') procedure
- (3) "The measure of simplicity must be defined in such a way that we will be able to evaluate directly the simplicity of any proposed grammar." p.116
- (4) Greater generalization → greater simplicity  
"We can generalize the notion of generalization to cover the situation where we have a set of statements (each about a single element) which are identical in part. Then the common substatement can be extracted out and stated only once, applying to all elements, with a consequent shortening of the grammar." p.117
- (5) There were several notational transformations provided, of which the lasting ones were braces (Boolean 'or') and parentheses (for 'optional' elements)

$$X \rightarrow Y / \_ \left\{ \begin{array}{c} A \\ B \end{array} \right\}$$

$$\begin{array}{l} X \rightarrow Y / \_ A \\ X \rightarrow Y / \_ B \end{array}$$

- (6) Ross (1969) provided a strong argument against the use of braces - that it allowed for the statement of false generalizations involving items that shared no basic properties.

- (7) **Levels:** phonetics, phonemics, word, syntactic category, morphemics, morphophonemics, phrase structure, transformations
- (8) A level of representation consists of elementary units (primes), an operation of concatenation by which strings of primes can be constructed, and various relations defined on primes, strings of primes, and sets and sequences of these strings. Among the abstract objects constructed on the level L are L-markers that are associated with sentences. The L-marker of a sentence S is the representation of S on the level L. A grammar for a language, then, will characterize the set of L-markers for each level L and will determine the assignment of L-markers to sentences.
- (9) The theory of syntax: PS rules yielding P-markers; transformations (fairly limited, contrary to what was sometimes claimed later) yielding T-markers; an evaluation metric comparing permissible grammars compatible with the data.
- (10)a PS component (context free; non-recursive); includes lexical insertion. Creates P-markers (which are set theoretic objects).  
 b Singular transformations. Manipulate P-markers (or derived P-markers).  
 c Generalized transformations. Combine n-ads of P-markers (or derived P-markers).
- (11) P-markers:  
 Given a particular  $\Sigma F$  (PS) grammar and a particular terminal string (i.e., string of terminal symbols) (TS):  
 a) Construct all of the equivalent PS derivations of TS.  
 b) Collect all of the lines occurring in any of those equivalent derivation into a set. This set is the phrase marker (PM), a complete representation of the PS of TS.
- (12) Two PS derivations are equivalent if and only if they involve the same rules the same number of times, but not necessarily in the same order.
- (13) An artificial illustrative example:
- (14)  $\Sigma::$  S  
 F: S  $\Rightarrow$  NP VP  
 NP  $\Rightarrow$  he  
 VP  $\Rightarrow$  V  
 V  $\Rightarrow$  left
- (15) All the equivalent derivations for the sentence “He left”
- (16)a Derivation 1: Line 1: S  
 Line 2: NP VP  
 Line 3: he VP  
 Line 4: he V  
 Line 5: he left

b Derivation 2: Line 1: S  
 Line 2: NP VP  
 Line 3: NP V  
 Line 4: he V  
 Line 5: he left

c Derivation 3: Line 1: S  
 Line 2: NP VP  
 Line 3: NP V  
 Line 4: NP left  
 Line 5: he left

(17) PM={S, he left, he VP, he V, NP left, NP VP, NP V}

(18) The primes of the level P: Sentence, NP, VP, N, V, etc.

(19) "... the names chosen for the elements of P ... have no significance, and are devoid of content in the system developed here." p.173

(20) Thus, the 'endocentric' character of phrase structure is not captured.

(21) Lasnik and Kupin (1977) proposed a theory of phrase structure with a small difference in detail, and a substantial conceptual difference.

(22) Difference in detail: 'Reduced P-markers' contain the terminal string and the 'monostrings'.  
 {S, he left, he VP, he V, NP left}

(23) Conceptual difference: The source of RPMs is **not**  $\Sigma F$  derivations. Rather, any set of strings satisfying certain conditions is an RPM. [See McCawley (1968) for a similar idea.]

