On the Integration of Lexical Information into the P&P Model of Syntax

Ivan B. BROWN *

ABSTRACT

Principles and parameters theory （PPT）, as developed by Chomsky and other linguists, aims to explain and account for both the similarities and differences exhibited by the grammatical structures of the world's human languages. The principles are certain generic properties which grammars of all languages are thought to possess. The parameters are aspects of grammatical structures that have limited variability, and are fixed in one of a limited number of possible configurations. The lexicon, which is a list of words with their meanings, pronunciations and various properties, also has a significant role to play in this model. This paper outlines each of these components, and then examines them in depth to reveal the nature of some of the interactions. The rationale for the model and its major components are discussed, as well as the implications of the relevant modules and elements of the theory.

KEY WORDS:
principles, parameters, syntax, lexicon, generative, grammar.

1. Introduction: the Rationale for PPT

A fundamental assumption of universal grammar （UG） and principles and parameters theory is that all babies with normal mental faculties anywhere in the world are born with the universal principles "hardwired" in the language faculties of their minds. This accounts for the large number of common underlying patterns, which the grammars of all known languages have been found to have. The variations between different grammars are accounted for by the parameters. UG psycholinguists might argue that certain configurations in the newly born language faculty begin in moveable default positions, rather like electrical switches. As a baby grows up and experiences a particular language culture, these "switches" would become set in the necessary positions to build the grammar of that particular language. These variable configurations are the parameters. Chomsky （1981） referred to these principles and parameters collectively as the "computational component" of the human language faculty. PPT has undergone significant changes in its history, and this paper will focus chiefly on the 1980s versions, and attempt to show how issues regarding the role of lexical information were partly responsible for the later changes in the theory. First, some basic notions of PPT will be outlined.

2. Principles

To illustrate a principle, let us take the binding principles from binding theory. These three principles explain the distribution and use of reflexives, pronouns and referential expressions within a sentence, with respect to their antecedents. Principle A, for example, states that all reflexive anaphors, such as "myself" or "herself" must be bound to their antecedents. In other words, the anaphor must occur within the same domain as the pronoun or referring expression it refers to, in a particular configuration according to binding theory. In the English sentence （1）, *herself* is bound by and refers to *Clare*, which is within the domain, and not Susan, which is in the sentence, but outside the domain. PPT claims that such principles are true for all languages. In the

---

* Humane Studies and Social Studies Education

Spanish sentence（2）, *se* refers to *Pedro* and not to *Miguel*.

   1）Susan said that Clare treated herself.

   2）Miguel dijo que Pedro se   había   hecho   daño.
       Miguel said that Pedro himself had   done   damage
       Miguel said that Pedro had hurt himself.

3. Parameters

The concept of the parameter in PPT may be illustrated by the considerable enquiry and debate that has taken place concerning "pro-drop" languages, or in other words, the pro-drop parameter. Pro-drop languages, such as Spanish and Italian, allow the subject to be dropped from sentences. The Spanish sentence（3）for example, would normally be reduced to "Vivo en Madrid" by dropping the subject *yo*, unless it is required for emphasis. These pro-drop languages have been found to have rich verb-inflexion, in particular for agreement with the subject-person, and also tend to display free movement of the subject around the verb, such as in（4）.

   3）Yo vivo en Madrid.
       I live in Madrid.

   4）Vienen los agrimensores.
       Come the surveyors
       The surveyors are coming.

It has been argued that the co-ordinated occurrence（or absence）of these properties is no coincidence, rather the effects of just one of the parametric settings necessary for building a particular language. However, these principles and parameters alone are not enough to build a human language. In order to convey and understand meaning, a vocabulary of words is needed to slot into the grammatical structures to form sentences. This is the role of the lexicon.

4. The Lexicon

The lexicon is sometimes considered superficially to be a list of words, which includes the pronunciation, meaning and spelling（if the language user is literate）for each word, rather like a mental version of a physical dictionary. Some would acknowledge that the list must also include the category of each word, that is, whether it is a noun, verb or adjective, and so on, as this is necessary for the words to slot into the right places in the syntactic structures generated by the computational component. However, according to PPT, there is still more information that must be recorded with each lexical entry in order for the whole model to work.

5. Lexical Categories and Argument Structure

This simple basis already shows how important basic lexical information is in phrase structure. The ultimate constituents（words）come in particular categories such as N（noun）, V（verb）and P（preposition）. They are then grouped into natural associations by stages until one single constituent is left at the top. The syntactic categories of the words project to the higher nodes as far as their maximal projections. Initially, it may be considered possible to substitute any word or phrase in a sentence with a different word or phrase of the same syntactic category, and still produce a grammatical sentence. For example,（5）and（6）are also grammatical sentences. Indeed, one of the main reasons for adopting this basis is to provide an explanatory system that can

potentially generate the infinitude of sentences that exist in any human language.

