Chapter 4

Pattern Matching Analysis in Relation to Semantic Description

4.0 Introductory Notes

This chapter is devoted to issues related to the **syntax-semantics interface**, which arise naturally postulation of abstract constructs like *S* and *O*, on the one hand, and *V*, on the other, which I have called (**pattern**) **glues** earlier. To justify them, of course, one needs to ask, What are glues? Where do they come from? Before starting to answer these question, let me make a few preliminary remarks.

4.0.1 Description of syntax distinguished from description of semantics

As with all scientific descriptions, the description of natural language syntax should consist of a restricted set of terms, or a vocabulary. In the prosed system, an adequate vocabulary comprises *S* (for subject), *O* (for object, direct and indirect), *V* (for main verb), *U* (for auxiliary), *P* (for preposition), to identify only a few. All of them are **surface-true generalizations of syntax**, and my prime concern is to provide a general framework for "cognitively realistic" description of syntax in term of these basic constructs.

Descriptions of semantics of natural language, on the other hand, should be based on a different vocabulary. Two vocabularies should be different if the kinds of objects being described are different. So, at least in principle, there may be no incompatibility between syntactic and semantic descriptions. This discourages all attempts at describing syntactic phenomena in semantic terms, on the one hand, and at describing semantic phenomena in terms of (surface-true) syntax, on the other.

It should be emphasized that no necessity is attributed to the priority of syntactic issues over semantic and phonological issues. I preferred issues in syntax over ones in semantics (and pragmatics) and in phonology (and phonetics) basically

because of personal preferences, not because of logical or factual order.

There is, however, an additional consideration. I find that description of syntax is simpler, and I have set priority on what is simpler. By this, I virtually claim that NL syntax is not so deep an object of inquiry as Chomskian linguists claim. The often-cited complexity of natural language seems to be misunderstood. Many Chomskian linguists claim that natural language is so complex that only an innate system called Universal Grammar can fully determine its details. Such claim looks like plausible only as far as we are ignorant of a theory of emergent systems and of chaos. Many emergent, self-organizational systems are so much complex, but the reason is not that there are large "programs" that determine what should happen when in the systems, but that massive interactions of simple units in them lead to the complexity. Self-organization in neural networks is one of the best examples of this.

To show the same emergent property is true of NL syntax is indeed one of the goals of this thesis. PMA suggests that syntactic structures are emergent structures that come out of the interaction of all words in them. Abstractly, syntactic structure is a "network", whose nodes denote words, and to which a maximally complex directed graph reduces. A maximally complex digraph is understood as a graph where all nodes in it have bidirectional connections to all other nodes. Thus, emergence of syntactic structure is nothing but an effect of the reduction of the connection complexity.

From this perspective, even if syntactic structures are tree structures, a generative grammar explains nothing essential unless it is explained how rules and principles of NL syntax emerge in the human mind/brain. Specification of production rules and principles that adequately describe resulting structures is insufficient. Description is not an explanation. It must be explained why such and such descriptions, rather than any other descriptions, hold.

Glues have an obvious bearing on **grammatical roles**, or **grammatical functions**. So, reductionist approaches to them are conceivable: glues come from semantic or pragmatic factors that define such roles or functions.

Having this possibility in mind, I rather claim that glues are irreducible to the conceptualities and/or functionalities in and of language, by noting that it is not sufficient that such sort of "interpretation" of glues is possible. It must be emphasized that even if *S*, *O*, and *V* allude to subject, object, and verb, respectively, it does not mean that the former are reducible to the latter, unless it is defined what the latter are.

I claim that glues constitute the most basic structuring of NL syntax, irrespective of under what labels they are identified, and they are irreducible to conceptual or discourse functional notions. I provide arguments to defend the controversial claim that such constructs are "primitives" of language syntax.[1]

My program is rather the reverse of some conceivable reductionist approaches, i.e., an attempt to define grammatical functions like subject, object and verb, which are considered to serve as primitives of NL syntax, by means of abstract functions characterized in terms of glues.

But it is certain that such "nonreductionist" positions as mine are sure to be challenged from two reductionist claims. First, some groups of generative linguists are sure to argue that such constructs are not primitives because they are reducible to **thematic roles** (or possibly **deep cases** in the sense of Fillmore 1966, 1968), which are usually encoded as **agent**, **patient**, **experiencer**, **theme**, **source**, **goal**, and are therefore reducible to **argument structure** in the sense of Grimshaw (1990), understood as a component of Universal Grammar. Second, other groups of linguists are sure to argue that such constructs are not primitives because they are reducible to more cognitively real constructs. For example, Langacker (1987, 1990*a*, *b*) claim that subject, object, verb, as grammatical functions, are "derivatives" of notionally based constructs like **trajector**, **landmark**, and their **relationship**.

PMA will subscribe to neither kind of reductionist view. In my view, both reductionist claims are victims of a specific view of data. They mistake **correlations** for **causalities**. My point is that if glues have some relation to constructs like agent, patient, and predicate, on the one hand, and constructs like trajector, landmark, and relation, on the other, yet it is one of correlation rather than one of causality. Based on this, I claim that it is impossible to "reduce" *S*, *O*, *V* to a cognitive system other than what is called syntax. Specifically, *S*, *O*, and *V* comprising subpatterns like ***Tom*** *V (O)*, *S V* ***Jerry***, and *S* ***likes*** *O*, are **partial descriptions of certain abstract but surface-true properties**, provided that surface formations are not meanings *per se* but "carriers" of them. In this respect, basic properties of NL syntax are irreducible as most "emergent" properties are.[2]

4.0.2 What are grammatical categories?

Syntactic description of a natural language should automatically follow from generalization of surface forms and formations. Such description involves identification of constructs, usually called **grammatical categories**, like **subject**, **auxiliary (verb)**, **(main) verb**, **preposition**, **(direct) object**, **indirect** or **oblique object**, to name only a few. Whether the list of such terms is finite or not, is universal or not, etc., all are empirical problems, and I will not question them in this thesis.