(24) Grammatical relations are structurally defined in terms of P.  
*Actor-action* is the grammatical relation (*Sentence*,  $NP \widehat{VP}$ )  
*Verb-object* is the grammatical relation ( $VP$ ,  $V \widehat{NP}$ )

(25) Core motivations for transformations:  
 To keep P simple  
 To capture felt relatedness between sentences pp.306-307

(26) Transformations apply to P-markers. But the output of a T is not a P-marker. Yet transformations can be compounded. Thus, a T itself, in combination with general principles of derived constituent structure, must guarantee that the output of the T is an object of just the same formal type as a P-marker.

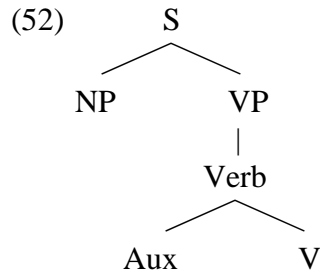
(27) One basic principle of derived constituent structure: a term of the proper analysis of Z is either carried over unaltered, dropped completely, or it has adjoined to it either other terms of the proper analysis (adjunction) or constant terms (deformations). But it can undergo no internal changes.

- (28) Ts are (or ought to be) structure dependent. One of the major criteria for P is based on "Ability to enter into transformations." p.210
- "Every term of the proper analysis of a transformed structure is an elementary constituent..." p.456
- But it is acknowledged that this desideratum cannot be maintained, since there are Ts that have as terms, e.g., sequences of Aux material that do not constitute constituents (see (55) below).
- (29) Transformations are
- marked obligatory or optional
  - linearly ordered ('extrinsically'); determining the grammar includes determining the ordering.
- (30) There is just one (very interesting) hint of a general ordering principle:  
 "Suppose ... that an element  $a$  is converted into  $b$  in the context  $c \_ d$ , and into  $b'$  in every other context. That is, we have rules
- 22** R1:  $a \rightarrow b$  in env.  $c \_ d$   
 R2:  $a \rightarrow b'$  in env.  $c' \_ d'$
- where  $c' \_ d'$  is a specification of all other contexts. We can drop the specification "in env.  $c' \_ d'$ ," which will in general be quite complex, from R2, if we indicate in the [theory of] grammar that R1 must precede R2." p.124
- (31) This is exactly the Elsewhere Condition of Kiparsky (1973).
- (32) Many of the analyses and arguments display a sort of modularity. For example, it is observed that passive questions don't require a special T. Rather, the interaction of Passive and Interrogative automatically give such sentences as  
 Was John chosen by Mary
- (33) A similar point could be made about negative questions. LSLT has a Negation T, but no negative question T, since negative questions are given for free, by the interaction with the Interrogative T.
- (34) Generalized transformations gone, and back again
- (35) "... there are no known cases of ordering among generalized transformation although such ordering is permitted by the theory of Transformation-markers." Chomsky (1965, p.133)
- (36) "... there are no really convincing cases of singular transformations that must apply to a matrix sentence before a sentence transform is embedded in it..."
- (37) Thus, instead of generalized transformations, we have recursion in the base, with transformations apply to deeply embedded constituents, and operating on the most deeply embedded clause,
- (38) Thus, singular transformations apply to constituent sentences 'before' they are embedded, and to matrix sentences 'after' embedding has taken place.
- (39) "The ordering possibilities that are permitted by the theory of Transformation-markers but apparently never put to use are now excluded in principle." Chomsky (1965, p.135)

- (40) It was almost 3 decades before it became clear that there was no real argument against generalized transformations here. It was not recursion in the base that excluded the unwanted derivations: It was the cyclic principle. And a cyclic principle can be stated just as easily in a theory with generalized transformations as in one with recursion in the base.
- (41) In general, transformations were far more specific than in later developments of the theory. These later developments usually had the effect of factoring properties out of specific transformations.
- (42) One rather striking example is locality, of which there is virtually no discussion in LSLT. The only hint is in the p. 437 discussion of a certain restriction on the WH transformation:
- (43) Whom did your interest in seem to me rather strange
- (44) Chomsky suggested incorporating the constraint into the transformation itself. It was only in Chomsky (1964) that we find the idea of formulating general constraints on the operation of transformations, and, of course, only in Ross (1967) that we find a full blown development of the idea.

