HISTORY OF LINGUISTICS 2015-16

(prof. Giorgio Graffi)

Handout 3 – Outline of the development of Generative Grammar

N. B: 1) Graffi 2006 = G. Graffi, "20th Century Linguistics: Overview of Trends", in Keith Brown (editor in chief), "Encyclopedia of Language and Linguistics", 2nd ed., Oxford, Elsevier, 2006, vol. 13, pp. 181-195; 2) Freidin 2013: "Noam Chomsky's contribution to linguistics", in *The Oxford Handbook of the History of Linguistics*, ed. by Keith Allan, Oxford, Oxford University Press, 2013, pp. 439-467. Details of all other bibliographical references can be found in Allan, ed., 2013.

1) Generative grammar from its origins until the "standard theory"

a) The beginnings

- *Chomsky vs. American structural linguistics*

  Generative Grammar (GG) is the label for the linguistic theory developed by the American scholar Noam Chomsky (b. 1928) and his followers; a GG, in Chomsky's own word, is ''a system of rules that in some explicit and well-defined way assigns structural descriptions to sentences'' (Chomsky, 1965: 8). Chomsky was a student of Harris […], but he early adopted a 'mentalistic' approach to the problems of language and knowledge, highly polemical against the behavioristic one, typical of Bloomfieldian and post-Bloomfieldian linguistics. (Graffi 2006: 188)

  The methods Chomsky abandoned were basic taxonomic procedures of segmentation and classification applied to a limited, though supposedly representative, linguistic corpus. Harris describes these analytic procedures in *Methods of Structural Linguistics*. (Freidin 2013: 441)

  This volume presents methods of research used in descriptive, or more exactly, structural, linguistics. It is thus a discussion of the operations which the linguist may carry out in the course of his investigations, rather than a theory of the structural analyses which result from these investigations. The research methods are arranged here in the form of the successive procedures of analysis imposed by the working linguist upon his data. (Harris 1951: 1)

  Harris applies these operations bottom-up from phonemes to morphemes on up to the level of the utterance. These operations yield a grammar of lists, taking the term 'grammar' to be some characterization of a language. (Freidin 2013: 441)

- *Early Chomsky's books*

  1951. Morphophonemics of Modern Hebrew. Master's thesis, University of Pennsylvania. [New York: Garland, 1979.]
  1955-6. *The Logical Structure of Linguistic Theory* (=LSLT). Manuscript. Published as Chomsky (1975a)
  1957. *Syntactic Structures* (=SS).

a) LSLT and SS model

- *The aim of grammar*
  The fundamental aim in the linguistic analysis of a language L is to separate the *grammatical* sequences which are the sentences of L from the *ungrammatical* sequences which are not sentences of L and to study the structure of the grammatical sequences. The grammar of L will thus be a device that generates all of the grammatical sequences of L and none of the ungrammatical ones. (Chomsky 1957: 13)

- *Phrase Structure rules and transformations*

Phrase structure rules in a grammar are formulated as rewrite rules, where the grammar contains 'a sequence of conversion statements "α → ß" where α and ßare strings, and derivations are constructed mechanically by proceeding down the list of conversions' (LSLT p. 190). The second appendix of SS provides the following simplified example (p. 111).

(1) (i) Sentence → NP + VP
(ii) VP → Verb + NP
(iii) Verb → Aux + V
(iv) NP → {$NP_{singular}$, NP_{plural}}
(v) $NP_{singular}$ →T + N + Ø
(vi) NP_{plural} → T + N + S
(vii) Aux → C (M) (*have + en*) (*be + ing*)
(vii) T → *the*
(ix) N → *man, ball*, etc.
(x) V → *hit, take, walk, read,* etc.
(xi) M → *will, can, may, shall, must*
[…]

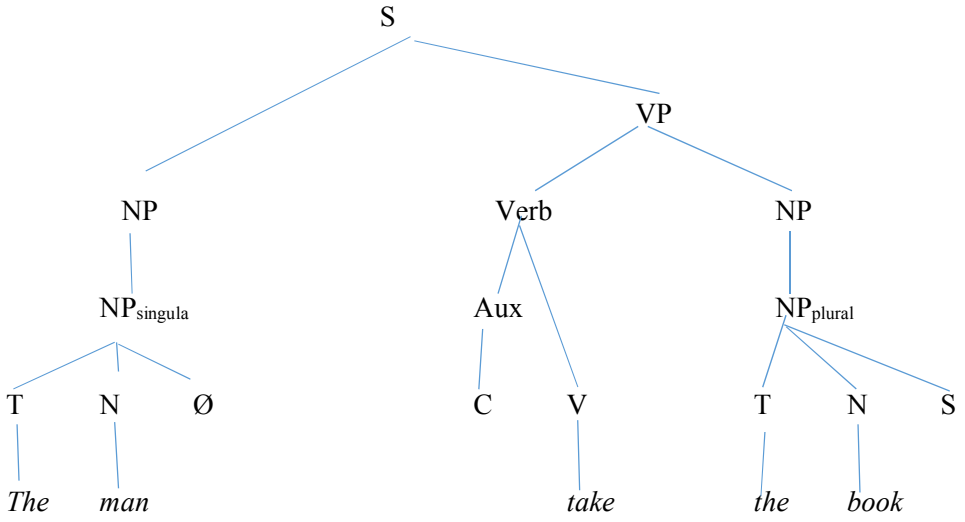
For example, one derivation of the sentence (2) from the grammar in (1) would produce a set of strings (3).