It indeed matters that independent justification is not provided for glues, even if syntax is described in terms of them.

It is possible, for the moment, to admit that they are **language universals** that cannot fail to emerge. It will never be claimed, though, that such constructs are part of Universal Grammar (UG), on the one hand, and that they are reducible to General Cognitive System (GCS), on the other. It is circular to appeal to UG, and forces one to abandon possible explanations. Similarly, it is gratuitous (and even irresponsible) to appeal to GCS, of which little is known. To date, reduction to GCG is replacement of one mystery by something more mysterious. It is a red herring to escape from the real problem.

As I will discuss later, pattern matching analysis is not be good at handling

issues related to semantics and pragmatics, simply because what it can deal with is **generalizations about surface-true syntax**. On the other hand, meaning is not surface-true. It is implicit in syntax. Indeed, there is the one-to-many relation between surface formations and their meanings, even if concern is concentrated on **interpretation in terms of semantic and/or thematic roles**. So, even rather superficial semantic roles such as **agent**, **patient**, **theme** are made implicit in our framework.

4.1 How Does Syntax Interface with Conceptual Semantics?

This section discusses some issues that arise when it is questioned how syntax is related to semantics.

4.1.1 Notion of external conditions on possible syntax distinguished from internal conditions for syntax

Pattern matching analysis (PMA) is a method specialized for syntactic description of language. For this reason it becomes questionable whether it can deal with semantic issues. Admittedly, pattern matching analysis, at least in my formulation of it, is not properly designed to provide detailed semantic analyses of linguistic phenomena.

By admitting this, I do not imply that PMA is incapable of semantic analysis. Rather, it is indeed capable of **type-based semantics**, simply because the entire framework crucially relies on the notion of **type matching** which is implicit in pattern composition. For purposes of discussion, this sort of semantics is called **internal semantics**. What pattern matching analysis is not good at, if not incapable of, is handling **semantics of conceptual sort**, which I call **external semantics**.

There are complications. External, conceptual sort of semantics is what most linguists call semantics, except a few groups of formal linguists. External semantics is concerned with **ordinary meaning**, not exclusively with truth conditions of sentences. Ordinary meaning includes conceptualizations, "construals", and even forces and effects in speech act, which is part of pragmatics. I would like to state plainly that PMA is not good at handling this sort of issues.

I am aware that many linguists would demand PMA to by providing descriptions of the phenomena of external semantics, thereby providing accounts for **external conditions on possible NL syntax**.[3] No effort will be made to extend PMA in such a way. My reason is that PMA is concerned with **internal conditions for NL syntax**, which has to be categorically distinguished from external conditions on possible NL syntax. More explicitly, I hold:

(1) A. It is internal conditions for NL syntax that define possible NL syntax.

B. The nature such internal conditions is distinct from, and perhaps disjoint to, external conditions on possible NL syntax.

Since PMA, at least in my formulation, is primarily concerned with internal conditions for NL syntax, and therefore should not be concerned with external conditions on NL syntax, I will provide no description of ordinary meaning, at least officially.

4.1.2 Illustrating representative problems in semantic description

Let us consider the following formation.

(2) *Bill married a star*.

To account for the syntax (and part of semantics) of (2), we posit abstract constructs in (3), which we call subpatterns.

(3) i. ***Bill*** *V (O)*
ii. *S* ***married*** *O*
iii. *S V* ***a star***

Subpatterns here are specialized for grammatical functions, thereby avoiding too much generality in [NP [V NP]]. Specifically, ***Bill*** *V (O)* is specialized for subject of some kinds of verbs, *S V* ***a star*** for object of some kinds of verbs.

Based on the "contextuated" units in (3), I give a pattern matching analysis to (2), as follows, in terms of C/D table.

(4)

0.	***Bill***	***married***	***a star***
1.	***Bill***	*V*	*(O)*
2.	*S*	***married***	*O*
3.	*S*	*V*	***a star***

Abstracting lexical matters aside, more schematicity should be countenanced. In fact, ***Bill*** *V (O)* and ***Bill*** *P (O)* (where *P* denotes a neutralized class of prepositions and particles) should be unified to yield ***Bill*** *R (O)*, where *R* denotes either *V* or *P*. Similarly, *S V* ***a star*** and *S P* ***a star*** should be unified to yield *S R* ***a star***. Moreover, *S* ***R*** *(O)* can be extended to include coordinating conjunctions such as *and*, *but*, and subordinating conjunctions such as *when*, *though* if *S* and *O* can be a matrix *M = S V (O)*.

In addition to the generality in classification, another kind of abstractness should be countenanced. It is in fact crucial to introduce more abstract units like the following, which serve as **syntactic schemas** or **templates** for ***Bill*** *V (O)*, *S* ***married*** *O*, and *S V* ***a star***, respectively.

(5) i. ***S*** *V (O)*
ii. *S* ***V*** *O*
iii. *S V* ***O***

More specifically, the pattern matching analysis of o = ***Bill married a star***, given in (4), can be more detailed so that we have (6) instead.

(6)	o.	***Bill***	***married***	***a star***		#o.	{*John*,*married*,	*a star*}
	1.	***S***	*V*	*(O)*	⇔	#1.	*Bill*	
	2.	*S*	***V***	*O*	⇔	#2.	*married*	
	3.	*S*	*V*	***O***	⇔	#3.		*a star*

Alignment in #1, #2 and #3 is for convenience.

The difference between the analyses in (4) and in (6) is not superficial, and indeed manifests conceptual issues of greatest importance.

4.1.3 Orthogonality in the syntax-semantics relation

In my interpretation, (6) illustrates crucially how syntax interacts with external semantics and phonology. Note that the relation of *Bill*, *married*, and *a star* in #1, #2 and #3 to *S V (O)*, *S V O*, and *S V* ***O*** in 1, 2 and 3 is one of **correspondence** or **association**, as indicated by ⇔, rather than of superposition which is relevant to the relation among subpatterns 1, 2, and 3. To make this explicit, *Bill*, *married*, and *a star* in subpatterns #1, #2, and #3 are not in boldface.