5) Customers eat spaghetti with chopsticks.
6) Customers eat their food with chopsticks.

However, these relatively simple phrase structures also generate ungrammatical sentences:

7) *Parisians slept their beds from midnight.
8) *The chimpanzee puts.

Sentence (7) is ungrammatical because the intransitive verb *sleep* is treated as if it were a transitive verb. It would be grammatical if the preposition *in* were inserted after the verb, making *their beds* a prepositional phrase instead of an object noun phrase and changing its thematic relation with the verb. Sentence (8) is ungrammatical because we normally *put something somewhere*. The verb *put* is treated here as an intransitive verb, whereas it is in fact a ditransitive verb. It seems that the subcategories of certain words determine which categories of phrases must, or must not be part of the predicate of the sentence. This aspect of lexical information is also beginning to show the far-reaching role it plays in syntactic structure. Sentences do not only have syntactic structure; they (or at least their predicates) have argument structures, and these two aspects of structure are inextricably linked with each other. The lexical information in the lexical entry for the predicate determines the argument structure. "This refers to the number of arguments that a particular predicate requires" (Carnie, 2002: 166).

9) The tiger sleeps.
10) Noam Chomsky dislikes George Bush Jnr.
11) Short gives Blair a judicious level of support.

In (9), the intransitive predicate *sleep* requires only one argument, *tiger*. In (10), the transitive predicate dislike requires two arguments, *Noam Chomsky* and *George Bush*. In (11), the ditransitive predicate give requires three arguments; *Short, Blair*, and *a judicious level of support*. These argument structures form part of the lexical information stored in the lexical entry of each of these verbs. This determines what kind of syntactic structures can be constructed around the predicate. What is beginning to take shape here is θ-theory ("theta theory"), one of the most important pillars of PPT concerning the integration of lexical information, whereby lexical entries contain selectional restrictions in order to avoid semantically inappropriate combinations (Horrocks, 1987).

6. X-Bar Theory and X-Bar Schema

It was demonstrated above that some extra lexical information is needed in combination with simple phrase structure rules to ensure generation of more grammatically correct sentences. However, θ-theory is intended to be used in conjunction with the more advanced phrase structure rules of another major pillar of PPT: X'-theory ("X-bar theory"). Although more complex and sophisticated abstractions are generated by X'- theory, its configurations are in fact designed to be more uniform than earlier phrase structure rules. This is in order to provide a more explanatory (rather than merely descriptive or observational) framework for accounting for both variation and consistency in human languages. For example, with previous transformational grammar, there were problems in the transformational relationships between sentences such as "Bresnan criticised Chomsky" and NPs such as "Bresnan's criticism of Chomsky" (examples from Horrocks, 1987). Taking sentence form as basic or deep, the properties of various nominalizations of verbs and verbalizations of nouns were difficult to predict, as some nouns have no corresponding verbs, and vice versa, leading to difficulties in arriving at general rules. Since certain X' configurations can

relate to several syntactic categories, it imposes some degree of uniformity on the possible configurations of categories. X'-theory is one possible framework in which to embed the whole concept of principles and parameters. For example, there is a set of X'-rules for generating specifiers, adjuncts and complements. In their most generalised form they are as follows (Carnie, 2002: 127-130):

Specifier rule:
12)   XP → (YP) X'   or:
13)   XP → X' (YP)
Adjunct rule:
14)   X' → (ZP) X'   or:
15)   X' → X' (ZP)
Complement rule:
16)   X' → (WP) X   or:
17)   X' → X (WP)

X is an ultimate constituent of any given category, X' is a projection of X (in the same syntactic category), XP is the maximal projection of X', and YP, ZP and WP are other phrases of given categories. These are powerful rules for generating a wide range of sentences in any given language. Its structural relations also reveal more about the thematic relations in a sentence. In (18) we can see all three rules operating. The specifier rule operates in each of the NPs, where XP is realized by NP, YP is realized by D, and X' is realized by N'. The adjunct rule operates in V'', where X' is realized by V'' (daughter of VP), the daughter X' is realized by the daughter V' and ZP is realized by PP. The complement rule operates from the lower V', where X' is realized by V', X is realized by V and WP is realized by NP. It also operates in each of the N's that are daughters of NPs. Out of the two possibilities for each rule, we have (12), (15) and (17).

