



## Form and Meaning: A Transformational Generative Approach to Syntax-Semantics Interface

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### ABSTRACT

The interrelation between syntactic and semantic properties of sentences has puzzled transformational generative syntacticians for decades. This paper approaches the issue from a transformational generative (TGG) point of view. It aims to show three approaches within TGG to syntax-semantics interface, and the problems each approach faces. The questions tackled here include: what is the general assumption concerning the relation between form and meaning that guides TGG in its dealing with the interface problem? How is this assumption realized in TGG's compartmentalization of grammar? What are the problems with each model of grammar when it comes to syntax-semantics interface? This paper hypothesizes that TGG assumes the syntactic component of language to be the sole generative component; hence it considers the semantic component to be merely interpretive; the paper also hypothesizes that the interrelation between structure and meaning has been a key factor in several reorganizations of grammar proposed by TGG. This paper adopts a descriptive method, although on some issues, including the problem of the logical form (LF), it brings in solutions proposed by semanticists from outside TGG. The paper concludes that even LF has been prone to several objections, as it is not quite



clear how syntactic properties are encoded in such a way as to be accessible to conceptual components of the mind.

## **1. Introduction**

A self-evident fact about sentences is that they are instances of merging of sounds with meaning; the nature of this unity and how it should be represented, however, have been the subject of serious debates among different approaches to the study of language. The question is how meaning as a conceptual construct is derived from a phonetically realized structure. Transformational generative grammar (henceforth TGG) has been seriously engaged in this issue, to the extent that it has been at the heart of all modification in the different models of grammar it has proposed in more than seventy years.

This paper, descriptive in its nature, presents a sketchy picture of a rather complicated issue such as the interrelation between form and meaning. To this end, the second section is devoted to how Chomsky in his *Syntactic Structures*, tackles the issue. The third section depicts the standard theory and its approach to the point of connection between syntactic and semantic components of language. Finally, in the fourth section the logical form as a syntactic level which interfaces with other cognitive systems is discussed.

This article tries to consider how the issue of the interface between syntactic and semantic components has been tackled in TGG, and how this issue has triggered several changes in TGG. The topic chosen for this article is too complex to be elucidated in full detail, so in many cases the issue has been discussed only in outline.

## **2. Syntactic Structures: Autonomous Grammar and the Question of Meaning**

Any attempt to study TGG should take into account Chomsky's monograph 'Syntactic Structures', published in 1957. This consideration, however, is not only due to chronological concerns, i.e. the fact that it is the first systematic effort in TGG. The main motivation behind such a consideration is that foundations for many issues discussed in later stages of the development of TGG were first laid in *Syntactic*



Structures, including different layers of structural representations of sentences, universalism, and the status of grammar in any linguistic theory.

Syntactic Structures, however, seems to be problematic as a starting point for the topic of this paper since one of the assumptions proposed therein is the characterization of grammar as a “self-contained study [of language] independent of semantics” (Chomsky, 2002, p. 106), that is, the two notions of grammatical well-formedness and semantic well-formedness should be distinguished. This paper claims that such doubts are not justified, as Chomsky does not categorically reject the plausibility of a connection between syntactic and semantic representations; what he argues in *Syntactic Structures* is the need for a comprehensive theory of language in which such connections are represented in formal ways. In this regard, Chomsky (2002, p. 104) states:

These correlations [between syntactic and semantic properties] could form part of the subject matter for a more general theory of language concerned with syntax and semantics and their points of connection.

Chomsky does not elaborate on the nature of this more comprehensive theory, although he asserts that a formal (i.e. syntactic) study of language can contribute to semantic analysis. Such a contribution can be stated in the following terms: to comprehend a sentence, different levels of its construction should be taken into account, including the structure underlying its kernel sentence and transformations applied to that underlying structure. Following Matthews (1981), a kernel sentence can be defined as a sentence “which is not derived from another” (p. 267). In more formal terms, a kernel sentence can be characterized as sentences in which “we apply [only] obligatory transformations” (Chomsky, 2002, p. 45). By way of example, (1), but not (2), below is a kernel sentence, since in the former only the obligatory transformation of affix-hopping, responsible for tense and number agreement, is applied, while in the latter the question transformation is also applied:

- (1) John goes to the party
- (2) Does John go to the party?



To understand (2), then, it is required to analyze the underlying structure of (1) and the history of transformations that have been applied to derive (2). Thus the interface between syntax and semantics in the Syntactic Structures model of grammar resides in the underlying structure of the kernel sentences and the way they are mapped into non-kernel ones through applying optional transformations. It should be remembered that in Syntactic Structures model optional transformations are semantically effective, i.e. they do not preserve meaning. As it will be shown in the next section, the notion of optional transformations is excluded from TGG, and the relation between transformations and semantic properties of sentences becomes a persistent issue.

### **3. The Standard Theory: Katz and Postal Hypothesis and the Division of Grammar**

The significance of the early 1960s for the development of TGG cannot be exaggerated. In 1963, Katz and Fodor's article "The Structure of a Semantic Theory" (hereafter SST) was published in which a sketch of formal characteristics of a semantic theory was proposed. It took Katz and Postal solely one year to expand the ideas proposed by Katz and Fodor into a general theory of how formal and semantic dimensions of linguist account could be integrated; the expanded version (known as K&P hypothesis) was published in 1964 under the title of "An Integrated Theory of Linguistic Descriptions" (henceforth ITLD). And finally, Chomsky's "Aspects of the Theory of Syntax" (henceforth ATS) was published in 1965, in which besides several revisions of the grammar proposed in Syntactic structures, the K&P hypothesis was also adopted.