## II. Analyses

- (45) The most detailed and most elegant analysis in LSLT centers on the English auxiliary system. In slightly revised form in Chomsky (1957), it also was, by far, the most influential.
- (46) The fundamental insight, one which made the whole system work so well, is that verbal affixes, especially tense-agreement affixes, are autonomous entities as far as the syntax is concerned.
- (47) Core facts:
- (48) John left                      John didn't leave  
 John should leave              John shouldn't leave  
 John has left                    John hasn't left  
 John is leaving                 John isn't leaving
- (49) John left                      Did John leave  
 John should leave                Should John leave  
 John has left                    Has John left  
 John is leaving                 Is John leaving
- (50) John left                      John **did** leave  
 John should leave                John **should** leave  
 John has left                    John **has** left  
 John is leaving                 John **is** leaving
- (51) Brief summary (of the somewhat more familiar Chomsky (1957) variant of LSLT):



(53) Aux → C (Modal) (have en) (be ing)

(54) C →  $\left\{ \begin{array}{l} \text{S in the context NP}_{\text{sing}} \_ \\ \emptyset \text{ in other contexts} \\ \text{past in any context} \end{array} \right\}$

(55) Tnot - optional

Structural analysis:

$\left\{ \begin{array}{l} \text{NP - C - V...} \\ \text{NP - C+M - ...} \\ \text{NP - C+have - ...} \\ \text{NP - C+be - ...} \end{array} \right\}$

Structural change: X1 - X2 - X3 → X1 - X2 + n't - X3

(56) TA - optional [Strong Affirmation]

Structural analysis: same as Tnot

Structural change: X1 - X2 - X3 → X1 - X2 + A - X3

(57) Tq - optional [Interrogation "Subject Aux Inversion"]

Structural analysis: same as Tnot

Structural change: X1 - X2 - X3 → X2 - X1 - X3

(58) Auxiliary Transformation ("Affix Hopping")- obligatory

Structural analysis: X - Af - v - Y (where Af is any C or is *en* or *ing*; v is any M or V, or *have* or *be*)

Structural change: X1 - X2 - X3 - X4 → X1 - X3 - X2# -X4

(59) Word Boundary Transformation - obligatory

Structural analysis: X - Y (where X≠v or Y≠Af)

Structural change: X1 - X2 → X1 - #X2

(60) do - Transformation - obligatory

Structural analysis: # - Af

Structural change: X1 - X2 → X1 - do + X2

(61) "... the treatment of 'do' as an element automatically introduced to carry an unaffixed affix will have a considerable simplifying effect on the grammar." p.419

- (62) This huge generalization is stated in the system (via ordering and obligatoriness), but not truly captured. It's a sort of conspiracy.
- (63) Lasnik (1981) proposed factoring out the conspiracy in terms of a Stranded Affix Filter. The transformations are then freely ordered and optional.
- (64) Lasnik (1981) still needed one bit of ordering, to demand that the do-Transformation be last. But it was argued that this ordering is intrinsic, following from the Elsewhere Condition! [I have to confess that at the time, I had forgotten that LSLT had this; I attributed it to Kiparsky (1973).]
- (65) As for one other major desideratum, structure dependence discussed in (28) above, fairly early there were proposals that auxiliaries raise to Infl, prior to the aux-Infl complex fronting in interrogatives. [See, especially Jackendoff (1972) citing unpublished work of Ed Klima.] The relevant term of the T then is a constituent.
- (66) Lasnik (1995) argues for the fundamental LSLT idea that Infl is syntactically autonomous, with verbs initially inserted 'bare'; but also for the distinction between main verbs and auxiliaries implicit in (65).
- (67) The argument is based in part on an observation of Warner (1986) of an asymmetry in VP ellipsis:
- (68) John slept, and Mary will ~~sle~~ep too
- (69) The Lasnik (1995) proposal for (68) is that prior to Affix Hopping slept is identical to sleep, essentially following LSLT (especially p. 552, where it is argued that Affix Hopping of the tense-agreement morpheme follows VP deletion).
- (70) \* John was here and Mary will ~~be~~ here too
- (71) Departing from LSLT, the proposal for (70) is that was is 'lexicalist', not derived from be via Affix Hopping, hence is never identical to be at any stage of the derivation. [The initial motivation for the proposal was the fact that auxiliaries, unlike main verbs, do raise. The raising is motivated by the need for the already present inflectional features to be checked.]