18)
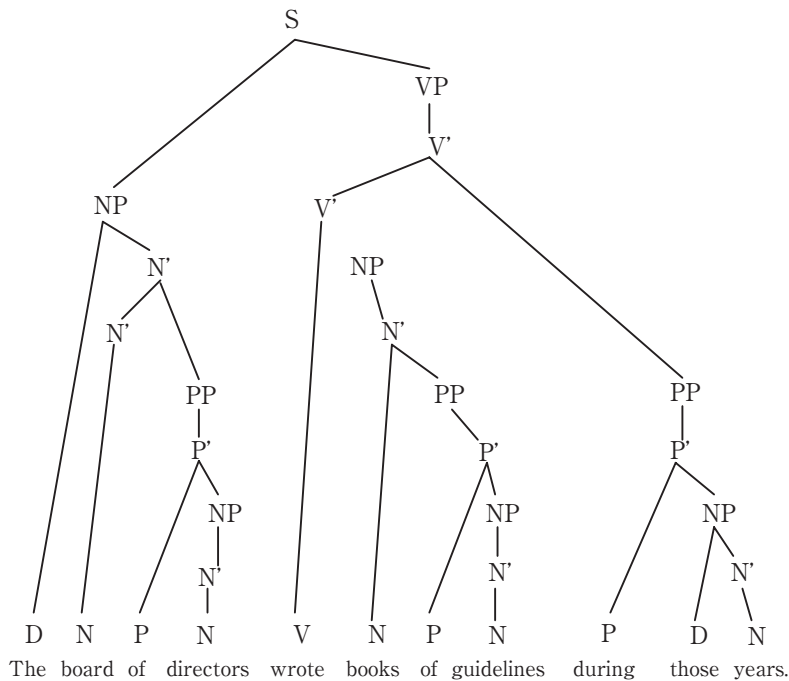
19) adjunct（PP）- head（V'）
太郎　が　内　で　寿司　を　食べた。（Tsujimura, 1996, p. 288）
Tarou ga uchi de　sushi wo tabeta
（Taro　　home at sushi　　　ate）
Taro ate sushi at home.

20）complement（NP）- head（V）
兄　が　　　車　　を　　買った。
Ani ga　　kuruma wo　　katta
(Brother　　car　　　　bought）
My brother bought a car.

21）　　complement（CP）- head（N）
自分　が　正しい　と　いう　主張
Jibun ga tadashii to　iu　　shuchou　（Cook and Newson, 1996, p. 143）
（self　　right　　　　　claim)
The claim that [he] was right.

7. More Parameters: SPEC-Head, Head-Compliment and Head-Adjunct Order

In fact, these are the only three possibilities in English. They represent three parameter settings. Thus in English these parameters are set as head-right for specifiers（the lexical head must sit to the right of the specifier in the phrase）, and head-left for adjuncts and complements. In Japanese for example, all the parameters are set to head-right, so that prepositions are really "post-positions" and verbs occur at the ends of VPs, as shown in（19）to（21）. However, these rules and parameter settings are not enough alone to ensure generation of grammatical sentences and prevention of ungrammatical sentences. This is where we return to θ-theory.

8. θ-Theory, S-Selection and C-Selection

Let us recall that θ-theory concerns the argument structures of predicates. Lexical information that comes from the predicate, for example the verb *write* in（21）, determines the argument structure. As well as the number of arguments, the predicate also determines what kinds of arguments are permissible. The arguments traditionally referred to as object-noun phrase, [NP *books of guidelines*] in（21）for example, are internal arguments, and the subject-noun phrases are external arguments. Internal arguments are generally assumed to be complements to the predicate. The X'-complement rule suggests that any complement may be inserted whenever there is X'（in（18）V'）. Indeed in（18）, the complement is an NP, but it could also be a CP: "The board of directors wrote that the proposals were to be implemented." However, if the predicate were changed from *write* to *bring* this CP would make the sentence ungrammatical. Thus, predicates determine which categories of complement are permissible. These restrictions have been referred to as c-selection or category selection by Cook and Newson（1996）, and later by Carnie（2002）as subcategorization restrictions. Intransitive, transitive and ditransitive verbs are traditional subcategories of verbs, but a lexical information system that integrates the category of complement into this is the subcategorization frame（Cook and Newson, 1996:162）. The subcategorization frames for *write* and *bring* would be:
write [_CP/NP]　bring [_NP,NP]

Predicates also place semantic restrictions on their arguments. These may be referred to as selectional restrictions (Carnie, 2002) or as a process of s-selection (Cook and Newson, 1996). There are a number of ways that the arguments can be semantically related to each other by the predicate. Carnie (2002) calls these thematic relations. The most obvious ones are: agent, whereby an argument is the deliberate performer; patient, the entity which undergoes the action; experiencer, whereby an argument perceives or feels through no volition; and theme, which overlaps with patient and experiencer, and is often the most important topic of the predicate. Others are goal, recipient, source, location, instrument and benefactive (Carnie, 2002). An argument can take more than one of these thematic relations. In (22), the cat could be said to have the thematic relation patient or theme. *I* is the agent and the *table* is the goal.