(2) The man takes the books.

(3) {Sentence, NP+VP, NP+Verb+NP, NP+Aux+V+NP, $NP_{singular}$+Aux+V+NP, $NP_{singular}$+Aux+V+ NP_{plural}, T+N+Ø+Aux+V+NP_{plural}, T+N+Ø+Aux+V+T +N+S, T+N+_+C+V+T+N+S, . . . , *the+man*+Ø+C+*take+the+books*+S}
(Freidin 2013: 445-6)

The set of strings (3) is equivalent to the following diagram ('phrase-marker')

(4)



- *Examples of transformations*

To get from the abstract underlying representation in (4) to the phonetic form of (2) involves the application of transformational rules, which are defined as mappings from one phrase marker to another. Under the grammar given in SS the derivation of (2) involves one transformation that has the effect of specifying C as a morpheme *S* (representing present tense and third person singular) and

another (generally referred to as Affix Hopping[1]) that attaches C to the verb *take* (yielding *takes*). Thus the syntactic derivation of the simplest sentences will involve transformations as well as phrase structure rules.
Under the earliest formulations of transformational generative grammar the phrase marker (3–4) also serves as the underlying structure of the passive construction (5) corresponding to (2).

(5) The books are taken by the man.

The derivation of (5) involves the application of a passive transformation as well as the two transformations required for the derivation of (2). The formulation of the passive transformation in SS, given in (6), is complex.

(6) Passive—optional:
Structural analysis: NP—Aux– V—NP
Structural change:
$X_1 - X_2 - X_3 - X_4 \rightarrow X_4 - X_2 + be + en - X_3 - by + X_1$
(Freidin 2013: 447-8)

In deriving an active sentence and its passive counterpart from the same underlying representation, the transformational analysis provides a straightforward account of sentence relatedness. In the earliest transformational grammars, this extends to the relation between affirmative and negative sentences (e.g (2) vs (7a)), and between declarative and interrogative sentences (e.g. (2) vs (7b)).

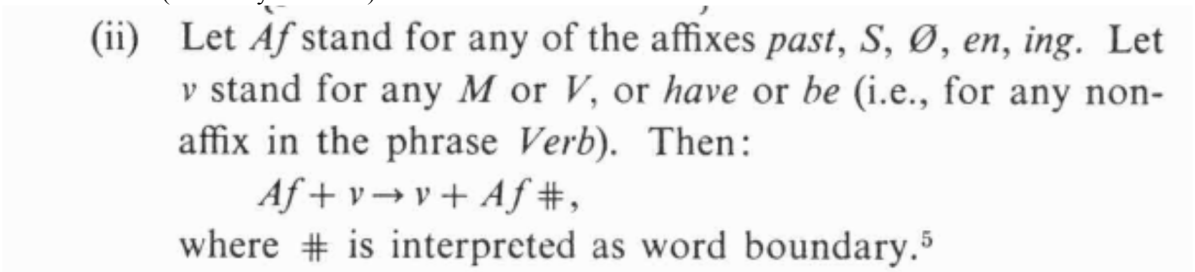
(7) a. The man does not take the books.
b. Does the man take the books?

Compounding the three basic distinctions (active/passive, affirmative/negative, declarative/interrogative) yields at least eight possible outcomes (e.g. affirmativeactive- declarative (2) vs. negative-passive-interrogative (8)), all of which are derived from the same underlying structure (3–4).
(8) Aren't the books taken by the man?
(Freidin 2013: 448)

- *'Transformation' in Harris and in Chomsky*

This notion was borrowed from Harris, but it is rather differently conceived. Whereas, for Harris, it is a relation between *sentences*, for Chomsky it is a relation between *structures*. This means that the input of a transformation is a sentence in Harris' framework, whereas in Chomsky's one it is an abstract structure often rather remote from the actual sentence that it underlies. The importance given to the notion of transformation in the early phase of GG had the effect that Chomsky's theory was initially known as transformational grammar rather than as generative grammar (actually, the use of the latter label was rather unsystematic at that time). (Graffi 2006: 188-9)