The specifications in #1, #2 and #3 are specifications of phonology and semantics without any grammatical roles associated to them. In short, the relation of syntax to semantics is rather orthogonal. The diagram in Figure 4.1 illustrates, in a schematic fashion, the relation of syntactic or "grammatical" units to phonological units and semological units (rather than mere semantic units).

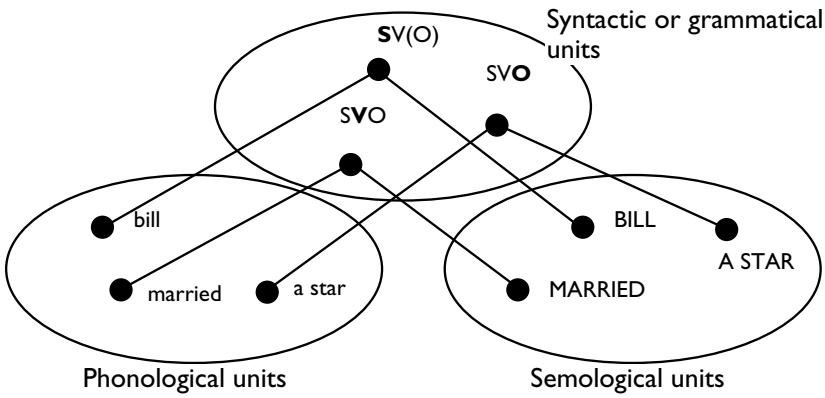

Figure 4.1

Assuming a popular notational convention, the phonology and semantics of *Bill*, for example, are denoted by 'john' and 'JOHN', noting that #1, #2, and #3 should have phonological and semantic components.[4]

One of the crucial points that Figure 4.1 embodies is that there is no direct mapping between phonology and semantics of linguistic expression. They are mediated by syntax. I note here that it is an understatement to say, like Langacker, that in language, semantic structures are symbolized by phonological structures, without independent syntax. In fact, he claims, because "[t]he central claim of cognitive grammar is that language is fully describable in terms of semantic structures, phonological structures, and symbolic links between the two", on the one hand, and "[o]nly symbolic structures need be posited for the characterization of lexicon, morphology, and syntax, which form a gradation that can be divided only arbitrarily into discrete components" (1990: 514).

Analogically, I find his claim is analogous to the claim that simple "perceptrons" without hidden units can learn language syntax, which is false. So, while Langacker's cognitive grammar provides an intriguing perspective on semantic analysis, we do not take it seriously for purposes of syntactic analysis. I hold that syntax is more than a set of symbolic links between units at phonological and semantics poles.

Now, return to the problem that we are faced with. If my assumption is correct, then it is implied by (6) that the following generalization is possible.

(7)				
	0.	***S***	***V***	***O***
	1.	***S***	*V*	*(O)*
	2.	*S*	***V***	*O*
	3.	*S*	*V*	***O***

Here, boldfaced symbols denote abstract units which may match lexical items with a greatest degree of arbitrariness.

A reasonable interpretation is that subpatterns ***S V (O)*** and ***S V O*** are parts of English syntax that encode the subject and object of *V*, respectively. They contrast with ***S P (O)*** and ***S P O*** that encode the subject and object of *P*, respectively. Neutralization of the two classes leads to ***S R (O)*** and ***S R O*** that encode the subject and object of relational $R = \{V, P\}$

Generalization of ***S V (O)*** and ***S V O*** to $\mathcal{N} = \{$***S V (O)***, ***S V O***$\}$ is not surface-true, and is of little significance for purposes of syntax, even if the class $\mathcal{N}$ corresponds to that of NP. In effect, an asymmetry is found between subjects and objects (or rather nonsubjects). For one thing, not all objects can surface as subjects while all subject seem to surface as objects.

4.2 Defense of the Irreducibility of Syntax

In this section, I will provide more detailed arguments against the reductionist claims mentioned earlier.

4.2.1 Problems in specifying "nonlexical" meanings

It is incorrect to suppose that abstract objects such as ***S V (O)***, ***S V O***, and ***S V O*** (and by composition ***S V O***, ***S V O***, ***S V O***, and ***S V O***) all lack semantics and phonology of their own. First, this clearly contradicts with my assumption made earlier. Simply put, a category denotes a set of disjunctive descriptions. With charitable misunderstandings of **underspecification** in the sense of Archangeli (1984, 1988) and related works mentioned in Bird (1995), I claim, though controversially, that even such abstract constructs have meanings of abstract sort, which is identified with what is recently called **constructional meanings**, no matter how difficult it is to specify them. Thus, I claim, with Goldberg (1995) for example, that meanings need not be lexical.

Of course, acceptance of constructional meaning does not account for everything; there are many problems that arise. One of them is the problem of identification. This point can be made obvious when questioning how a linguistic theory should deal with the "polysemy" of syntactic pattern ***S V O***, in the same way as the ***S V O (P) O*** is polysemous in the sense of Goldberg (*ibid*.). For illustration, I give a few examples below:

(8)	*S*	*V*	*O*		*X*	*Y*	*Z*
a.	*Bill*	*kicked*	*Fred*	⇔	AGT	ACT(ION)	PAT
b.	*Bill*	*kicked*	*the ball*	⇔	AGT	ACT	TH,PAT?
c.	*Bill*	*married*	*a star*	⇔	AGT?	ACT	PAT?
d.	*Bill*	*received*	*a mail*	⇔	AGT,GL?	ACT	TH?
e.	*the mail*	*included*	*a memo*	⇔	AGT,LOC	ACT??STAT?	TH?
f.	*Bill*	*read*	*the memo*	⇔	AGT,EX?	ACT	TH
g.	*the memo*	*resembled*	*a leaf*	⇔	AGT,TH?	ACT?STAT?	TH?&SRC?
h.	*the memo*	*told*	*a sad news*	⇔	AGT??	ACT??	TH??
i.	*the news*	*surprised*	*Bill.*	⇔	TH?	ACT?	EX?
j.	*Bill*	*had*	*a headache*	⇔	EX?	STAT?	TH?