22) I put the cat on the table.

These thematic relations can be grouped around one argument to form one θ-role. These θ-roles, which are the centrepiece of θ-theory, are assigned to each argument by the predicate in a process called θ-marking, and have important consequences for the argument structure, and in turn for the syntactic structure of a sentence. There are internal θ-roles and external θ-roles. In θ -theory, a word that has potential use as a predicate contains in its lexical entry information about how many and what kinds of θ-roles it can or must assign as a predicate to arguments. This particular lexical information is known as a θ-grid. (23), (24) and (25) are possible examples of θ-grids for the predicates *put, like* and *sleep*. The external θ-roles are underlined in the left-most column. The other columns are internal θ-roles. The letters underneath can be used to notate a particular sentence's θ-roles.

23) put

Agent	Theme/ patient	goal
i	j	k

24) like

Experiencer	Theme
i	j

25) sleep

Experiencer / Theme
i

The θ-roles must be assigned to the arguments of a particular predicate according to the 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).

In this way, each lexical entry for a potential predicate will have a θ-grid integrated into a subcategorization frame determining its argument structure. The θ-criterion ensures that this lexical information is intact in the syntactic structure. This is then safeguarded even further by the projection principle:

Representations at each syntactic level (i.e. D-structure, S-structure and LF) are projected from the lexicon, in that they observe the subcategorization properties of lexical items (Chomsky, 1981: 29). Important aspects of this are that the lexical information is initially inputted into a syntactic structure at the D-structure level, then as the D-structure undergoes transformations such as NP movement and Wh- movement to form S-structures such as passive, negative and

question forms, the integrity of the original lexical information is checked again, to ensure that the resulting sentence is grammatical.

However, this model still does not account for sentences such as (26) and (27).

26) It is raining.
27) There are many newts in this pond.

The arguments *It* and *There* are syntactically indispensable but do not appear to have θ-roles, so the θ-criterion is violated. It appears as if some kind of external argument is always necessary, and this is partly accounted for by the extended projection principle (Carnie, 2002: 175):
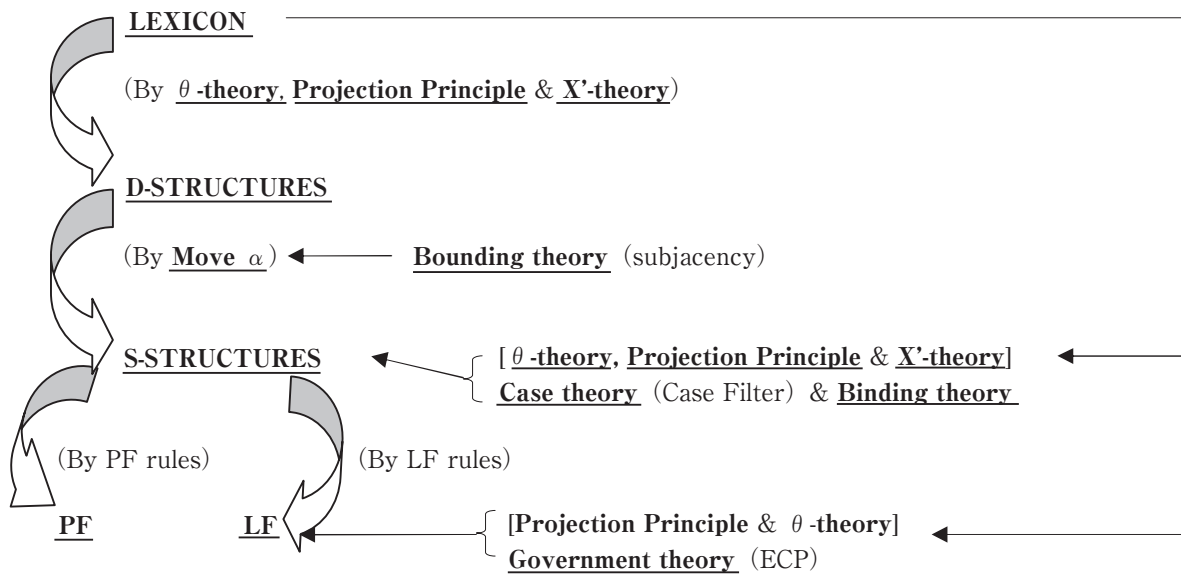
All clauses must have subjects. Lexical information is syntactically represented.