[1] Actually, "Affix Hopping" is called "Auxiliary Transformation" in Chomsky 1957. It is formulated as follows (Chomsky 1957: 56):


(ii) Let *Af* stand for any of the affixes *past*, *S*, *Ø*, *en*, *ing*. Let *v* stand for any *M* or *V*, or *have* or *be* (i.e., for any non-affix in the phrase *Verb*). Then:

$$Af + v \rightarrow v + Af\#,$$

where # is interpreted as word boundary.[5]

- *Order of transformations*

  Another essential property of the early formulation of transformational grammars concerned the ordering of rules. For example, given (3–4) as the underlying phrase marker for the passive construction (5), if the transformation that determines the content of C applies before the passive transformation, then the deviant (10) results.

  (10) *The books is taken by the man.

  However, if the passive transformation applies first, then C is mapped onto Ø (representing the morpheme for third person singular[2] and present tense) and the legitimate (5) is derived. Therefore early transformational grammars included statements about the necessary ordering of transformations. (Freidin 2013: 449)

- *Typology of transformations*

  The early formulation of transformational grammar involved two distinct types of transformations. Those involved in the derivation of simple sentences like (2) and (5) applied to a single phrase marker, the singulary transformations. The derivation of complex and compound sentences required another kind of transformation that operated on pairs of phrase markers to produce larger phrase markers, the generalized transformations. (Freidin 2013: 449)

  The other basic distinction is that between *obligatory* vs. *optional* transformations: obligatory transformations need always apply to obtain a grammatical sentence, optional transformations apply only in given cases. For example, "Affix Hopping" is an obligatory transformation (all sentences need their adequate verb form); "passive" is an optional transformation (not all senetnces are passive).

- *Constraints on the working of transformations*

  (11) a. Your interest in him seemed to me rather strange.
  b. *Whom did your interest in seem to me rather strange?

  Chomsky notes that the deviance of (11b) cannot be attributed to the stranded preposition *in*, because it does not create deviance in other constructions, as illustrated in (12) *(LSLT* p. 437).

  (12) a. You lost interest in him (this year).
  b. Who did you lose interest in (this year)?

  So the deviant (11b) is not blocked under the minimal formulation of the transformation that relocates the *wh*-phrase *whom* to clause-initial position from its underlying position where it occurs as the object of the preposition *in*. (Freidin 2013: 450)

- *Particular grammars and general linguistic theory*

  From the outset, Chomsky's goals in proposing generative grammar transcend the development of new grammatical tools for syntactic analysis—i.e. phrase structure rules and transformations. *LSLT* identifies two interrelated general goals: the construction of both grammars for particular languages and a formalized general theory of linguistic structure. *SS* extends the second goal to include an exploration of 'the foundations of such a theory' (p. 5). It also announces a further goal that in light of the developments of the past two decades now stands as visionary. 'The ultimate outcome of these investigations should be a theory of linguistic structure in which the descriptive devices utilized in particular grammars are presented and studied abstractly, with no specific reference to particular languages' (p. 11). It took more than four decades of research to begin to understand how this goal might be realized within the Minimalist Program (see § 19.5). Thus the conceptual shift in focus from

[2] This is is clearly a misprint: instead of "singular", one must read "plural".

describing the internal structure of languages to constructing formal grammars and their underlying formal theory, which marks the advent of modern generative grammar, was the first step toward this goal. The second involved the psychological interpretation of grammars and also the theory of grammar as discussed in the first chapter of Chomsky (1965). (Freidin 2013: 452-3)

d) The "Standard Theory"

- *Reference work:* Chomsky: *Aspects of the Thoery of Syntax* (1965)
- *Changes in the model of grammar*

  In the decade 1955–1965, the model of grammar described in the previous section was modified by Chomsky himself and by some of his early associates, such as Charles J. Fillmore (b. 1929), Jerrold J. Katz (1932–2002), Edward S. Klima (b. 1931), Robert B. Lees (1922–1996), and Paul M. Postal (b. 1936). The result of such changes was the so-called (by Chomsky himself) standard theory, presented in Chomsky (1965). The overall structure of the standard model is the following one: PS-rules and lexical insertion rules generate the deep structure both of simple and of complex sentences. The application of transformational rules to deep structure produces surface structures. PS-rules, lexical rules, and transformations form the syntactic component of grammar; deep structures are interpreted by the semantic component, giving the semantic representation of sentences; and surface structures are interpreted by the phonological component, giving the phonetic representation. (Graffi 2006: 189)

- *"Mentalistic view of linguistics"; 'competence' vs. 'performance'*

  The fact that all normal children acquire essentially comparable grammars of great complexity with remarkable rapidity suggests that human beings are somehow specially designed to do this, with datahandling or 'hypothesis-formulating' ability of unknown character and complexity. (Chomsky 1959).