Here and elsewhere, **agt** encodes 'agent', **act** encodes 'act(ion)', **pat** encodes 'patient', **th** encodes 'theme', **gl** encodes 'goal', **src** encodes 'source', **ex** encodes 'experiencer'.[5] For expository purposes, *S V O* is called a **syntactic template**, whereas *X Y Z* is called a **semantic template**.

I do not intend any truthfulness in the right-hand side contents of the correspondence table above. One of my points here is that semantic templates specify constructional meanings in the sense of Goldberg (1995).

It is clear that descriptions that pattern matching analysis provides fail to

specify semantic templates. This is obviously because what it provides are apparently superficial descriptions like the following, where constructs like **agent, patient** never appear.

(9) i. {{*S* ***kicked*** *O*}, {***Bill*** *V (O)*}, {*S V* ***Fred***, *S V* ***the ball***}}
ii. {{*S* ***married*** *O*}, {***Bill*** *V (O)*}, {*S V* ***a waitress***}}
iii. {{*S* ***received*** *O*}, {***Bill*** *V (O)*}, {*S V* ***a mail***}}
iv. {{*S* ***included*** *O*}, {***the mail*** *V (O)*}, {*S V* ***a memo***}}
v. {{*S* ***read*** *O*}, {***Bill*** *V (O)*}, {*S V* ***the memo***}}
vi. {{*S* ***resembled*** *O*}, {***the memo*** *V (O)*}, {*S V* ***a leaf***}}
vii. {{*S* ***told*** *O*}, {***the memo*** *V (O)*}, {*S V* ***a sad news***}}
viii. {{*S* ***surprised*** *O*}, {***the news*** *V (O)*}, {*S V* ***Bill***}}
ix. {{*S* ***had*** *O*}, {***Bill*** *V (O)*}, {*S V* ***a headache***}}

What this kind of generalizations miss among other things is specification of **semantic (or cognitive) roles**,[6] or **(deep) cases**, putting aside morphological cases, which are polysemous with respect to semantic roles. The reason is that semantic roles are not surface-true. They are implicit in uses of words and constructions.

Admittedly, this constitutes a limit of pattern matching analysis. But I would like to note that it is unreasonable to blame pattern matching analysis for this property.

4.2.2 How syntactic are templates related to semantic templates?

There is another more practical problem that arises. It is the question, "How are syntactic and semantic templates related to each other?" To see this, the semantics of (8)a, repeated here, is examined in some detail.

(8) a. *Bill kicked Fred*

In this formation, *Bill* obviously behaves as the subject of *kicked*, and *Fred* as the object. This assertion is the same as stating that *Bill* and *Fred* match the *S*- and *O*-glues in *S* ***kicked*** *O*, respectively.

Meanwhile, *Bill* and *Fred* are understood as **agent** and **patient** of the **act** of kicking. This is partly because *Bill* and *Fred* realize, by their syntactic positioning, the subject and object of *kicked*, and partly because of the lexical semantics of *kicked*. To make complicated issues clear, consider the correspondences of the sort specified below.

(10)

1.	***Bill***	*V*	*(O)*	⇔	%1.	AGENT	ACT(ION)	(THEME)
2.	*S*	***kicked***	*O*	⇔	%2.	KICKER	KICK	KICKEE
3.	*S*	*V*	***Fred***	⇔	%3.	AGENT	ACT(ION)	PATIENT

Patterns with number *n* and with %*n* are in relation of correspondence.

Making reference to (10), it is better to say that ***Bill*** *V (O)* and *S V* ***Fred***, with rather generic roles of AGENT (or TRAJECTOR) and THEME (or LANDMARK), bear the roles of KICKER and KICKEE after they are unified with *S* ***kicked*** *O* which hold such specific roles.

In passing, let me note that it is possible to modify specifications in (10):

(11)	1.	***Bill***	*V*	*(O)*	⇔	%1.	CAUSER	CAUSE	(CAUSEE)
	2.	*S*	***kicked***	*O*	⇔	%2.	KICKER	KICK	KICKEE
	3.	*S*	*V*	***Fred***	⇔	%3.	AGENT	ACT(ION)	PATIENT

In this, causativity is attributed to ***Bill*** *V (O)*. Consequences and implications of this revision are not clear.

Whether (10) or (11) is correct, the best conception of the issue under discussion is that there are two layers (call them *F* (for **form(ation)**, equated with surface-true syntax) and *M* (for semantic formation, equated with **meaning**) on which different kinds of constructs are defined. On *F* layer, such constructs as *S*, *V*, *O* are defined, but such objects as AGENT, ACT(ION), PATIENT (and their analogues) are not. This is because constructs on *M* layer are implicit by definition. On *M* layer, by contrast, constructs like AGENT, ACT(ION), PATIENT, on the one hand, and objects like KICKER, KICK, KICKEE, on the other, are defined, whereas *S*, *V*, *O* are not. Thus, even if *S* and *O* of *kicked* correspond to the notions AGENT and PATIENT, it is because of a set of correspondences between the two layers.

4.2.3 Remarks on correspondences

By admitting correspondences of the sort described above, I never suggest that the specifications at the left in terms of grammatical roles are reducible to those at the right in terms of conceptually based roles. The contrary is true. I will never take at face value such an ultra-conceptualist claim that grammatical roles are reducible to semantic/conceptual constructs. It is certain that grammatical roles would have a certain conceptual basis. This never implies that grammatical roles are reducible to conceptual one. But this kind of reductionism is what the recent **theory of complexity** clearly denies (Nicholis and Prigogine 1989; Prigogine and Stengers 1984). If such reductionism is possible, then emergence is impossible. In general, emergence is possible as long as two conflicting boundary conditions exist.