This is then finalised by the expletive insertion rule (Carnie, 2002: 175):

Insert an expletive pronoun into the specifier of TP (TP is the tense phrase).

9. Lexical Information in the Overall Framework

Horrocks (1987) provided the following overview of Chomsky's 1980s framework for PPT (often known as "GB", or "Government and Binding Theory"). D-structure referred to the state of an utterance in its most basic form, as drawn from the lexicon. This form was then subject to movement operations where items would move to different places, leading to S-structure. From S-structure, in turn, the PF and LF components were derived. PPT at that time consisted of a number of sub-theories, or modules, which were mutually dependent and closely integrated. These included: (i) X'-theory; (ii) θ-theory; (iii) case theory; (iv) binding theory; (v) bounding theory; (vi) control theory; and (vii) government theory. These operated together as follows (figure based on Horrocks (1987: 287)):

LEXICON

(By θ-theory, **Projection Principle** & **X'-theory**)

D-STRUCTURES

(By **Move** α) ◄——— **Bounding theory** (subjacency)

S-STRUCTURES ◄—— [θ-theory, **Projection Principle** & **X'-theory**] ◄——
   Case theory (Case Filter) & **Binding theory**

(By PF rules)   (By LF rules)

PF   **LF** ◄—— [**Projection Principle** & θ-theory]
   Government theory (ECP) ◄——

   N. B. Both the assignment of Case and the operation of binding theory at S-structure require reference to notions of government.

According to Cullicover (1997), the fundamental and general guiding principles (not specific syntactic principles, as in "principles and parameters") of PPT are syntacticization, uniformity, and configuration. The principle of syntacticization aims to represent all grammatical information, including lexical information, syntactically. The principle of uniformity guides the search for as

much underlying uniformity as possible in explaining the grammatical structures of human languages. The principle of configuration aims to encode all grammatical structures in terms of configurations. In PPT it is assumed that the primary relation between the words in a sentence is a configurational one （e.g., *sisterhood*）, which determines all of the other properties of a given word in an expression （e.g., case, role, place in word order, etc.）.

The lexicon is the component of the grammar that contains all linguistic information associated with words, or lexical items （LI）. For each LI there is a lexical entry with itemized information （syntactic category, meaning, sounds, particular ways it combines with other lexical items and phrases, i.e., θ-roles）. θ-theory explains how syntactic structure mediates the relationship between the syntactic constituents of a sentence and the thematic argument structure of a head through θ-roles, or thematic roles. The function of θ-theory is not to explain what these roles are, how they differ from one another, and what the possible roles are, but to explain the syntax of θ-roles; how syntactic structure determines the assignment of θ-roles to particular constituents of a sentence. X'-theory specifies what constitutes a syntactic phrase, and characterizes the level of structure prior to movements （i.e., at D-structure）. Results of such movements should also conform to X'-theory, leading to S-structure. Every phrase has a head, and can also include a complement, specifier and/or an adjunct. The fundamental relation in X'-theory is one constituent dominating another constituent. The most basic initial building blocks are the X'-schema, and it is generally assumed that all branching is binary. Grammatical relations, such as subjects and direct objects, are defined in terms of X'-structures. For example, direct objects are generally complements of the head, whereas subjects occupy the specifier position.

After a D-structure has been formed, it may or may not be reconfigured before it becomes an S-structure. At this stage, the principle move α （"Move anything anywhere"） is constrained by the various principles of bounding theory. At the S-structure level, the form emerging from movement is checked again according to θ-theory and the projection principle, but also case theory, which determines the assignment of case to subjects and objects, and binding theory, which restricts the configurational relationships of anaphors, pronouns and referential expressions with their antecedents. Control theory determines the configurations of co-referentials and the co-indexing of empty categories. In government theory relationships are expressed in configurational terms, according to the general guiding principle of uniformity.

10. θ-Marking and Canonical Realization of θ-Roles

As shown in some of the examples earlier, lexical entries include θ-roles, but some lexical items' θ-roles can be realized in more than one way, which is not predictable from such simple θ-grids. For example, external θ-roles, which are usually the subject, may be agent, experience or patient, depending on the context. In other words, the choice of object may affect the θ-role of the subject. This highlights the question of θ-marking, or how arguments are θ-marked in a given syntactic structure. As noted by Cook and Newson （1996）, complements （within VP, or XP） are θ-marked by the head （V, or X） under a sisterhood condition as internal arguments. On the other hand, subjects （i.e., external） are also θ-marked according to sisterhood, but by the head and its complements （i.e., V' or X'）.