  Linguistic theory is mentalistic, since it is concerned with discovering a mental reality underlying actual behavior. (Chomsky 1965: 4)

  A linguistic theory is 'explanatorily adequate' if it "succeeds in selecting a descriptively adequate grammaron the basis of primary linguistic data" (Chomsky 1965: 25).

  We thus make a fundamental distinction between competence (the speaker-hearer's knowledge of his language) and performance (the actual use of language in concrete situations) . […] The distinction I am noting here is related to the *langue-parole* distinction of Saussure; but it is necessary to reject his concept of *langue* as merely a systematic inventory of items and to return rather to the Humboldtian conception of underlying competence as a system of generative processes. (Chomsky 1965: 4)

- *The "fundamental questions"*

  The interpretation of a generative grammar as a system of knowledge in the mind of a speaker raises four fundamental questions:

  (15) a. What is the system of knowledge?
  b. How is it acquired?
  c. How is it put to use?
  d. What are the physical mechanisms that serve as the basis for this system and its use? (Freidin 2013: 453-4)

- *"Poverty of the stimulus"*

  Chomsky's answer to the first question has always been relatively straightforward: a computational system and a lexicon. What has changed significantly over the past half century are the formulations of the two components […]. The second question can be interpreted in two ways: how is language

acquisition possible versus how is it actually accomplished step by step. The possibility question involves what has been called the logical problem of language acquisition. The problem arises from the fact that what speakers come to know about their language cannot all be explained solely on the basis of the linguistic data they have encountered. Part of this knowledge involves distinguishing deviant from grammatical utterances. For example, English speakers know that (11b) is deviant and not a novel utterance, a legitimate sentence of their language that they have not encountered before. English speakers can also make systematic judgements about relative deviance, where some constructions are judged to be more deviant than other deviant constructions. Consider for example (11b) compared to (16), which appears to be significantly worse.

(16) *Whom did your interest in him seem to rather strange?

In both cases, the linguistic data provided by the environment is not sufficient toexplain the linguistic knowledge attained, referred to as the *poverty of the stimulus*. (Freidin 2013: 454)

2) The impact of generative grammar: developments and alternatives

a) Issues of debate

The following tenets were especially the focus of discussion: (1) The mentalistic view of linguistics (cf. "The Standard Theory"), which was later called cognitive. (2) The assumption that linguistic theory has to deal with 'an ideal speaker–hearer,' within a 'homogeneous linguistic community': i.e., the social and communicative aspects of language do not influence its structure. (3) The notion of Universal Grammar (UG), resuscitated by Chomsky (1965) with explicit reference to the tradition of *grammaire générale* starting with Port-Royal. From the early 1970s, UG essentially came to mean what he had earlier dubbed the 'language acquisition device' (LAD; cf. "The Standard Theory"): it was assumed to be universal since it would be shared by all human beings. (4) The postulation of two different levels of representation (deep and surface structure). (Graffi 2006: 190)

b) Trends Stemming from Generative Grammar

- *Generative Semantics*

  Generative Semantics (GS) was worked out between the 1960s and 1970s by scholars such as George Lakoff (b. 1941), James D. McCawley (1938–1999), Paul M. Postal (b. 1936) and John R. Ross (b. 1938). It was sharply opposed to the Extended Standard Theory (EST) by Chomsky and some of his followers. Both approaches shared a realistic view of linguistics and a multilevel approach to syntax, but their way of implementing such ideas was totally different. In their first works, generative semanticists rejected some basic assumptions of the standard theory: according to them, (a) deep structure was a useless concept, and (b) linguistic description must be semantically based. This semantic basis was sought in the reduction of linguistic categories to logical and/or psychological categories: semantic representation should be made to coincide with natural logic. In later works, it was assumed that semantic representation also includes typical semantic and pragmatic categories, such as focus or presupposition. (Graffi 2006: 191)

- *Relational Grammar and Case Grammar*

  From the middle 1970s, two linguists formerly belonging to the GS group, David M. Perlmutter (b. 1938) and Paul M. Postal, developed a theory called Relational Grammar (RG). RG completely abandoned the notion of transformation as an operation on hierarchically and linearly ordered phrase markers. It also explicitly rejected any aim at being 'psychologically real.' RG takes grammatical relations as primitives and represents clause structure as an unordered set of constituents that bear grammatical relations to each other. Grammatical relations may change from one level ('stratum,' in RG terminology) to another. Strata are not connected by means of transformations, but of Relational Networks, which show which different grammatical relations the constituents bear at different levels.