A complete description of a natural language, according to SST, cannot be based solely on a grammatical (that is, phonological, morphological, and syntactic) specification of that language, however comprehensive the specification might be; such a description necessitates a semantic delineation as well (Katz & Fodor, 1963). The reason behind such an assertion is that the linguistic ability (competence) of native speakers cannot be reduced to their ability to produce syntactically well-formed sentences and recognize syntactic ill-formedness, but it should also embrace their ability to produce and understand semantically well-formed sentences and to

discern semantic deviancies. In Katz and Fodor’s words, “Semantics takes over the explanation of the speaker’s ability to produce and understand new sentences at the point where grammar leaves off.” (1963, pp. 172-173).

The question here is what remains unexplained by an autonomous syntax that must be taken up by semantics. To answer this question, consider (1), (2), and (3) below, where (1) is ambiguous based on two different meanings of ‘bill’, (2) is a normal sentence with a clear-cut interpretation, and (3) is an anomalous sentence semantically, though not syntactically, as audible properties cannot be attributed to paint. The point raised by Katz and Fodor, is that there is no syntactic rules such that they take these differences into account. It is worth noting that the basic constituent structure of the following strings, provided in (1~), (2~), and (3~), are the same.

(1) The bill is large.

(1~) [s [NP [Det The][N bill]][VP [v is][ADJP [Adj large]]]]

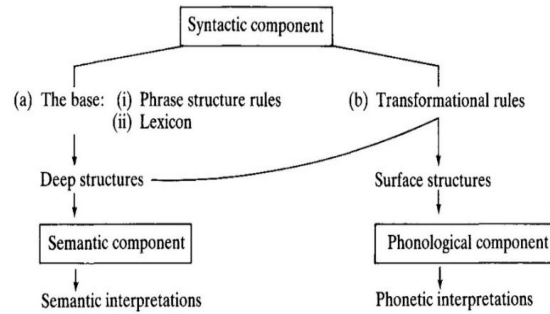
(2) The paint is yellow.

(2~) [s [NP [Det The][N paint]][VP [v is][ADJP [Adj yellow]]]]

(3) The paint is silent.

(3~) [s [NP [Det The][N paint]][VP [v is][ADJP [Adj silent]]]]

These considerations lead Katz and Postal to start ITLD with a division of grammar into three components, i.e. “syntactic, semantic, and phonological” (Katz and Postal, 1964, p. 1). The only generative component is the syntactic component, while the other two components are interpretative in nature. The organization of grammar proposed by ITLD and ATS, is shown in figure (1) below:



*Figure 1: The organization of grammar proposed by the standard theory (Cowper, 1992, p. 6)*

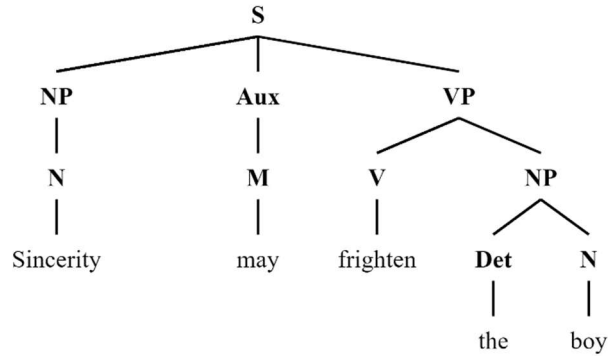
In figure (1) above, the syntactic component comprises the base and the transformational component. The former is divided into two parts: phrase structure rules (henceforth PSRs), and lexicon, where lexemes alongside their lexical properties are stored. The base is responsible for generating deep structures as its output. These underlying structures are, in turn, “mapped into surface structures by grammatical transformations” (Chomsky, 2006, p. 162). It is crucial to notice, in passing, that deep and surface structures are not actual sentences, but rather “abstract structures” (Chomsky, 2006, p. 162). In Lasnik words, transformations do not convert one sentence into another, but rather, “one abstract structure into another abstract structure” (Lasnik, 2000, p. 52). The output of the base is an input to the semantic component as well. The reason for such an assumption will be the topic of the next section; for now it is important to notice that the deep structure of (4) below is produced by PSRs in (5), while the resultant deep structure is represented in tree diagram provided in (6):

(4) Sincerity may frighten the boy.

- |                      |   |
|----------------------|---|
| (5)(i) S → NP Aux VP | (ii) M → may                            |
| VP → V NP            | N → sincerity                           |
| NP → Det N           | N → boy                                 |
| NP → N               | V → frighten (Chomsky, 2015, pp. 72-73) |
| Det → the            |   |

Aux → M

(6)



Now, (5) is an instance of phrase structure grammar (or PSG). In (5i) above, S stands for sentence, NP for noun phrase, Aux for auxiliary, VP for verb phrase, V for verb, N for noun, Det for determiner, and M for modal auxiliary. (5i) is a representation of PSRs where all elements, except for ‘the’, are non-terminal symbols that can appear on the left hand side of the PSRs. Terminal symbols cannot appear on the left side of PSRs (e.g. sincerity, may, frighten, the, and boy in (6)). The symbol ( $\rightarrow$ ) means “rewrite as”, so ‘VP  $\rightarrow$  V NP’ means ‘rewrite VP as V followed by NP’, it can also be interpreted as ‘VP immediately dominates V followed by NP’. Considering (5ii), it is a rather oversimplified representation of lexicon, since subcategorization facts of the verb is not included, i.e. the fact that frighten subcategorizes an NP as its object with selection feature of [ANIMATE].

