

The Effects of Core and Peripheral Grammar on Grammatical Development in Children

Nina Hyams
UCLA

0. Introduction

One of the central claims of Government-Binding Theory, as detailed in Chomsky (1981), is that the syntactic component of the grammar is modular in structure, consisting of various principles which define well-formedness at different grammatical levels. On this approach there are no transformational rules which generate specific sentence types, for example, a passive rule. Rather, particular constructions arise through the interaction of general principles of grammar. The passive construction, for example, arises through the interaction of Case Theory, Move ~~a~~, and Theta Theory.

Closely related to this modularity hypothesis are the concepts of "core" and "peripheral" grammar. The core grammar of a particular language is the set of grammatical properties which are determined by the principles and parameters of Universal Grammar (UG). Outside of core grammar is the set of "peripheral"

or "marked" properties of the language. The periphery might include, for example, exceptions or "relaxations" of the settings of core grammar or idiosyncratic features of the language which are governed by particular lexical items.[1]

The modularity hypothesis and the core/periphery distinction have rather direct implications for grammatical development in children. The modularity hypothesis allows for the possibility that a particular grammatical "construction" will emerge in a step-wise fashion as the various rules and principles of grammar which enter into the construction are acquired by the child. [2] Along similar lines, the core/periphery distinction leads us to expect that those aspects of a particular grammatical phenomenon which are marked or peripheral will be more "difficult" to acquire than those features of the construction which are derived from core grammar. This difficulty should manifest itself in at least two ways. First, the peripheral aspects of a construction should be acquired later than the core properties associated with that construction.[3] Second, peripheral aspects of grammar may be acquired in a more piecemeal i.e., less systematic manner. The difficulty associated with learning the periphery is perhaps due to the fact that it must be learned on the basis of data which are more "exotic" or less accessible in the input. Or, it may be that learning the periphery involves more computation or a different sort of computation than the acquisition of core grammar.

The purpose of this paper is to investigate the effects of

the core/periphery distinction on grammatical development in children. I will suggest that this theoretical distinction explains a number of properties of real-time acquisition. In particular, I hope to show that core and peripheral aspects of grammar are acquired differently and that the latter pose a more substantial learning problem for the child. The evidence I will consider comes from two different areas of grammatical development; the acquisition of complex sentences, specifically clausal complementation, and the acquisition of inflectional morphology.

The theory of core/peripheral grammar is a particularly fruitful area in which to explore the relationship between linguistic theory and language development. One of the traditional concerns of language acquisition studies has been to determine what constitutes formal complexity for the child since it is assumed that at least one important factor affecting order of acquisition is the relative complexity of different grammatical rules and constructions. The core/periphery distinction thus provides a measure of linguistic complexity against which the acquisition data may be viewed. At the same time the acquisition data, and in fact other forms of psycholinguistic evidence such as data from processing and language deficits, can inform the theory of grammar. One expects that evidence from these areas, used alongside grammar-internal and comparative evidence, will contribute towards determining which aspects of grammar are more or less marked or peripheral. One of the goals of this paper is to show that the acquisition

data, coupled with certain reasonable assumptions about the learning process, can indeed provide insight into the structure of Universal Grammar (UG) and the theory of markedness.

This paper is organized as follows. In Section 1 I examine the acquisition of clausal complementation. I outline the theory of complementation proposed in Government-Binding Theory (Chomsky, 1981) and show that this theory makes the right predictions concerning the actual time-course of acquisition of various aspects of clausal complementation. In Section 2 I discuss the acquisition of verbal inflection. On the basis of cross-linguistic acquisition evidence I argue that the grammatical status of inflectional systems may vary across languages. In certain cases it is closely related to core grammar; in other cases it is a peripheral property of the language. The variable status of inflection accounts for its relative ease or difficulty of acquisition in different languages. Finally, in Section 3 there is a general discussion of markedness and acquisition. Included in this section is a presentation of some cross-linguistic evidence from agrammatic aphasiacs which further supports the analysis of inflection proposed in Section 2. I turn now to the acquisition of complex sentences.

1.0 The Acquisition of Clausal Complementation

Within Government Binding theory it is proposed that all propositional complements have a sentential structure, as illustrated in (1a) (Chomsky, 1981; Koster & May, 1982). This

constitutes the core property of complementation. In this section I will argue that the same is true of child language. That is to say, I will propose that from the point at which the early grammar generates complex sentences, all propositional complements have the syntactic structure in (1a). In particular, I will argue that infinitives have a clausal structure, as illustrated in (1b), where the subject is represented by a phonologically null category, PRO.