Fillmore's Case Grammar was often associated to GS, but it is essentially independent from it, even if both approaches wholly replaced the standard notion of deep structure. In Fillmore's view, the 'basic structure' of the sentence consists of the verb and an array of case relationships (see Fillmore, 1968). By 'case,' Fillmore does not mean a morphological category, but an 'underlying syntactic–semantic relationship.' The elements of the basic sentence structure are unordered. (Graffi 2006: 191)

- *From EST to the Minimalist program*

  The syntactic theory worked out by Chomsky and his closest associates in the period from the late sixties until now had as its primary goal that of implementing the notion of Universal Grammar: the development of an adequate model of UG was seen as the proper goal of the cognitive view of language. This theory was called, during the 1970s, Extended Standard Theory (EST); in the 1980s, Principles and Parameters Theory (P&P) or 'Government-Binding Theory' (GB-Theory); from the early 1990s, the Minimalist Program (MP). (Graffi 2006: 191)

  EST's main concern was the definition of restrictions on the functioning and on the format of syntactic rules. The first, decisive, step in this direction was the system of conditions on transformations of Chomsky (1973). […] The great abstractness of all such conditions was assumed to be the proof that they could not possibly have been taught by adults or inductively discovered by the child. They were assumed to belong to Universal Grammar, namely the 'innate biological system' that is ''invariant about humans'' (Chomsky, 1975: 29). (Graffi 2006: 192)

c) Trends Alternative to Generative Grammar

- *Functionalist Schools*
- *Typological Linguistics*
- *Sociolinguistics*
- *Pragmatics*

3) Principles and parameters theory

- *Reference work:* Chomsky: *Lectures on Government and Binding* (1981).
- *Universal Grammar*

  Chomsky's solution to the logical problem of language acquisition is to posit an innate component of the computational system, which would therefore be universal across the species—designated as Universal Grammar (UG). UG accounts for whatever linguistic knowledge cannot be explained solely on the basis of experience. Thus generative grammar bears on the debate about nature versus nurture. Given that the linguistic systems humans acquire are unique to the species, this innate component constitutes a core part of the definition of human nature. (Freidin 2013: 454-5)

- *Principles and parameters*

  The innateness hypothesis, of course, contrasts with the actual cross-linguistic diversity. The Principles and Parameters approach was the first real effort made within the Chomskyan program to provide a systematic account of cross-linguistic differences. The universal features of language were dubbed principles, and the dimensions along which languages can vary, parameters. For example, the fact that a sentence in any language must have a subject would be a principle: but in some languages (e.g., Italian, Spanish, etc., as opposed to English, French, etc.) the subject may be 'null,' i.e., not phonetically realized. This option is called the 'null-subject-parameter': it has 'positive value' in Italian or Spanish, 'negative value' in English and French. Although principles are innate, the values of parameters are to be fixed on the basis of experience. 'Principles and Parameters' approach stimulated an amount of

research much larger than anything previously done within any other framework connected with generative grammar. In particular, the notion of parameter stimulated cross-linguistic investigation of several languages. (Graffi 2006: 192)

The system of principles in Chomsky (1981b) includes constraints on (i) predicate/argument structure (the θ-Criterion, see below)[3], (ii) the occurrence of NPs with phonetic content (the Case Filter, see below)[4] […]. In addition to the set of principles, UG also involves a set of parameters that account for cross-linguistic variation among languages. For example, some languages (e.g. Spanish and Italian) allow finite indicative clauses with covert pronominal subjects, whereas others (e.g. French, English, and German) do not; and further, some languages (e.g. French, Spanish, Italian, and German) allow yes/no interrogative construction where the finite main verb occurs clause-initially, whereas English does not. (Freidin 2013: 460)

- *E-language and I-language*

SS defines a language as a set of sentences 'each of finite length and constructed out of a finite set of elements' (p. 13). In Chomsky (1986) such characterizations are designated 'as instances of "externalized language" (E-language), in the sense that the construct is understood independently of the mind/brain' (p. 20). If E-language is the object of investigation, then 'grammar is a derivative notion; the linguist is free to select the grammar one way or another as long as it correctly identifies the E-language' (p. 20). In contrast, the cognitive interpretation focuses on the representation of language in the mind of the speaker, thus the steady state of the language faculty attained on exposure to primary language data. This involves UG and the generative grammar of the language derived from it. Chomsky calls this concept 'internalized language' (I-language). […] From this perspective the notion of a language as a set of sentences plays no role. Furthermore, the concept of I-language does not rely on a notion of 'an ideal speaker-listener, in a completely homogeneous speech-community, who knows its language perfectly and is unaffected by such grammatically irrelevant conditions as memory limitations, distractions, shifts of attention and interest, and errors (random or characteristic) in applying his knowledge of the language in actual performance' (Chomsky 1965: 3). (Freidin 2013: 455-6)