A PSG like (5) and a tree diagram in the form of (6) illustrates a central grammatical relation referred to as ‘is a’ relation. In fact, the crucial function of PSRs is to show ‘is a’ relation, which consists in “relations between portions of the terminal string and nonterminal symbols” (Lasnik, 2000, p. 32). In other words, the notion of ‘is a’ relation shows which group of the lexical items in (6) form a constituent structure and which group do not. In (5), for example, ‘the boy’ *is an* NP, hence a constituent, but ‘frighten the’ *is not a* constituent. Such relations, according to ITLD and ATS, are represented at deep structure.

Grammar, then, is compartmentalized into three components, while sentences are conceived as being represented at two levels of deep and surface structure. The rules of the semantic component, which will be discussed in the subsequent section, are applied to deep structure, in which grammatical relations are represented.

### **3.1. Semantic Rules and Grammatical Relations**

Following Katz and Fodor (1963), ITLD considers the semantic component to be two units: one is a mental dictionary embracing all lexemes alongside their meanings; and the other is a set of projection rules. As for items in the dictionary, they must be in a normal form, that is, they must embrace all the data necessary for their interpretation. These items, nevertheless, should not be represented as they are in a normal dictionary, they must rather be represented in a formal way. To this end ITLD relies on the componential analysis of lexical items. In this regard, Katz and Postal (1964, p. 13) argue:

It [i.e. the normal form] must decompose the meaning of the lexical item into its most elementary components and state the semantic relation between them.

Componential analysis, also called lexical decomposition, consists in decomposing the sense of a lexical item into its “sense-components or semantic features” (John Lyons, 1977, p. 317). All these sense-components, which are supposed to be language independent, can be represented in terms of features; i.e. in a formula such as [ $\alpha$ F], where F stands for the common sense factor or feature such as [HUMAN] and  $\alpha$  represents its value, realized as [ $\emptyset$ /-]. To observe how componential analysis works, see (1) and (2) below which illustrate how two lexemes of *man* and *woman* can be analyzed in terms of their semantic features:

(1) Man = [HUMAN] & [MALE] & [ADULT]

(2) Woman = [HUMAN] & [-MALE] & [ADULT] (Lyons, 1990, p.110)

Now, the formal representation of a lexical entry is composed of a series of symbols which are “syntactic markers”, “semantic markers”, optional “distinguishers”, and





“selection restrictions” (Katz & Postal, 1964, p. 13). The syntactic marker or category of the lexical item must be there because its syntactic category could bear upon its interpretation in the semantic component, hence different interpretations, for instance, would be assigned to ‘perfect’ as an adjective and ‘perfect’ as a verb; semantic markers, on the other hand, are formal basic units (features) that are used by a semantic component to show the most general semantic features of the entry; distinguishers, by contrast, are about “idiosyncratic features” in the meaning of the lexical item in the lexicon (Katz & Postal, 1964, pp. 13-14).

A selection restriction determines which reading of a lexeme could combine with which reading of another lexeme within a sentence. The term ‘reading’ will be explicated presently, for now, it is sufficient to know that different readings of a lexical item is a consequence of it having different sense components. Regarding selection restriction, Katz and Postal (1964, p.15) state:

[It is] a formally expressed necessary and sufficient condition for that [particular] reading to combine with others. Thus the selection restriction attached to a reading determines the combinations with the readings of other lexical items into which that reading can enter.

All that has been discussed above concerning the markers included in the lexical entry can be presented in a tree diagram such as (3) below:

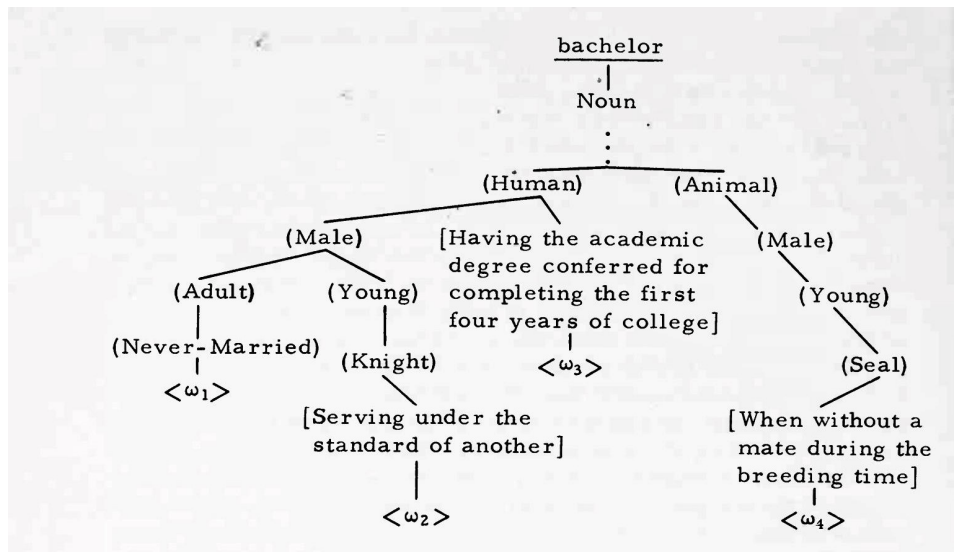


Figure 2: formal representation of the lexeme BACHELOR proposed by Katz and Postal (1964, p. 14)