- (1) a. ... [[NP [+/-tense] [VP]]]
 S' S INFL
- b. I want [[PRO [(to)] [go]]]
 S' S INFL VP

The proposal that early infinitives are clausal contrasts with that of Maratsos (1979) and more recently, Bloom, Takeff and Lahey (1984) who have argued that early infinitives are VP's and that the acquisition data support the VP' analysis of infinitives proposed in Bresnan (1978).

In Section 1.2 I will discuss the acquisition of several peripheral aspects of complementation. I will show that in contrast to the basic clausal structure of complements, which emerges abruptly and relatively early in acquisition, the various peripheral aspects of complementation, which depend on idiosyncratic properties of matrix verbs, emerge later and in a more piecemeal fashion.

1.1 The contribution of core grammar

Let us first turn to the core property of complementation,

the sentential structure associated with propositional complements, and consider its effects in the acquisition of complex sentences. As a point of departure we may consider the sentences given in (2)- (4). These data are a representative sample of the earliest complex sentences produced by English speaking children (Limber, 1973; Bloom et al., 1984; Pinker, 1984).

- (2) a. Watch me draw circles
I see you sit down
Lookit a boy play ball
See mommy busy
- b. You make me cry
I let it fall
- (3) a. I want take the bridge away
I forgot (to) bring it
Next year I like (to) go bowling
- b. Tell him stand up
Help me (to) make a happy face
- (4) a. I guess she's sick
I think I want grape juice
- b. I remember where it is
I don't know who is it

For some children, we find the range of constructions illustrated in (2)-(4) appearing within a 6-week period. For others, the period may last up to 6 months. Most accounts agree that the acquisition of complex sentences begins at roughly 2 to 2 1/2 years.

If we consider the set of matrix verbs illustrated in (2)-(4) from a semantic point of view, we find that complements to perception and causative verbs, factive verbs and verbs of

propositional attitude emerge at roughly the same point. Viewed from a syntactic perspective, and ignoring for a moment the data in (2), we note that infinitival complements, illustrated in (3), emerge at roughly the same point as tensed complements given in (4). If infinitival complements have the sentential structure given in (1), this result is expected. The most parsimonious description of the emergence of complementation would thus be that at a point P the recursive rule given in (5) is introduced into the grammar.

(5) VP ----> V S'

The S' complement may be realized as either tensed or infinitive, declarative or interrogative depending on lexical properties of the matrix verb, as I assume is the case in the adult grammar. On an analysis in which tensed complements have a sentential structure and infinitives are VP's, as illustrated in (6), the co-emergence of the two complement types is fortuitous.

(6) a. I think [[I want grape juice]]
 S' S

 b. I forgot [(to) [bring it]]
 VP' VP

We find further support for a clausal analysis of early infinitives if we consider what is missing from the acquisition data. During the early period of complex sentences, infinitival complements typically lack the infinitive marker to. This is indicated in the examples by placing the element in parentheses. Bloom et al. (1984) note that the use of to increases

developmentally but is not consistently found (i.e. 75% of the time) until roughly age 2 1/2. The initial absence of to is of particular interest in that this element is treated differently in the S' and VP' analyses of infinitives. As indicated in example (1b), on a clausal analysis of infinitives to is a realization of [-tense] features and is contained in INFL. On the VP analysis there is no INFL in infinitival complements since the latter are non-sentential. Within this framework, to is treated as a complementizer and a constituent of VP' (Bresnan, 1978), as illustrated in (6b).

Interestingly, the absence of to in the acquisition data is paralleled by the absence of modals and aspectuals in simple tensed sentences. In Bellugi's (1967) well-known study of the acquisition of modals and negation, she found that children acquired productively control of the modals during what she called Stage C, that is when children reached an MLU (Mean Length of Utterance) of 3.5-4.0. This is precisely the point at which to becomes productive in infinitives. Note that if to is a constituent of INFL (which entails that infinitives are sentential), we expect this element to exhibit the same developmental pattern as other auxiliary elements. On a VP analysis the initial absence and parallel appearance of to and the modals is again accidental. [4]

There is a further aspect of the acquisition of the modals and auxiliaries which is relevant to the present discussion. Pinker (1984), adopting a VP analysis of the acquisition of

infinitives, has proposed that modals and semi-auxiliaries (eg. have to, going to, got to) be treated as main verbs which take VP' complements. The structure he proposes is given in (7).