The question still remains of how specific θ-roles are realized as syntactic categories. As Haegeman （1994） notes, thematic roles such as agent are generally realized as NPs, and are thus known as canonical realization. Therefore, the θ-grid of a verb with an agent does not need to specify it should be NP. In other words, c-selection follows from s-selection. However, there is not always a perfect match between certain types of thematic roles and their corresponding syntactic

realizations, so the θ-grid may need to specify extra information in some cases. For example: (a) "I asked [what the time was / the time]," and (b) "I inquired [what the time was / *the time]". *Ask* and *inquire* are synonymous in meaning, and both take a "question" complement. This led Grimshaw (1981) to state, in relation to canonical structural representations (CSR), that categorical information in lexical entry is only required where realization is unpredictable.

11. Lexical Information and Case Assignment

Lexical entries' θ-grids not only affect the appearance of syntactic compliments, but also have implications for syntax through case assignment. This has some relevance for all languages, since as Cullicover (1997) points out, although some languages mark case overtly (e.g., the case morphology of Russian and German) while others do not (e.g., Chinese, and English apart from particular pronouns), under the principle of uniformity, these kinds of differences are taken to be superficial, and all languages have at least abstract case. Assuming that assignment of overt morphological case reflects the assignment of abstract case, nominative case is assigned to the subject NP, and accusative case is assigned to the direct object. In PPT, conditions under which case is assigned are syntactic and configurational; and thus also determined by X'-theory and government theory. But how does the θ-grid influence case-assignment? In a general sense, the case filter links θ-roles and the syntactic configurations by specifying X' nodes that assign case through government:

(a) An argument NP (i.e., one assigned a θ-role) must be assigned case by the governor. (b) A non-argument NP is assigned default case.

The verb predictably governs the direct object. However, the subject is the 'specifier' of an abstract head Infl (or I), which contains the inflectional morphology realized on the verb. Infl assigns nominative case to the subject:

IP = NP + I' ; I' = I (nfl) + VP

Thus, in the configurational aspect of case, it is assigned through government, as determined according to m-command and the presence or absence of barriers, where barriers are generally complementizers (CP) in instances of exceptional case marking.

According to Cullicover (1997), either (1) θ-role is a reflection of case; or (2) case is a reflection of θ-role. Assuming (1) to be true, the following principles apply:

The θ-criterion (mapping between arguments and θ-roles), together with: (a) the visibility thesis: Every argument NP must receive a θ-role; and (b) the visibility condition: In order to receive a θ-role, an NP must have case.

Assuming (2) to be true, the thematic case might apply:

(a) Every governed NP must receive a θ-role; (b) Abstract case is a realization of θ-role assignment.

There are some instances, especially in non-pro-drop languages, where the apparent absence of a θ-role for an inserted expletive would seem to cause problems for the assignment of case. In (28), cat receives the θ-role THEME in relation to the predicate be in the basement. However, there has no θ-role, yet (29) shows that even an NP like there that does not receive a θ-role must be in a case position.

28) There was a cat in the garden.

29) *my belief there to have been a cat in the garden.

This problem can be approached by supposing that the expletive *there* and the NP *a cat* form a chain. It should be noted that in PPT, chains must meet certain configurational conditions, as there are also chains formed by movement, but in this instance, the θ-role and case is assigned not

to the individual NP position, but to the entire chain.

It was noted earlier that external θ-roles are basically subjects, and are therefore generally assigned nominative case, whereas objects, which are represented as internal θ-roles in the lexicon, are generally assigned accusative case. However, there are some interesting exceptions. For example, some verbs seem not to assign accusative case nor θ-mark external arguments (e.g., the Italian verb *arrivare*). This led to Burzio (1986, cf. Haegeman, 1994) making the following two-part generalization: (i) A predicate that assigns no external θ-role cannot assign accusative case; (ii) A verb which fails to assign accusative case fails to θ-mark an external argument. We saw earlier that verbs are generally classified as either transitive or intransitive, where transitive verbs have both external and internal θ-roles, and intransitive verbs have only an external θ-role. However, Burzio (1986) identified a third category of verb, known as unaccusative verbs, which have only an internal θ-role, such as *arrivare*. Such unaccusative verbs in Italian often display the syntactic phenomenon of *ne*-cliticization in congruence with the syntactic manifestations of the internal arguments of transitive verbs. They also differ from mainstream intransitive verbs in their selection of auxiliaries. Similarly in English, the one-argument verbs *believe* and *seem* take one internal clausal argument and do not assign an external theta role to the subject position; therefore, they cannot assign accusative case to the subject position of the lower infinitive. Some English verbs that display these feature, including distinguished auxiliary selection, such as in (30) and (31) have been referred to as unaccusatives, or ergative-causal pairs (Haegeman, 1994: 331-334):

30) Poirot is gone.
31) There arrived three men at the palace.