There is nothing inconsistent in claiming that constructs such as subject, verb, object, that are postulated to describe surface-true **syntax**, are semantically based. I, in fact, think that *S*, *V*, *O* are virtually **perceptual**, at least relative to meaning construction, thereby underlying and supporting conceptualization rather than being supported by conceptualization. This is another possibility of the syntax-semantics relation that most proponents of cognitive linguistics miss.[7] If conceptualization is formed independently of surface linguistic formation, and it is only hint-

ed at by surface formation, still it by no means follow that surface formation is reducible to conceptualization. Rather, it is not only possible but I argue it is the case that surface formation is itself formed independently of conceptualization. Causal relations are a special case of interrelations. Another case is one of correlation, which does not imply causal relations.

4.2.4 Remarks on the fuzziness of semantic roles

By the table of syntax-semantics correspondence in (8), I intended two things. First, specifications at the right and the left are of a different kind. While subject and object are polysemous relative to the conceptual semantics of verb, this fact has nothing to do with the apparent superficiality of the specifications at the left. More specifically, the relation of *SVO* pattern to semantic templates like **agt-act-pat** is one to many. Any more implication cannot be drawn.

Second, I have appealed to the table to suggest the worst possibility of limitless proliferation of semantic templates. Identification of thematic roles at the right are nothing but arbitrary, as suggested by marks ? and ??. In fact, I find it highly dubious that there can be a coherent procedure for identifying thematic and/or semantic roles for *S* and *O* in *SVO* without knowing the semantics of *V*, and for this reason I find it superficial to specify *S* and *O* of *S V O* in terms of thematic roles such as agent, patient. Not only do I find it very dull to try to specify exactly what roles arguments of a sentence bear by "labelling" this role as agent and that role as patient, but I also argue that it does not deserve serious effort. More specifically, I can hardly agree that descriptions of language in terms of agent, patient, etc. are semantic descriptions. They are too general, if not utterly useless. They are very likely to be arbitrary, unless vocabulary is severely limited.

What needs to be accounted for moreover is whether attested pairs exhaust all possibilities. It is clear that only a limited pairs are possible if the set of roles is {**agt**, **pat**, **th**, **src**, **gl**, **ex**, ...}. Differently put, why is it that pairs like **agt**-R-**agt**, **ex**-R-**ex**, **th**-R-**th**, **src**-R-**th**, are excluded? This suggests that there is an inventory of "scenarios", or "frames" in the sense of Fillmore (1982, 1985), within which participants described can receive specific roles.

By remarking on these problems, I by no means intend that it is impossible to determine semantic templates like **agt**-R-**pat**. I only try to ask whether adequate tools are provided for description of them. I take it for granted that a vocabulary more articulate and detailed than agent, patient, etc., is in need to make articulate semantic descriptions, since thematic roles are too general and too coarse to bear essential properties of conceptual semantics.

The same remains true even if, following Langacker (1987, 1991*a*, *b*), one tries to replace "subject" and "object" relative to "verb" by **trajector** and **landmark** relative to **relation**. They may be more general than subject, object, and verb, and can cover them; but by this fact, they cannot ontologically account for subject, object, and verb. I say this because more detailed specifications in *S*, *O*, *V* are what

really matters.

Prototype effects are observable in (8). For example, when (8)a = *Bill kicked Fred* and (8)b = *Bill kicked the ball* are compared, one can recognize with ease the fuzziness of the role that the object of *kick* bears. In (8)a, *Fred* is patient, but it is somewhat strange to identify *the ball* in (8)b as patient: it is not a human, not even an animate.

It is possible that **patient** is a special sort of **theme**; but, what really matters is in what sense patient is a special case of theme. With contrast with (10), the relevant effect is captured by the following encoding:

(12)	1.	***Bill***	*V*	*(O)*	⇔	#1.	AGENT	ACT(ION)	(?)
	2.	*S*	***kicked***	*O*	⇔	#2.	KICKER	KICK	KICKEE
	3.	*S*	*V*	***the ball***	⇔	#3.	?	ACT(ION)	THEME

The two expressions minimally contrast, as encoded, with specifications of *the ball* and *Fred* in (10) with regard to animacy.

Unification of apparently different semantic roles just examined fits the idea of underspecification; but there arises another problem when we compare (8)j = *Bill had an headache* with (8)a = *Bill kicked Fred*, on the one hand, and with (8)b = *Bill kicked the ball*, on the other. In this case, the fuzziness in the semantics of *Bill* seems to stem from a different basis. Note that it is strange to identify *Bill* in (8)j as agent. *Bill* here rather serves as experiencer. This suggests a continuum of roles that bridges agent to experiencer, perhaps a special case of location. But, Is it sufficient to simply say that agent is continuous to experiencer? I think not. Here too, what really matters is in what sense experiencer is a special of location, on the one hand, and why, for *x*-R-*y*, *x* and *y* co-vary only in a limited way, on the other.

To describe relevant effects, it is reasonable to appeal to the following encoding.

(13)	1.	***Bill***	*V*	*(O)*	⇔	#1.	AGT	ACT(ION)	(?)
	2.	*S*	***had***	*O*	⇔	#2.	OWNER	HAVE	OWNEE
	3.	*S*	*V*	***a headache***	⇔	#3.	?	ACT(ION)	THEME

Labels OWNER and OWNEE are chosen only for expository purposes.

Two different scenarios are conceivable, from which to choose one. In one scenario, the AGT role that *Bill* receives in #1 is so abstract that OWNER is a special case of it; hence, there is no incompatibility in unification of AGT and OWNER. This line of solution would be compatible with Langacker's proposal that AGT should be equated with "trajector". In another, an "ad hoc" mechanism of **specification overriding** is introduced, though it is incompatible with the very idea of underspecification. More specifically, by assuming that the "default" semantic specification for *S* in #1 and #3 is AGT, we allow it to be "overridden" by OWNER in #2 despite their incompatibility. Either solution cannot be free from problems, but I suggest

that the former solution is preferable, without specifying the exact role of *Bill* in ***Bill*** *V (O)*.