The topmost element ‘bachelor’ is the lexical entry; ‘Noun’ represents its syntactic marker or category which can be subcategorized further into features such as (-/+common), (-/+abstract), and so on; the semantic markers are enclosed in parentheses, distinguishers in angles, and selection restrictions in brackets. Each completed route, or series of symbols, is a representation of one reading of the lexeme. ‘Bachelor’ has got four readings and is ambiguous in just the same number. The first reading of ‘bachelor’, represented as  $\langle \omega_1 \rangle$  is completed at the semantic marker (never-married). The third reading, symbolized as  $\langle \omega_3 \rangle$ , is completed at the selection restriction “[having the academic degree conferred for completing the first for years of college]” (Katz, Postal, 1964, p. 14).

An English native speaker is not only equipped with the semantic data in the dictionary which are represented in terms of feature analysis and markers. If a native speaker had only such data at his/her disposal, then he/she would not be able to account for semantic ambiguities resulting from the different readings assigned to lexical items in a sentence. Besides, he would be able to recognize paraphrases, or to observe the relation between semantic and grammatical properties. There must be some rules, then, that determine the interaction between readings of different lexical

items. These rules, finite in number, are called projection rules. Katz and Fodor (1963, p. 138) define projection rules in the following terms:

Rules which take account of semantic relations between morphemes and of the interaction between meaning and syntactic structure [...] the effect of the projection rules must be to select the appropriate sense of each lexical item in a sentence.

Syntactic structure contributes to interpretation in two ways: first, it specifies the category to which the lexical items in a sentence belong, so it is the syntax that determines that 'bread' in (3) below is used as a noun and not as a verb (i.e. in the sense of covering food with breadcrumbs prior to cooking); second, it accomplishes "constituent analysis of the sentence" (Katz & Postal, 1964, pp. 19-20). Again, it is syntax, rather than semantics, that specifies 'is a' relation represented in (4), i.e. the fact that 'the' and 'girl' are syntactically related, forming NP<sub>1</sub>, or that 'girl' and 'eat' do not form a constituent and are not related structurally, while 'eat' and 'bread' together make up a VP.

(3) The girl eats bread.

(4) [S [NP<sub>1</sub> [Det The][N girl]][PerDP [Aux[Tense[present]]][VP[v eat][NP<sub>2</sub> [N bread]]]]]

These formal facts about structural relations and constituent analysis of sentences are crucial for semantic interpretation proposed in ITLD, because the semantic component does not assign interpretations haphazardly to any combination of lexemes, but takes into consideration the constituent structure of sentences. Thus, the semantic component assigns interpretation to structures generated by the syntactic component. Katz and Postal (1964, p. 20) summarize the reliance of the semantic component on phrase structure and the structure dependency of meaning assignment in the following words:

Projection rules [...] produce derived readings by combining the readings of lower-order constituents [such as lexical constituents] to form readings for higher order constituents [namely phrases or sentences].



The operation of shaping a derived reading utilizing projections rules from a set of readings assigned to individual members of a syntactic constituent is called amalgamation. In (3), for example, from a series of readings assigned to ‘the’ and ‘girl’ in the dictionary, a composite derived reading for ‘The girl’ is amalgamated. Projection rules also rely on selection restrictions to amalgamate readings into a derived reading, since it is based on selection restriction that in an NP such as “a colorful ball”, colorful is interpreted in the sense of “having a lot of different colors” and not “interesting or amusing.” (Katz & Postal, 1964, pp. 21-22)

Now, one problem facing Katz and Postal is to decide on which level of representation the projections rules operate. There are three alternatives; first, projection rules operate on surface structure; second, they work on both surface and deep structures; third, they solely operate on deep structure. ITLD opts for the last option because grammatical relations such as “subject, object, and predicate are specified at deep structure” (Katz & Postal, 1964, p. 33). That being the case, transformations are, using the common terminology in the literature, “meaning preserving”, that is “no transformation has the effect of changing meaning” (Grinder and Elgin, 1973, p. 124). It should be noted that such an assumption is a departure from the grammar proposed in Syntactic Structure where optional transformations were regarded as semantically effective. The reason for such a fundamental shift resides in the fact that optional singularly transformations are abolished from grammar; to put it differently, all “singularly transformations” are now considered “obligatory” (Bent Jacobsen, 1977, p 91).

Katz and Postal’s argument concerning the grammatical relations is based on some empirical facts that there are a group of sentences with different surface structure whose underlying structure is alike or the same, such as active and passive constructions. Moreover, there are another class of sentences which have identical or similar surface structure, while their deep structure is very different. In (5) and (6) below, which are instances of the first group of sentences, ‘Mary’ and ‘the cake’ are the logical subject and logical object respectively in both sentences. These facts cannot be drawn from the surface structure of (6), as ‘the cake’ is the grammatical and logical object in (5) and grammatical, though not logical, subject of (6):

- (5) Mary ate the cake.  
(6) The cake was eaten by Mary.