12. θ-Theory and Structural Levels in the PPT Framework

As shown earlier, θ-theory actually applies to at least two levels of representation. D-structure is a representation of lexical properties and is subject to the θ-criterion. Additionally, S-structure encodes the result of movement transformations. This encoding includes traces of movement, or in other words traces of the D-structure, which are required by the structure-preserving principle. Traces of movement form a chain with their antecedent, so that the θ-criterion also applies at S-structure, through the antecent-trace chains. In addition, the case filter applies at S-structure, which itself involves notions of θ-roles.

13. Other Types of Important Lexical Information in PPT

As noted earlier, while lexical entries include the syntactic category of the lexical item, such as lexical categories (nouns, verbs, prepositions and adjectives) and functional categories (e.g., determiners, complementizers, tense phrases and agreement phrases), lexical entries for nouns also need to record type of noun; i.e., anaphor, pronominal or referential expression (Cullicover, 1997). As we have seen, these categories have important implications for syntactic structure through binding theory. As Cook and Newson note,

> As always, principles and parameters theory integrates the principle with the lexical specification. The principles depend upon a knowledge of which words are anaphors and which are pronominals. The lexical entries in the speaker's lexicon must indicate which category each item belongs to, effectively yielding a list such as:

she	[+pronominal]	[-anaphoric]	
herself	[-pronominal]	[+anaphoric]	
each other	[-pronominal]	[+anaphoric]	（Cook and Newson, 1996: 67）

PPT claims that these three categories are universal to all languages, but acknowledges that the words which the categories contain vary between languages, possibly through parametric variation. Wexler and Manzini (1987: 47) thus proposed that "parameterization is essentially lexical"; in other words, parameters are not properties of principles but of individual items in the lexicon. This proposal is known as the lexical parameterization hypothesis, on which the lexical learning hypothesis is based. In fact, Chomsky came to the conclusion that "there is only one human language apart from the lexicon, and language acquisition is in essence a matter of determining lexical idiosyncrasies" (1991: 419).

In the PPT perspective, there is a crucial categorization of lexical items at higher order than that of standard categories; namely, lexical categories (V, N, A, P) and functional categories (C, AGR, T, Neg, D). This distinction is not only crucial for many principles in PPT, but their manifestations in the lexicon itself are crucially different, as summarized by Cook and Newson (1996). For example, in the semantic sense, lexical phrases have descriptive content, whereas functional phrases do not. Additionally, lexical items are open class; that is, they are not limited in number, and new words in these categories are coined all the time. On the other hand, functional items are closed. Ouhalla (1991) argued that only functional categories have grammatical features such as number and person, and only functional categories have parameters. This argument is known as the functional parameterization hypothesis; it argues that whereas lexical categories are universal and uniform across all languages, functional categories differ. This would imply that word order differences between languages mainly depend on differences in the c-selection properties of functional elements. Thus there would be two types of lexicon; "One for lexical entries containing Ns, Vs, As and Ps, each with a specification of its s-selection properties; and another containing functional categories, each with the relevant setting for the appropriate parameters" (Cook and Newson, 1996: 186). The functional parameterization hypothesis is therefore an extension of the lexical parameterization hypothesis; variation in the lexicon determines variation between languages. Such variation may also include the presence or absence of a given functional category in a given language.

The increasing importance given to lexical information during the development of PPT has arguably led to implications for the framework of PPT. The greater the importance of information from a lexical entry, the richer the D-structure becomes, since D-structure is an initial arrangement of items and their lexical properties. According to Horrocks (1987), owing to the Projection Principle and traces, D-structure and Move α may be somewhat redundant, since D-structure is no more than S-structure with the effects of Move α abstracted away, and all the properties of the D-structure are visible in the S-structure in the form of traces. Indeed, in the late 1980s, Chomsky (1986, 1991) replaced several principles in PPT. For example, the principle of Full Interpretation (1986), which stipulates that every element that appears in a structure must be interpreted in some way, effectively replaced the θ-criterion, and this in turn led to the principle of economy (1991). These changes eventually led to radical revisions in PPT, in the form of the minimalist programme (Chomsky, 1995, 1998). In the new model, there is no D-structure, S-structure, government or prescribed X'-theory, and the lexicon is given greater importance through the numeration and the merge operation.