4.2.5 Section summary

In conclusion, I say that conceptual constructs like *X*, *Y* and *Z*, defined in (8), will provide more useful description if it is understood as:

(14)

Phon:	Bill	kicked	Fred	
	|	|	|	
Syn:	***S***	***V***	***O***	
	|	|	|	
Sem:	*X*	*Y*	*Z*	= θ(BILL) θ(KICKED) θ(FRED)

where | indicates correspondence; θ(x) is a thematic function that results in a thematic role like AGT, KICKER, AGT&KICKER, hybrid or not.

The diagram above claims an important thing:

(15) It is syntax (e.g., *S V O*) that "mediates" between phonology and semantics (or rather semology).

Put differently, syntax is where sound and meaning meet, and they do not meet nowhere else.

This has to do with the question, Where does syntax come from? I disagree with most generative linguists in that we are willing to deny the existence of a component to serve for generating templates such as *S V O*. The role is usually attributed to the base component, more particularly to the categorial component. I claim the base component is unnecessary because, as far as I can see, it is basically syntactic patterns of functional words that serve as templates for combinatorial syntax. Thus, I claim that English syntax can be reduced to vast **knowledge of words** described here and elsewhere as *S* ***laugh***, *S* ***meet*** *O*, *S* ***before*** *O*, where *S* and *O* are specialized for head words (e.g., *laugh*). This leads to one of the main claims of pattern matching analysis: Grammar in general is specifiable in terms of complex interaction among such apparently simple units. Complexity emerges out of simplexity.

As I have mentioned above, sound/meaning linkage is one-to-many. I believe it is not sufficient to account for syntax by admitting only such linkage, as Langacker (1997) suggests. Clearly, more conceptual elaborations are in need whether to accept or refute such a reductionist claim. But there is a practical problem, How to elaborate such a vague idea? For this end, I believe connectionist insights help us greatly.

4.3 A Connectionist Help

4.3.1 Summarizing core connectionist ideas

To illustrate basic characteristics of connectionist models, I rely on a concise description by Benjafield (1992: 38-40), who, based on Schneider (1987), describes briefly connectionist networks discussed by Jones and Hoskins (1987). To quote Benjafiled, "Jones and Hoskins (1987) have illustrated some aspects of the way connectionist networks operate by means of the story of Little Red Riding Hood. Little Red Riding Hood must learn how to respond appropriately to three different inputs: Grandma, the Woodcutter, and the Wolf. Each of these three characters can be described as having three features, or input units. Grandma is *kindly* [sic.] and *wrinkled* and has *big eyes*. The Woodcutter is *handsome* and *kindly* [sic.] and has *big ears*. The Wolf has *big ears*, *big eyes*, and *big teeth*. There are specific behaviors, or output units, that are appropriate to the three characters. Little Red Riding Hood should *approach*, *kiss on the cheek*, and *offer food to* Grandma; *approach*, *flirt with*, and *offer food to* the Woodcutter; and *scream*, *look for the Woodcutter*, and *ran away from* the Wolf." (p. 38)

Illustrated below is a diagram of a simple connectionist network (of a special kind called "perceptrons") to do this task.

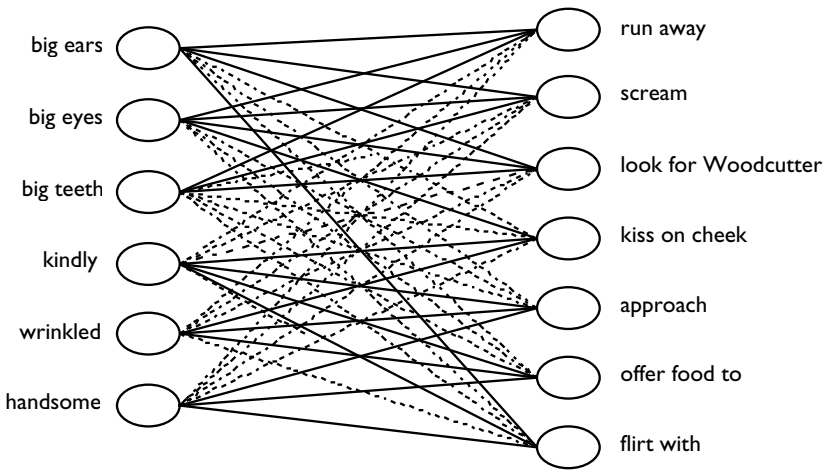

Figure 4.2[8]

"[This figure] shows", Benjafields explains, "a network of connections between these input and output units. These connections develop different strengths as a result of experience. Thus, after being exposed to the inputs a number of times, some connections become stronger (more positive). Other connections may become weaker, or even negative. A negative connection between two units would be *inhibitory*. That is, a negative connection would tend to prevent the output unit from being active if the input unit is active. This is represented in the figure by solid lines for positive connections, and dotted lines for negative connections. Figure [4.2] is a *trained network*, one that has emerged in Little Red Riding Hood

as a result of her experience. (p. 38)

I want to make a few remarks on Benjafield's description. First and foremost, connectionist models are not given no "instructions" of the from "if *X*, then do *Y*" to perform such and such things. All that connectionist networks are able to be "informed" is input/output pairs as positive evidence (no negative evidence is presented). In this regard, connectionist networks are systems that "learn" or rather "self-organize" by self-adjusting to external conditions specified by input/output pairs.

Also assumed is a familiar view of representation: Grandma, the Woodcutter, and the Wolf are represented as "bundles of features". There is, however, a more subtle assumption: there is a lower-level process that precedes all this. It is the process of "feature detection", where units (conceptually corresponding to "perceptive neurons" in our neural system) particularly and selectively respond to certain physical, objective properties that real objects such as Grandma, Woodcutter, and Wolf posses. This leads to feature-based encoding of perceived objects in that it results in an *n*-dimensional vector, where *n* indicates the number of features to be detected (which, for simplicity, are assumed to be orthogonal to each other). Relative to a base vector [has big ears. has big eyes. has big teeth. is kindly. is wrinkled. is handsome] of length 6, for example, Grandma, the Woodcutter, and the Wolf are encoded as vectors v_1 = [111000], v_2 = [010110], and v_3 = [100101], respectively. Under this assumption, thus, a connectionist neural network, simple or complex, can be seen as a operator on such vectors (mathematically, it is a $m \times n$ matrix of "weights" to operate on an *n*-dimensional vector). It takes patterns of basic features as inputs and returns patterns of features as outputs.