4) The Minimalist Program

- *"Economy of derivations and representations"*

In the past sixty years the landscape of generative grammar has undergone a radical transformation. The two grammatical mechanisms for creating linguistic structure have been reduced to one, eliminating phrase structure rules (Chomsky 1995a) and reducing transformations to their simplest formulation as single elementary operations (see Chomsky 1976, 1980). This reduction unifies phrase structure and transformational rules under the simplest combinatorial operation. As discussed below, this reduction has been facilitated by the development of a system of constraints on the operation and output of transformations, formulated as general principles of grammar (and thus part of a substantive proposal about the content of UG). Since the 1990s Chomsky and others have been concerned with refining and reducing these constraints from the perspective of economy conditions on derivations and representations (see Chomsky 1991), ultimately as principles of efficient computation. The goal of this work is to show how the computational system for human language, a central part of a biological language faculty, incorporates properties of economy, simplicity, and efficiency— thereby revealing the optimal nature of language design. (Freidin 2013: 456)

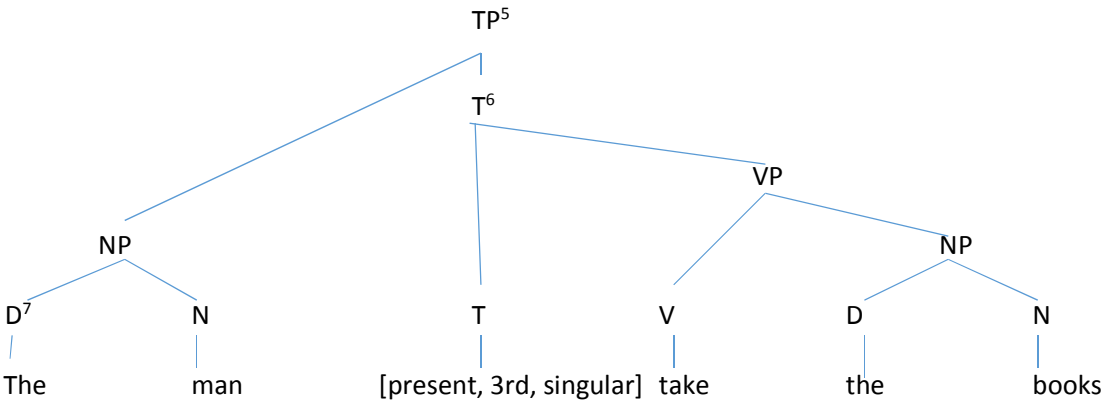
[3] *Θ-criterion*: Each argument bears one and only one *Θ*-role, and each *Θ*-role is assigned to one and only one argument. (Chomsky 1981: 36)

[4] *Case Filter:**NP if NP has phonetic content and has no Case. "Chomsky 1981: 49)

- *The operation "Merge"*

  The structural analysis is derived via the elementary operation Merge, which combines constituents (lexical items and/or constituents formed from lexical items) to form a new syntactic object with a syntactic label the matches the label of one of the constituents of the combination. Like generalized transformations of the earliest theory, this operation maps pairs of syntactic objects onto a single object. Thus *the* and *books* will be merged to form a syntactic object labelled N and that construct will be merged with *take* to form a phrase labelled V. The lexical item in a phrase that determines its label constitutes the head of the phrase. Assuming that every phrase is endocentric (i.e. has a unique head), the derivation of (2) under Merge yields (17) where T stands for tense and contains tense and agreement features that are ultimately attached to the verb *take.* […]

  (17)



  (Freidin 2013: 456-7)

- *"External" and "Interna"l Merge*

  Under Merge the derivation of the passive counterpart to (2) (i.e. (5)) involves the intermediate structure (18).

  (18) [$_{T}$ were [$_{VP}$ [$_{V}$ taken [$_{NP}$ the books]] [$_{PP}$ by [$_{NP}$ the man]]]]

  The NP *the books* is merged with the verb *taken* as its logical object because it is in this position that the NP is assigned its semantic function by the verb. The NP *the man* is merged as the object of the passive P *by*, in which position it is interpreted as the logical subject of the verb. To derive (2) from (18), the NP *the books* must be merged with the phrase (18) to create the TP (19).