The point that Katz and Postal are making here is simply this: there must be a level of representation in which these grammatical relations are maintained. Such a level of representation is referred to as the deep structure generated according to PSRs. It is worth mentioning that Chomsky (2015, p. 16), following ITLD, assumes that “no ambiguity is introduced by rules of the base.” The deep structure of (5) and (6) are represented as (7) and (8), respectively below, where grammatical relations are preserved:

- (7) [S [NP [N Mary]][PredP [Aux [Tense[Past]]][VP [V eat][NP [Det the][N cake]]]]]  
(8) [S [NP [N Mary]][PredP [Aux [Tense[Past]]][VP [V eat][NP [Det the][N cake]][ADVP by passive]]]]

Again, there are sentences that appear to be similar with reference to their surface structures, however when it comes to grammatical relations among its constituents, they show remarkable differences. See (9) and (10) and their active counterparts in (11) and (12) separately below, where the asterisk indicates ungrammaticality:

- (9) The prisoner was tortured by an old guard.  
(10) The prisoner was tortured by an old method.  
(11) An old guard tortured the prisoner.  
\*(12) An old method tortured the prisoner.

On the face of it, the underlying phrase markers (henceforth PM) of (9) and (10) might seem to be as shown in (13) and (14):

- (13) [S [NP [Det an] [ADJP [Adj old]][N guard]][PredP [Aux [c [Past]]][VP [V torture][NP [Det the][N prisoner]][ADVP [Adv by][Passive]]]]]  
\*(14) [S [NP [Det an] [ADJP [Adj old]][N method]][PredP [Aux [c [Past]]][VP [V torture][NP [Det the][N prisoner]][ADVP [Adv by][Passive]]]]]

The anomaly of (12), however, shows that (14) is a misrepresentation of (10). The problem is that in (14) difference in grammatical relations of ‘an old guard’ and ‘an old method’ to the verb ‘torture’ is not taken into account. According to Katz and Postal (1964, p. 35), a constituent like ‘an old guard’ in (9) is the deep subject, so it must be immediately dominated by S in the underlying structure; whereas ‘an old method’ in (10) is a modifier of the verb, therefore it must be dominated by VP in deep structure. So despite remarkable similarities in surface structure, the deep structure of (9) and (10) should be represented as (15) and (16) below:

(15) [S [NP [Det an] [ADJP [Adj old]][N guard]][PredP [Aux [Tense [Past]]][VP [V torture][NP [Det the][N prisoner]][ADVP [Adv by][Passive]]]]

(16) [S [NP [N someone]][PredP [Aux [Tense [Past]]][VP [V torture][NP [Det the][N prisoner]][ADVP [Adv by][NP [Det an][ADJP [Adj old]][N method]]][ADVP [adv by][Passive]]]]

According to ITLD, then, grammatical relations and functions cannot be specified at the surface structure level, so it cannot be the level at which the projection rules of the semantic component operate. Hence another level of representation must be assumed where grammatical relations, which are crucial for semantic interpretations, are preserved. The syntax-semantics interface, then, lies not in the surface structure or derived phrase markers, but in the underlying structure, where such relations are maintained and projection rules can be applied to the structures generated by the syntax component.

### 3.3. The Issues with Katz and Postal Hypothesis

Katz & Postal’s hypothesis concerning the meaning preserving nature of transformations soon faced multiple challenges, the most important of which concerned its key assumption that projection rules operate on the underlying phrase markers, or to put it differently, transformations do not result in a change of meaning. The issue with K&P hypothesis stems from its identification of the semantic properties of a sentence with its grammatical relations specified in deep structure. Several examples, however, show that it is an oversimplification of a rather complicated issue. To illustrate the problem, see (1) and (2) below, discussed by Chomsky:

(1) Beavers build dams.

(2) Dams are built by beavers.” (Chomsky, 1977; p. 28)

Both (1) and (2) are general statements about a certain relation between ‘beavers’ and ‘dams’ which is represented by the predicate ‘build.’ The two sentences above then involve an implicit universal quantifier such as all, every, everyone. To express them in logical form, suppose that  $x$  = beavers and  $y$  = dams; the logical form of (1) and (2), then, will be as (3) and (4) below:

(3) For all  $x$ , such that  $x$  is a beaver,  $x$  builds a dam.

(4) For all  $y$ , such that  $y$  is a dam,  $y$  is built by  $x$ .

In the ITLD model of syntax-semantic interface, (1) and (2) should be paraphrased, so if (1) is true, then (2) must necessarily be true. Taking into account the universal quantifiers, though, this is not the case: (1) contains a proposition about beavers, i.e. beavers taken universally have the capability to construct dams; whereas (2) contains a proposition about dams, that is, dams taken universally are constructed by beavers (Chomsky, 1977, p. 29). According to Chomsky (1977), sentence (1) is true while (2) is not, because all beavers are such that they have the natural capacity to build dams, while it is not true that all dams are constructed by beavers, since many dams are actually built by men.

Studies in the late 1960s and early 1970s show that the problem with such instances is related to the scope of logical predicates, which are a group of words generally called quantifiers such as some, many, all, etc., and the predicate of negation (or simply ‘not’). Before going in detail through this assumption, see (5) and (6) below:

(5) Many students do not reject the current proposal.

(6) The current proposal is not rejected by many students.

Sentences such as (5) and (6) are counterexamples of K&P hypothesis, and the fact that they are not paraphrases can be proved by (7) and (8) below, where the same clause is conjoined to both (5) and (6):

(7) Many students do not reject the current proposal, but many students do reject it.

\*(8) The current proposal is not rejected by many students, but many students do reject it.