To complete the quote from Benjafield, "The model given in Figure [4.2] is too simple to handle very many situations. Often connectionist models make use of at least one other layer between input and output units. This layer contains *hidden units*. Thus, each character is not known directly, but is a unit that can be known only in terms of the features that make him or her up. This means that a character is a *hidden unit*, not directly observable. Figure [4.3] gives a connectionist network containing three hidden units, corresponding to the three characters with whom Little Red Riding Hood must deal. Once again, the solid lines are positive, and the dotted lines negative connections."

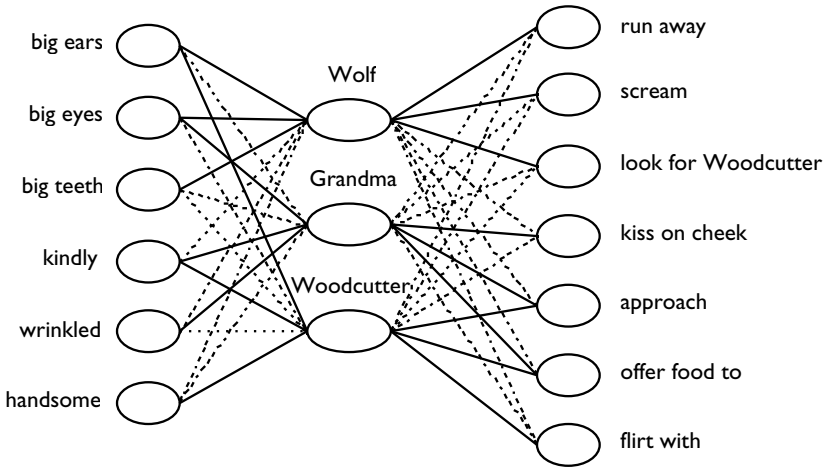

Figure 4.3

This figure is my reproduction, with slight modification, of Fig. 2-18 of Benjafield (1992: 39) which he cites from Jones and Hoskins (1987).

4.3.2 A proposal

I want to point out that the emergent structure depicted in Figure 4.3 suggests crucial things about the interface between sound structure and meaning structure. It is reasonable to imagine a structure, as diagrammed in Figure 4.4, where it is shown how glues interface structures of sound and meaning.

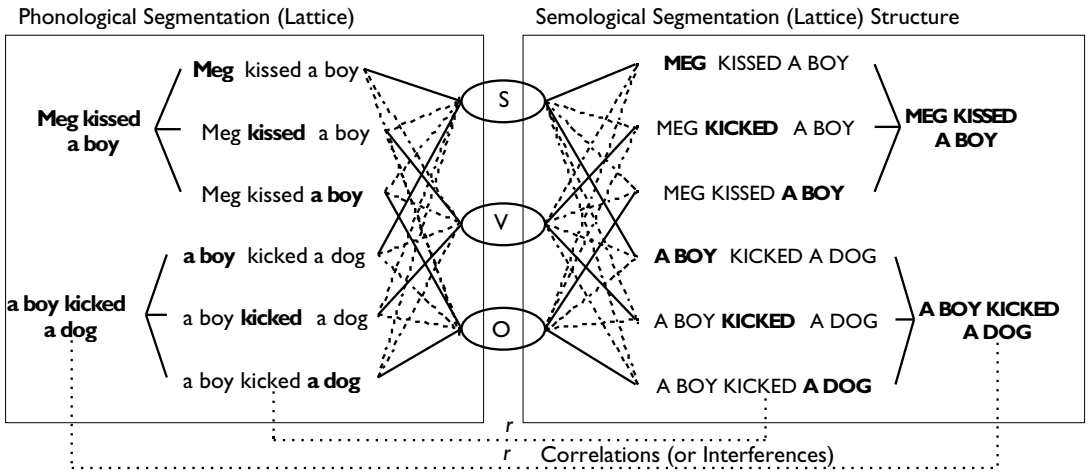

Figure 4.4

In this diagram, phonological segmentations (on the left) and semological segmentations (on the right) are interfaced by *S*, *V*, and *O*, for *Meg kissed a boy* and *A boy kicked a dog*.

One of the crucial implications is that surface-true syntax in terms of *S*, *V*, *O* is not a simple correspondence between semantic structure and phonological structure. A significant correlation is suggested between the positioning and meaning of

components. Note that positioning is more abstract a notion than phonological sequencing. In syntax and semantics, unlike in phonology, *Meg*, *kissed*, *a boy* (and *a* and *boy*), *kicked*, *a dog* (and *a* and *dog*) are units rather than composites.

Based on this, I claim that patterns like *S V O* are better understood as more or less "autonomous" units for "higher-level perception" to encode the conjunction of three precedence statements:

(16) i. *S* precedes *V* (and *O*),
ii. *V* postcedes *S* and precedes *O*, and
iii. *O* postcedes *V* (and *S*).

While exact roles for *S* and *O* are underspecified until reference to semantics of *V* is made, yet *S* and *O* should be identifiable independently of the content of *V*. More explicitly, a competent speaker of a language should posses a finite set of surface-true patterns such as *S **kiss** O*, *S **kick** O*, and *S **include** O*, *S **of** O*, *S **may** V*, *S **give** O_x O_y* for the sake of parsing. The question of what semantic roles *S* and *O* bear is an independent problem, and I find the problem is best characterized in terms of correspondence.

Further consideration will lead to the following structure, where the relation of syntax to phonology and semantics is indicated.