  (19) [$_{TP}$ [NP the books] [$_{T}$ were [$_{VP}$ [$_{V}$ taken [$_{NP}$ the books]] [$_{PP}$ by [$_{NP}$ the man]]]]

  Chomsky distinguishes this application of Merge as 'internal Merge' (IM) as compared to 'external Merge' (EM), which applies in the derivation of (18). Like EM, IM joins two syntactic objects X and Y to form a new single syntactic object. In the case of IM a copy of X is contained in Y, whereas with EM X is not a part of Y. (Freidin 2013: 457-8)

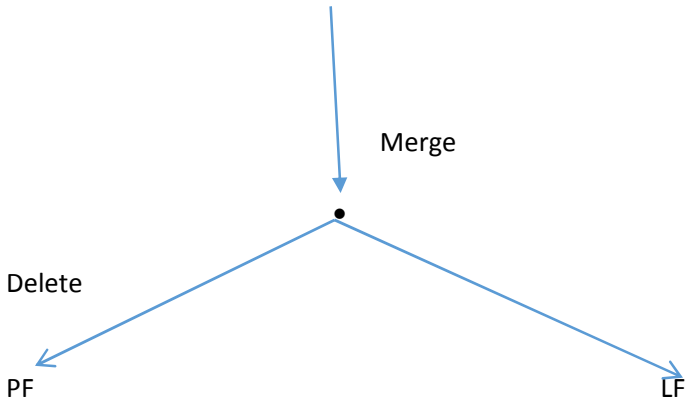
- *Interfaces*

  The copy of the NP *the books* in the verbal object position is relevant to interpretation, but not pronunciation (i.e. phonetic form) and therefore is deleted (via another elementary operation Delete) from the syntactic representation of phonetic form (PF) that interfaces with the sensory-motor components of the mind/brain. This leads to two distinct interface representations, PF and LF (which

[5] TP = Tense Phrase.
[6] T = Tense
[7] D = Determiner.

connects with the conceptual/intensional components of the mind/brain), yielding a derivational model (20) where a derivation bifurcates at some point, one part producing PF and the other LF.

(20)



This model captures the phenomenon of displacement, where a constituent is interpreted in a different syntactic position than the one in which it is pronounced, a phenomenon that may be unique to natural language. (Freidin 2013: 458)

- *Case Filter, θ-criterion and Full Interpretation: a result in terms of economy*

Merge generalizes to intra-clausal NP displacement, as illustrated in (21).

(21) a. The man was reported to have taken the books.
b. The man is likely to have taken the books.
(Freidin 2013: 459)

Free Merge can also misgenerate constructions like (26), where instead of merging non-referential *it* as the main clause subject, a NP with semantic content is merged instead.

(26) a. *The woman was reported that the man had taken the books.
b. *The woman was likely that the man had taken the books.

In (26), the NP *the woman* is not assigned a semantic function by any predicate and therefore violates the part of the θ-Criterion that prohibits NPs with semantic content that are assigned no semantic function by any predicate. Both the Case Filter and the θ-Criterion function as conditions on representations. (Freidin 2013: 461)

Comparing the legitimate constructions in (21) (where IM applies to the infinitival subordinate clause subject by creating a copy as the subject of the finite main clause) to the deviant constructions in (25) (where IM does not apply) demonstrates how Case motivates NP displacement—i.e. IM applies when it must. In contrast, consider (27) where unconstrained free Merge, as indicated in the analyses (27a.ii) and (27b.ii), produces another deviant result.

(27) a. i. *The man was reported (that) has taken the books.
ii. [$_{TP}$ [$_{NP}$ the man] was [$_{VP}$ reported [$_{CP}$ (that) [$_{TP}$ [$_{NP}$ the man] to have taken the books]]]]
b. i. *The man is likely (that) has taken the books.
ii. [$_{TP}$ [$_{NP}$ the man] is [$_{AP}$ likely [$_{CP}$ (that) [$_{TP}$ [$_{NP}$ the man] to have taken the books]]]]

In (27), because the NP the man is licensed for Case as the subject of the finite subordinate clause, displacement of the NP to subject position of the finite clause via IM is not motivated by the Case Filter. If the application of IM in (27) is not required by any other UG principle, then the deviance of (27a.i) and (27b.i) would follow from a basic economy-of-derivation assumption 'that operations are driven by necessity: they are "last resort," applied if they must be, not otherwise' (Chomsky 1993: 31). Thus

economy of derivations supports the minimal formulation of the grammatical operation Merge. (1995b: ch. 4). (Freidin 2013: 461-2)

- *Locality*

Another phenomenon that bears on the issue of minimal computation concerns the syntactic distance between pairs of adjacent copies created by IM, where shorter distances are preferred. Consider for example the following paradigm involving NP displacement in complex sentences.

(28) a. It seems that it has been reported that the student had taken the books.
b. It seems to have been reported that the student had taken the books.
c. It seems that the student has been reported to have taken the books.
d. The student seems to have been reported to have taken the books.
e. *The student seems that it has been reported to have taken the books.