The addition of ‘but many students do reject it’ to (5) results in the semantically well-formed sentence (7); the addition of the same clause to (6), however, produces (8) which is semantically anomalous, since it is an example of contradiction, that is, if the first clause is true then the second one is false. What accounts for the difference of meaning between (5) and (6) is that the application of the transformation “would cause two logical predicates to cross,” that is, the linear order is reversed as a result of the transformation (Grinder and Elgin, 1973, p. 152). The change in the linear order changes the scope relation between the two logical predicates ‘many’ and ‘not’ in (5) and (6). In (5), the logical predicate ‘not’ is included within the scope of ‘many’; while in (6) the reverse is true (Grinder and Elgin, 1973, p. 153). The conclusion to be made here is this: in transformations (such as PASSIVE-transformation) in which permutation takes place, if logical predicates are not involved, then K&P hypothesis about the meaning preserving nature of transformations holds; however, if such predicates are involved, then it fails to account for the semantic difference between sentences such as (5) and (6), hence its general assumption about the syntax-semantics interface as residing only in the deep structure faces problems.

Assigning interpretation “to pronominal forms” could equally be problematic for ITLD and the standard theory (Horrocks, 2013). To see the complexity involved, consider (9) and (10) below:

(9) Hamlet hates his uncle.

(10) His uncle is hated by Hamlet.

There is no syntactic rule in the standard theory proposed in ATS that prevents applying PASSIVE-transformation to (9) to generate (10). Yet, contrary to K&P hypothesis, (10) is not a paraphrase of (9). In (9), the determiner ‘his’ could be correferential with Hamlet, or it could refer to someone else’s uncle other than Hamlet’s. In (10), by contrast, the determiner ‘his’ cannot be correferential with Hamlet at all, so only the second reading assigned to ‘his’ in (9) can be allotted to it in (10).





Yet another issue with K&P hypothesis concerns problem of focus and presupposition. Before looking into Chomsky's arguments, a brief discussion of the very notion of 'focus' seems prerequisite; to this end, consider (11) below and its underlying PM (12):

(11) The car did not hit the man.

(12) [S [NEG [Not]][Nucleus [NP [Det the][N car]][PredP [Aux [Past]][VP [V hit][NP [Det the][N man]]]]]]]

The underlying PM (12) above shows an interpretation of (11) in which the negative particle 'not' has scope over the whole nucleus clause. Following Jacobsen (1977, p. 175), it can be asserted that in this interpretation of (11) the negative particle 'not' is strongly stressed. Such a reading can be paraphrased as: 'It is not the case that the car hit the man.' Sentences such as (11), though, can be uttered with what Chomsky (1975, p. 100) calls different "intonation center", including 'the car' and 'the man'; in such cases (11) is rather paraphrased as (13) and (14) below:

(13) It was not the CAR that hit the man.

(14) It was not the MAN that the car hit.

Now, in (13) 'the CAR' and in (14) 'the MAN' are the foci of the respective sentences (where words written wholly in uppercase refer to intonation centers or strong stress following Chomsky's notation). The focus of a sentence can be defined as "a phrase containing the intonation center" and the presupposition as "an expression derived by replacing the focus by a variable [such as someone or something]" (Chomsky, 1975, p. 100). These differences in focus, nevertheless, lead to variation in the semantic interpretation; and if, according to Katz and Postal, all information needed for semantic interpretation of a sentence resides in the underlying PM, then variations between (13) and (14) should be represented in their underlying structures, a suggestion played down by Chomsky because these differences are due to shifts in intonation centers in surface structure.

To elaborate on focus and presupposition, as intended by Chomsky, see (15) and (16) and their presupposition in (17) and (18) respectively below:

- (15) Did John give the book to BILL?
- (16) Did John give Bill the BOOK? (Chomsky, 1975; p. 96)
- (17) John gave the book to x. (where x is someone)
- (18) John gave Bill y. (where y is something)

The intonation centers in (15) and (16) are 'BILL' and 'BOOK' respectively, so 'BILL' and 'the BOOK' are foci of the respective sentences. Sentence (15) presupposes that the book is given to someone, whereas (16) presupposes that something is given to Bill. Chomsky (1975, p. 101) finds these cases as “strong counter-evidence” to the basic assumption of the standard theory concerning the syntax-semantics interface, which assumes that semantic interpretation must be completely specified in deep structure.

Given the cases discussed in this section, it can be argued that surface structure plays a part in specifying semantic interpretations assigned to sentences, at least in cases where the issue of scope and focus is involved. These considerations led to several proposals in the 1970s, and ultimately brought about a radical reshuffle of the whole grammar in which new levels of representation were introduced, including logical form (henceforth LF), an interface between syntax and semantics.

#### **4. Logical Form**

Logical form or LF was incorporated systematically into TGG in the Pisa Lectures delivered by Chomsky in 1979; the lectures were later published in a book entitled “Lectures on Government and Binding” in 1981. LF is one of the four levels of representation: D-structure, S-structure, and LF, and phonetic form (PF). Two points, though, should be stressed from the start; first, D-structure should not be confused with deep structure in the sense that was assumed in ATS, as D-structure, in contrast with deep structure, is not the level at which semantic properties are specified; second, S-structure, which again should not be confused with surface structure, is not a phonetically realized structure, it contains several abstract elements such as traces (t) and empty elements; so, S-structure serves as the underlying structure for LF. Following May (1993, p. 2), LF can be defined as:

That level of representation which interfaces the theories of linguistic form [grammar] and interpretation [semantics]. On this view, it represents whatever properties of syntactic form are relevant to semantic interpretation—those aspects of semantic structure that are expressed syntactically.