14. Implications for SLA

The earlier PPT models had significant implications for research in second language acquisition, leading to many challenging issues. Interestingly, many of these concerned the relationship between syntax and the lexicon. According to Towell (2003), "The primacy of syntax within the generativist paradigm has led to a separation between syntax and semantics. This is not without its problems as more and more researchers are finding that semantic factors influence syntactic phenomena" (p.7), and, "The problem with the P and P model was that it was all or nothing: either the parameter had been re-set and all features fell into place or it had not and they did not... investigations [Hawkins, Towell and Bazergui, 1993; White 1991] based on this theory tended to find that partial re-setting took place, but the theory itself could not account for 'partiality' given that the re-setting process was one of 'switch-flipping'" (p.9). Towell (2003) also pointed out that the history of research in second language acquisition and foreign language teaching techniques has shown that the lexicon is the driving force of acquisition. The issue regarding parameter setting and resetting, referred to above, is arguably linked to the increasingly acknowledged crucial role of the lexicon in parametric variation. van Hout et al. (2003a) welcomed the emergence of the minimalist programme and its crucial increase of the significance of the lexicon. Hawkins (2001) also noted that, whereas in early PPT, the syntactic module constructed phrase markers independently of the lexicon, into which lexical items were subsequently inserted, later models any parametric variation between languages is located in the feature specification of lexical items and not in the syntax, which would concur with the importance of the lexicon as valued by second language teachers and learners.

To conclude, this paper has indicated the considerable potential of lexical information to influence PPT's generation of syntactic structures. Indeed, it is arguably the ever increasing acknowledgement of the crucial importance of the properties of lexical items which has driven the development of PPT, and other generative models, leading to the eventual radical overhaul of PPT through the Minimalist Programme and beyond.

References

Burzio, L. (1986) *Italian Syntax*, Dordrecht: Reidel.

Carnie, A. (2002) *Syntax: A Generative Introduction*. Oxford: Blackwell Publishers Ltd.

Chomsky, N. (1981) *Lectures on Government and Binding*. Dordrecht: Foris.

Chomsky, N. (1986) Knowledge of Language: Its Nature, Origin and Use. New York: Praeger.

Chomsky, N. (1991) Some notes on economy of derivation and representation. In R. Freidin (Ed.), *Principles and Parameters in Comparative Grammar*. Cambridge, Mass.: MIT Press, 417-545; preliminary draft in MIT Working Papers in Linguistics (1989), 10, 43-74.

Chomsky, N. (1995) *The Minimalist Program*. Cambridge, Mass.: MIT Press.

Chomsky, N. (1998) Minimalist inquiries: the framework. *MIT Working Papers in Linguistics* 15, 1-56.

Cook, V.J. & Newson, M. (1996) *Chomsky's Universal Grammar: An Introduction*. 2nd Ed. Oxford: Blackwell Publishers Ltd.

Cullicover, P.W. (1997) *Principles and Parameters: An Introduction to Syntactic Theory*. Oxford: Oxford University Press

Grimshaw, J. (1981) Form Function and the Language Acquisition Device. In C.L.Baker &

J.McCarthy（Eds.）, *The Logical Problem of Language Acquisition*, Cambridge, Mass.: MIT Press, pp. 165-82.

Haegeman, L.（1994）*Introduction to Government and Binding Theory. Second Edition.* Oxford: Blackwell Publishers Ltd.

Hawkins, R.（2001）*Second Language Syntax: A Generative Introduction.* Oxford: Blackwell Publishers Ltd.

Hawkins, R., Towell, R., & Bazergui, N.（1993）Universal Grammar and the acquisition of French verb movement by native speakers of English. *Second Language Research* 9: 189-233.

Horrocks, G.（1987）*Generative Grammar.* Harlow: Longman Group UK Limited.

Ouhalla, J.（1991）*Functional Categories and Parametric Variation. London*: Routledge.

Towell, R.（2003）Introduction. Second language acquisition research in search of an interface. In R.van Hout *et al.*（2003b）, pp.1-20.

Tsujimura, N.（1996）*An Introduction to Japanese Linguistics.* Oxford: Blackwell Publishing.

van Hout, R., Hulk, A., & Kuiken, F.（2003a）The interface. Concluding remarks. In R.van Hout, *et al.*（2003b）, pp.219-226.

van Hout, R., Hulk, A., Kuiken, F., & Towell, R.（Eds.）（2003b）*The Lexicon-Syntax Interface in Second Language Acquisition.* Amsterdam: John Benjamins Publishing Co.

Wexler, P. & Manzini, R.（1987）Parameters and learnability in Binding Theory. In T.Roeper and E.Williams（Eds.）*Parameter Setting.* Dordrecht: Reidel, pp.41-76.

White, L.（1991）Adverb placement in second language acquisition: Some effects of negative evidence in the classroom. *Second Language Research* 7:133-61.