In the derivation of (28a) IM does not apply. This construction involves two syntactic positions to which a semantic function is not assigned, i.e. the subject of *seem* in the main clause and the subject of the passive predicate *reported*. This is demonstrated in (28a), where both positions are filled with pleonastic non-referential *it*. Also both positions can take displaced arguments, as illustrated in (28c) and (28d), where the NP *the students*[8] is interpreted as the logical subject of the verb *taken*. (28b) shows that pleonastic elements can apparently also be affected by IM. However, displacement is blocked in (28e) where the distance between the subject of *taken* and the syntactic subject of *seems* crosses another subject position that does not contain a copy of the displaced NP. In contrast, the derivation of (28d) creates a chain of three copies of the NP *the students*[9] where each link, consisting of a pair of adjacent copies, conforms to the shortest distance criterion. Chomsky (1995b) formulates this constraint as the Minimal Link Condition (MLC), interpreted 'as requiring that at a given stage of a derivation, a longer link from α to K cannot be formed if there is a shorter legitimate link from α to K' (Chomsky 1995b: 295). (Freidin 2013: 462-3)

- *"Perfection" of human language and SMT*

Chomsky (1995b: 9) formulates the MP as a research program that addresses two interrelated questions.

(31) a. To what extent is the computational system for human language optimal?
b. To what extent is human language a 'perfect' system?

These questions are interrelated to the extent that an optimal computational system is a reasonable prerequisite for establishing the perfection of human language as a system. Answers to these questions require precise substantive interpretations of the adjectives optimal and perfect. As discussed above, the characterization of the computational system under the Principles and Parameters framework does appear to be optimal to the extent that it focuses on minimal computation in terms of the minimal formulation of grammatical mechanisms, the minimal function of these mechanisms in derivations, and the minimal nature of the representations they produce. These formulations also conform to basic notions of simplicity, economy, and efficiency of computation. (Freidin 2013: 464-5)

Ultimately the MP is an attempt to study the question of how well FL[10] is designed, a new question that arises within the Principles and Parameters framework. 'The substantive thesis is that language design may really be optimal in some respects, approaching a "perfect solution" to minimal design specifications.' These specifications concern the crucial requirement that linguistic representations are 'legible' to the cognitive systems that interface with FL, a requirement 'that must be satisfied for

[8] Misprint: read "the student".
[9] Idem.
[10] "Faculty of Language".

language to be usable at all' (Chomsky 2001: 1). Chomsky 2000b designates this as the strong minimalist thesis (SMT) and formulates it as (32).

(32) Language is an optimal solution to legibility conditions. (p. 96)

Thus the SMT narrows the focus of UG to interface conditions, which may result in a significant reduction and simplification of UG. Chomsky 2008 explains:

If SMT held fully, which no one expects, UG would be restricted to properties imposed by interface conditions. A primary task of the MP is to clarify the notions that enter into SMT and to determine how closely the ideal can be approached. Any departure from SMT—any postulation of descriptive technology that cannot be given a principled explanation—merits close examination, to see if it is reallyjustified. (p. 135)
(Freidin 2013: 465)

- *"Three factors in language design"*

From the perspective of the SMT there are three factors that affect the growth of language in the individual: data external to the individual (the contribution of experience), UG (the genetic endowment of the species), and principles that are not specific to FL. Chomsky (2004) subdivides UG into interface conditions ('the principled part') vs 'unexplained elements' (p. 106) and contrasts UG with general properties (the third factor, principles that are not specific to FL), the latter elaborated in Chomsky (2005) as falling into two subtypes:
(a) principles of data analysis that might be used in language acquisition and other domains; (b) principles of structural architecture and developmental constraints that enter into canalization, organic form, and action over a wide range, including principles of efficient computation, which would be expected to be of particular significance for computational systems such as language. It is the second of these subcategories that should be of particular significance in determining the nature of attainable languages. (p. 106)
(Freidin 2013: 465-6)

5) Summing up

[…] Chomsky:
a. constructed a formal theory of grammar (leading to the discovery of abstract underlying linguistic structure) and explored its foundations;
b. developed a cognitive/epistemological interpretation of the theory, leading to an understanding of human language as a component of mind/brain with substantial innate content, hence a part of human biology;
c. contributed a series of major proposals for constraints on grammars (ongoing from the beginning) that resulted in a significant reduction in and simplification of the formal grammatical machinery;
d. re-evaluated the theory of grammar in terms of questions about language design, raising the possibility of empirical proposals about the language faculty as a biological entity with properties of economy, simplicity, and efficient computation. (Freidin 2013: 467)