### III. A few miscellaneous phenomena of continuing interest

- (72) The apparent absence of SAI with subject WH-questions, as opposed to object ones:  
Who did you see vs. Who saw you
- (73) The account offered is pretty cute: SAI **does** apply, but its effects are undone by wh-movement.
- (74) The normally optional transformation separating a particle from its parent verb is obligatory when the object is a pronoun. [The now standard \* is anachronistic. LSLT uses no notation at all to mark unacceptable/ungrammatical sentences.]  
The detective brought the suspect in  
The detective brought him in  
The detective brought in the suspect  
\*The detective brought in him

p. 478

- (75) The fact that parentheticals cannot intervene between verb and direct object.  
 My friend, as you can see, enjoyed the book  
 \*My friend enjoyed, as you can see, the book p.228
- (76) The interpretation of the missing subject of a gerundive depends, in part, on whether the gerundive verb has a direct object.  
 The policemen must stop drinking after midnight [ambiguous between control and arb.]  
 The policemen stopped drinking hard liquor [only control] pp. 252, 289
- (77) The impossibility of passive-raising the subject of the complement of want:  
 They wanted John to come  
 \*John was wanted to come p. 513
- (78) Here's a really hard one. The second object, but not the first object, in a double object construction is susceptible to WH-movement:  
 What did the teacher give him  
 \*Whom did the teacher give the books p.493

#### **Appendix: Reminiscences, anecdotes, etc.**

-In 1969 Haj Ross organized a ditto project to make copies of LSLT. I participated (one of my expertises; I worked my way through college as an office boy). Note, it was **ditto**, as David and Sabine say on the website. Noam, and many others, sometimes incorrectly say the copies were mimeographed. That's a totally different technology, which, as far as I know, was never used for MIT linguistics projects.

An expert could get up to 300 decent copies out of a standard ditto master (before the purple ink on the back of the master was all gone). An expert could get **10,000** decent copies out of a standard mimeograph stencil (before the stencil simply disintegrated).

The masters for the 1969 copying project weren't standard ones, as the only way to get a standard one is to type directly onto it. I'm almost certain these were made by a relatively new procedure: 3M Thermo-Fax machines were designed to make photographic copies on fragile thermo-sensitive paper. In the mid 1960's, I think, a procedure was developed so the machines could also make a ditto master from a typed original sheet. These masters were very flimsy, but an expert could get up to 100 decent copies from one.

-What later came to be called I(nfl) was called C in LSLT. Almost every year, some student would ask me why C. I would always reply that that was probably short for 'concord'. Finally one year, I remembered to ask Noam. He said "Concord? It didn't stand for concord." So what did it stand for, I asked. Component. When I looked slightly bewildered, Noam continued, "as in the long components of the structuralists".

- As you probably all know, Plenum published LSLT in 1975. They certainly deserve our gratitude for that, but boy were they ever cheap! When the book came out, Noam was very apologetic to me. He told me he intended to give me a copy, but the company refused to give



him more than two copies, and he needed one for himself, and one for his father. I told him no problem, as I had been asked by one of the journals (Linguistic Analysis, if memory serves) to do a review, so I would get a review copy. No such luck. Plenum refused to send a review copy! They were also too cheap to pay an indexer, so the 1975 edition had no index. Astonishing! The source of the vast majority of the concepts and technical terms in the field and no way to find them in the book. Fortunately, within a short time, Jan van Voorst, then a student of Henk van Riemsdijk I believe, prepared an index and mailed it to whoever he and Henk thought would be interested. Eventually, I had gotten myself the Plenum edition, so I stuck that index inside of it (where it still is). When University of Chicago Press reprinted the book in 1985, they included that index. The binding, though, is pretty cheap. If you read the book more than once, the pages fall out.

I thought the book was out of print, but, happily, on their website Springer claims to have it.

-I actually still teach this stuff in my introductory graduate syntax course. In Lasnik (2000), I give several reasons why:

"First, many of the terms, concepts, and analyses in recent work are much easier to understand against a backdrop of their ancestors of a few decades ago. Second, our field is a relatively young one without a very large number of good arguments and analyses to use as models. We can't yet afford to ignore some of the good arguments and analyses, even if we conclude that they are ultimately incorrect. Finally, and probably most importantly, I believe that many of the analyses of the 1950's are actually correct, fundamentally and (sometimes) even in detail."

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