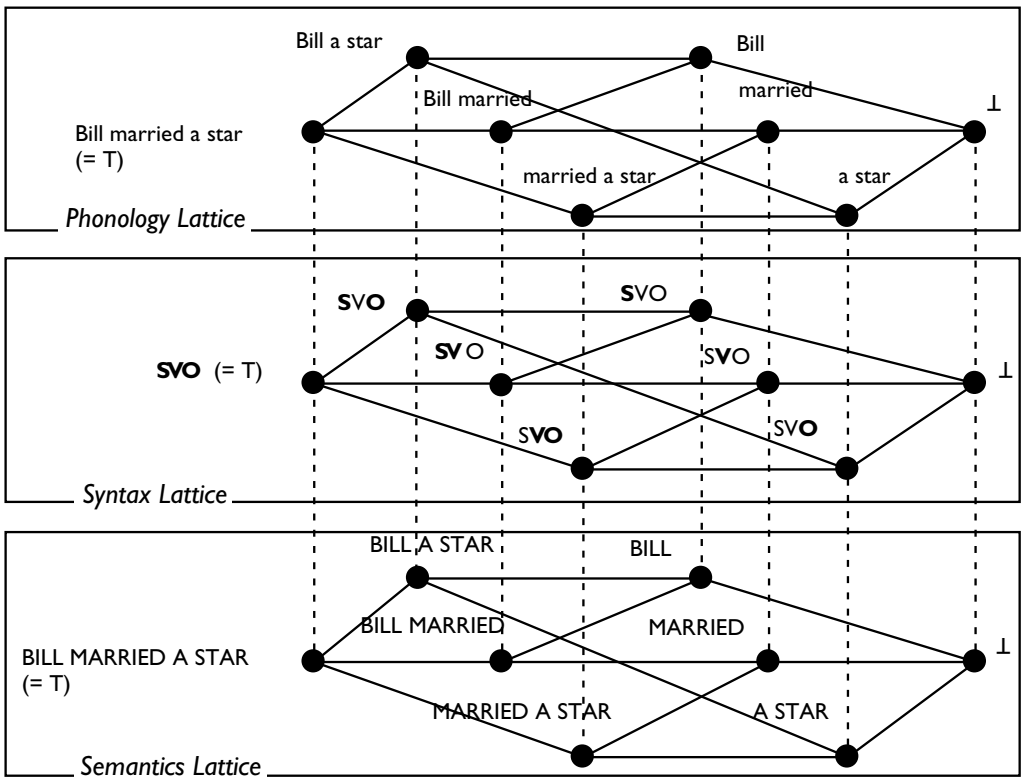

Figure 4.5

This claims that each of the phonology, syntax, and semantics of *Bill married a*

star forms a lattice, and that phonology and semantics lattices are mediated by syntax lattice. The role of glues is crucial.

4.4 Concluding Remarks

In this chapter, I have discussed in some detail the issue of how pattern matching analysis can be related to the external, conceptual sort of semantics (and phonology). My point was that even if patter matching analysis does not automatically provide semantic descriptions, it still provides insights into the interface of syntax with semantics, on the other, and presumably with phonology, on the other, though the latter kind was not discussed satisfactorily.

As noted in Chapter 1, and other places, pattern matching analysis is not a program that tries to "reduce" properties of syntax to properties of other aspect of cognition. I could state, thus, that syntax is an **emergent property**, and for this very reason it is impossible to reduce syntax to any combinations of those aspects of language that contribute to it. If the term "emergence of *X*" is understood in proper sense, it is clear that it by no means imply that "*X* comes from other places". Rather, *X* emerges from nowhere but there. I suggested in the last section this possibility, relating to some connectionist ideas.

Notes

1. In a sense, my claim here echoes the one made in 80's within the framework of **relational grammar** (Blake 1990; Perlmutter, *ed.* 1983; Perlmutter and Rosen, *eds.* 1984; Postal and Joseph, *eds.* 1990), though with different tone and emphasis.

2. There seems to be a serious misunderstanding of the term "emergence" among a group of linguists. They use this as a synonym of reducibility. I do not find it appropriate. Rather, emergent structures should mean structures irreducible to properties at lower levels, with equation of them with "dissipative" structures in the sense of Prigogine and this collaborators (Nicholis and Prigogine 1989; Prigogine and Stengers 1984). They are structures that emerge between two boundary conditions at lower and higher levels.

3. There are many linguists who favor the account of external conditions on NL syntax over the account of internal conditions for it. Still worse, some of them thereby try to dispense with internal conditions altogether.

4. I am not concerned with the problem of what JOHN, MARRIED, and A STAR specify, only alerting that they are presumably more than references.

5. It is a problem whether patient, for example, is a legitimate semantic role. While the terminology is very confused, Patient is not included in the list of thematic roles. Grimshaw (1990), for example, assumes a restricted set *R* {agent, experiencer, goal, source, location, theme} which consists only six roles. Argument structure (**agent**(**experiencer**(**goal/source/location**(**theme**)))) (1990: 8) is organized out of the set *R*.

Incidentally, according to Grimshaw (p. 28), the argument structure of transitive agentive (verb) such as *hit* is (**agent**[1](**theme**[2])), where indices like [1] and [2] indicate the syntactic positions and/or roles. Roughly, [1] encodes its being subject, and [2] object. Likewise, the one of

ditransitive (verb) is (**agent**[1] (**goal**[*i*] (**theme**[*j*]))), where 1< *i* < *j* (e.g., *X give Z Y*) or 1 < *j* < *i* (e.g., *X give Y to Z*). The one of unergative (verb) such as *stand* is (**agent**[1]). The one of unaccusative (verb) such as *melt* is ((**theme**)). The one of psychological state (verb) such as *fear* is (**experiencer**[1](**theme**[2])). The one of psychological causative (verb) such as *surprise* is (**experiencer**[2](**theme**[1])). The one of psychological agentive causative (verb) such as *frighten* is (**agent**[1](**experiencer**[2])).

6. As far as I can tell, "cognitive" case, coined by Masa-aki Yamanashi, seems the best term for our purposes.

7. As far as I can tell, no cognitive linguist but only Deane (1992) explicitly admits this possibility.

8. This figure is my reproduction, with slight modification, of Figure 2-17 of Benjafield (1992: 38), which he cites from Jones and Hoskins (1987).