Chomsky (1986, p. 157) defines LF as “interface between formal [syntactic] structure and other components of mind/brain” that have interaction with the faculty of language. Regarding representation at LF, one area of meaning that has been discussed widely in the literature is the structure of quantifiers. To start right away with an example, consider (1):

(1) Everybody loves somebody. (Hornstein, 1987, p. 20)

In (1), there are two quantifiers, a universal quantifier (i.e. everybody symbolized in formal logic as  $\forall$ ) and an existential quantifier (i.e. somebody, symbolized as  $\exists$ ). (1) is ambiguous in two ways which informally can be stated in the following way: under one interpretation (1) means there is one particular person who is loved by everybody; and under the second interpretation, (1) can mean for each particular person there is one particular person to love, so the number of the lovers is equal to the number of the persons who are loved. More formally, the ambiguity of (1) stems from the difference in the scope of the quantifiers; in the first interpretation, ‘everybody’ gets a wider scope than ‘somebody’, while in the second interpretation, the reverse is the case. Now, this difference in the scope of quantifiers can be accounted for in terms of quantifier raising (hereafter QR), a movement taking place at LF that moves the quantifiers. The movement is represented as (2) below, where (2ii) is an abstract representation of QR at LF; applying (2) to the two interpretations of (1), the result will be as shown in (3) and (4):

(2)(i) “[<sub>S</sub>[<sub>S</sub> ... Qx...]]

(ii) [<sub>S</sub>[<sub>S</sub> Qx[<sub>S</sub> ... x...]]]

(3) [<sub>CP</sub>[<sub>IP</sub> everybody<sub>x</sub> [<sub>IP</sub> somebody<sub>y</sub> [<sub>IP</sub> x loves y]]]]

(4) [<sub>CP</sub>[<sub>IP</sub> somebody<sub>y</sub> [<sub>IP</sub> everybody<sub>x</sub> [<sub>IP</sub> x loves y]]]]” (Hornstein, 1987, p. 20)



Quantifiers in (3) and (4) are called operators. In (3) the universal quantifier is moved prior to the existential quantifier; in (4), the movement takes place in the opposite order. Thus in the former the universal quantifier enjoys scope over the existential quantifier, while in the latter the order of scope is in the opposite order. In this way, then, the ambiguity of (2) and its two interpretations are accounted for at LF. It is crucial to notice, however, QR and its effect cannot be detected at S-structure level, since (3) and (4) are representations of scope ambiguity at LF, for this reason QR is referred to as an covert movement, contrary to movements taking place between D-structure and S-structure which are overt movements.

Logical form has not been immune to criticism, particularly for the obscurity of its status between a syntactic level and a conceptual level. Jackendoff (1991, p. 48), for example, argues that Chomsky does not have a clear idea of the status of LF, while on the one hand it is regarded as a syntactic level interfacing with “other cognitive systems” (Chomsky, 1986, 68), and on the other hand it is considered to be purely syntactic component that is not able to encode semantic properties as such; again, Chomsky (1979; p. 145) use the term LF to “designate a level of linguistic representation incorporating all semantic properties that are strictly determined by syntactic rules.” Jackendoff (1991, p. 48), questioning the last assumption, insists that semantic properties cannot be “encoded in terms of syntactic terms- in terms of configurations of NPs and VPs”, hence logical form cannot be directly linked to other conceptual components of the mind.

The reason behind assuming LF is that the scope of quantifiers cannot be represented at S-structure, hence it cannot be interpreted by the conceptual or semantic component of mind. Despite several changes in the organization of the grammar proposed by TGG, it has hold to one position regarding to the status of the components, viz., the only generative component of grammar is the syntactic component, while semantic and phonological components are interpretive.

## **5. Conclusion**

Syntax-semantics interface, then, has been a central topic in TGG, for which several proposals have been put forward. One proposal is the negligence of meaning in the construction of a syntactic theory as is assumed in the first model of TGG in Syntactic



Structures. Another proposal is the notion of deep structure as the locus of semantic interpretation as hypothesized in ATS. The last suggestion is the idea of new level of representation called logical form, where issues related to quantifiers scope are determined

Taking deep structure as the sole level of semantic interpretation, though, soon faced several objections from TGG syntacticians, and several solutions were proposed to fill the gaps left unresolved in ITLD, including the assumption that surface structure should play a role in semantic interpretation, particularly in cases where scope and focus are involved.

In the government and binding framework, a new level called LF is introduced which is taken to be an interface between syntax and semantics. This level is supposed to include all syntactic information necessary for semantic interpretation. One crucial reason for introducing LF as a new syntactic level is that the scope of quantifiers cannot be determined at S-structure.

Various assumptions regarding the syntax-semantics interface in more than seventy years of TGG clearly show how challenging the interface's characterization and its formal representation is. The problem facing the specification of the status LF, as the latest assumption concerning Syntax-semantics, clearly shows that the issue is yet to be resolved.

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## شیوه و واتا: نیوانه پرووی رسته سازی و واتاسازی له روانگی گرامه ری به ره مهینانی گواستنه وه وه

### پوخته:

بۆ ماوهی چەندین دەیه په یوه ندیی نیوان تاییه تمه ندییبه سینتاکسی و واتاییه کانی رسته شاره زایانی ریبازی گرامه ری به ره مهینانی به خۆبه وه سه رقāl کردوه. پرسیاره که ئه وه یه هه تا چ ئاستیک تاییه تمه ندییبه سینتاکسیبه کان به شدارن له راقهی رسته کان، ههروه ها هه تا چ ئاستیک تاییه تمه ندییبه واتاییه کان کاریگه رییان له سه ر دیاریکردنی بونیادی رسته کان هه یه. ئه م په یه ره له روانگی گرامه ری گواستنه وه وه له و پرسه ده پروانیت. ئامانجی په یه ره که ئه وه یه سن ریچکه ی مامه له کردن له گه ل پرسی نیوانه پرووی سینتاکس و واتاسازی له گرامه ری گواستنه وه دا بخاته پروو، هاوکات کیشه کانی هه رکام له ریچکه کانیش ده رده خرین. ئه و پرسیارانه ی لیڤه دا هه ولی وه لامدانه وه یان ده دریت بریتین له: ئه و گریمانه گشتیبه له باره ی شیوه و مانادا چییه، که گرامه ری گواستنه وه له مامه له کردن له گه ل پرسی نیوانه پروو دا پشتی پیده به ستیت؟ ئه م گریمانه گشتیبه چ ره نگدانه وه یه کی له دابه شکاری نیوخۆیی گرامه ردا هه بووه؟ ئه و گریمانه یه چۆن به شیوازیکی زانستی له گرامه ری گواستنه وه دا به رجه سته بووه؟ کیشه کانی هه رکام له مۆدیله کانی گرامه ری گواستنه وه چین؟ گریمانه ی ئه م په یه ره ئه وه یه: گرامه ری گواستنه وه دا به شی رسته سازی گرامه ر به به شه به ره مهینه ره که داده نری و به شی واتاسازی ته نیا راقه کاری بونیاده سینتاکسیبه کانه؛ ههروه ها گریمانه ی ئه وه ش ده کری که پرسی

نيوانه پروو رۆلى كارىگهري هه بووه له هه موو ريكخستنه كانى گرامهري گواستنه وهدا. له م په پيه ره دا پشت به ميتۆدى شيكاري ده به سترىت، به لام له زور پرسی وهك پرسی شيوهى لۆژيكيديا چاره سه ره كانى شاره زايانى دهره وهى گرامهري گواستنه وهش ده هينرينته وه. پرسی نيوانه پرووى سينتاكس و واتاسازى له سى مؤديلى گرامهري گواستنه وهدا باسده كرپت، واته مؤديلى بونيه ده سينتاكيبه كان، مؤديلى تيورى ستاندارد و مؤديلى تيورى ستانداردى فراوانكراو. له دوابين مؤديلياندا فۆرمى لۆژيكي وهك ئه و ناسته ي رسته سازى داده نريت كه زانياريبه واتاييه كانى لپوه رده گيرپت. ئه م په پيه ره ده گاته ئه و ئه نجامه ي كه ته نانه ت فۆرمى لۆژيكيديا ره خنه ي رووبه پروو بووه ته وه، چونكه ديار نييه تاييه تمه نديى واتاييه كان چۆن له فۆرمى لۆژيكيديا داده پيژرين تاوه كوو به شه چه مكيبه كانى زهين بتوان شرؤفه ي بكن.

### **الشكل والمعنى: الواجهة النحو والدلالة من وجهة نظر النحو التوليدي التحويلي**

#### **الملخص:**

لقد حير الترابط بين الخصائص النحوية والدلالية للجمل علماء اللغة لعقود. تتناول هذا البحث المشكلة من وجهة نظر النحو التوليدي التحويلي. يهدف إلى إظهار ثلاثة مناهج داخل النهج التوليدي التحويلي للواجهة النحو والدلالة والمشاكل التي يواجهها كل نهج. تشمل الأسئلة التي يتم تناولها هنا: ما هو الافتراض العام فيما يتعلق بالعلاقة بين الشكل والمعنى الذي يوجه النحو التوليدي التحويلي في تعامله مع مشكلة الواجهة؟ كيف يتم تحقيق هذا الافتراض في تقسيم النحو التوليدي التحويلي للقواعد؟ وكيف يتم إضفاء الطابع الصوري عليها في نماذج مختلفة من القواعد التي اقترحها النحو التوليدي التحويلي؟ ما هي المشاكل مع كل نموذج من القواعد النحوية عندما يتعلق الأمر بالواجهة النحوية الدلالية؟ تفترض هذه الدراسة أن في النحو التوليدي التحويلي، المكون التوليدي الوحيد هو مكون النحو؛ ومن ثم فهي تعتبر أن المكون الدلالي مجرد تفسيرية؛ تفترض هذا البحث أيضاً أن العلاقة المتبادلة بين البنية والمعنى كانت عاملاً رئيسياً في العديد من عمليات إعادة تنظيم القواعد التي اقترحتها مدرسة التوليدي التحويلي. تتبنى هذا البحث طريقة وصفية وتحليلية. يستنتج هذا البحث أنه حتى الشكل المنطقي كانت عرضة للعديد من الاعتراضات، لأنه ليس من الواضح تماماً كيف يتم ترميز الخصائص الدلالية بطريقة يمكن الوصول إليها من قبل المكونات المفاهيمية للذهن.