- (7) a. John [VP [V [might] VP' [VP [leave]]]]
 b. John [VP [V [has] VP' [VP [to [leave]]]]]

As he notes, the structure for modal and semi-auxiliary constructions is entirely parallel to that of the infinitival complements, exemplified in (6b). Thus, all else being equal, on this analysis we might expect modal and semi-auxiliary constructions to develop in tandem with the infinitival construction. The acquisition data do not bear out this prediction, however. What we find is that semi-auxiliary constructions, illustrated in (8), emerge with the infinitives given in (3a), while the modals are a significantly later acquisition, as observed, for example, in Limber (1973) and Bellugi (1967). [5]

- (8) I gotta get down
 I gon cut ~~as~~ some more
 We have buy some

It thus appears that semi-auxiliaries and main verbs pattern together as against modals. In particular, the semi-auxiliaries are used productively during the period in which we find the other forms of complementation but in which the modals are lacking. This is consistent with an analysis in which the semi-auxiliaries, like main verbs, take a sentential complement. [6]

There is one final source of evidence supporting the

hypothesis that the child's complements have a sentential structure and this concerns sentences of the sort given in (2), that is, complements to perception verbs and causative verbs. In the adult grammar, these complements are typically analyzed as small clauses (Stowell, 1983), that is, non-maximal projections of a lexical head (symbolized by V*) which contain a subject. The adult structures are illustrated in (9).

- (9) a. Watch [[me] [draw circles]]
 V* NP VP
- b. You make [[me] [cry]]
 V* NP VP

Although small clause complements contain a subject-predicate sequence, they are non-sentential in that they lack the inflectional structure of sentences, i.e. INFL. Notice in this regard that in small clause constructions the verb can be neither tensed nor preceded by the infinitive marker to, as illustrated in (10).

- (10) a. *You made me cried
 b. *You made me to cry

Given the analysis proposed thus far, in which complementation is introduced into the grammar via the PS rule in (5), it is unclear why small clause complements should emerge at this same point, unless it is the case that the child initially (mis)-analyzes these complements as sentential. There is some evidence to suggest that this is in fact the case. Pinker (1984) observes that children do make errors in which the small clause verb is inflected for tense. Examples are given in (11).

- (11) a. I let it spilled
b. Make it walks

Further evidence is provided by S. Klein (personal communication), who notes that children make errors of the sort given in (12), in which a pronominal subject of the small clause is inflected for nominative case, strongly suggesting the presence of INFL.

- (12) Make she do it

Acquisition errors of the sort given in (11) and (12) constitute particularly persuasive evidence that the child's first hypothesis concerning the structure of all propositional complements, including small clauses, is that they bear a sentential structure. [7]

To sum up the discussion thus far, the co-emergence of tensed and infinitive complements (both declarative and interrogative), the behavior of auxiliaries, including the infinitive marker to, and the early misanalysis of small clause complements suggest that the child's propositional complements have a sentential structure. This "core" property of complementation is the first aspect of complex constructions which the child acquires. It provides the basic skeletal structure of complex sentences which will be fleshed out by various peripheral acquisitions. These will be discussed in the next section.

1.2 The Periphery

Thus far I have proposed that at a particular point P in grammatical development, the phrase structure rule given in (5) is introduced into the grammar accounting for the emergence of the various complements illustrated in (2) -(4) and (8). This constitutes the "core" property of complementation. There are, however, other aspects of complementation which depend on, or are derived from, the lexical properties associated with particular matrix verbs. The latter we may consider to be "peripheral" aspects of complementation. As noted earlier, it seems reasonable to expect that those aspects of complementation which are idiosyncratic to particular verbs will take longer to acquire.

1.2.1. Raising

Bearing this in mind, note first that while we find infinitives embedded under control verbs, as in (3), raising constructions are conspicuously absent from the acquisition data. Early complex sentences include neither "raising to subject" nor "raising to object" constructions, of the sort given in (13a,b) respectively. [8] The # sign is used to indicate that these sentences are unattested in the acquisition data of this period.

- (13) a. #John tends (to) act crazy
b. #John believes Mary (to) be crazy

On most Government-Binding analyses, believe (and similar verbs) trigger a rule of S' deletion, thus permitting the embedded subject to be exceptionally governed and Case marked.

[9] The rule of S' deletion and subsequent exceptional Case marking (ECM) is a marked phenomenon, restricted to a small class of verbs in English, and not very common in the languages of the world. By hypothesis, the child must learn - largely on an item by item basis - which English verbs trigger this marked process.

[10] It is therefore not surprising that such constructions are late relative to other forms of complementation.

The absence of subject raising constructions (cf. 13a) is a closely related phenomenon. Within Government-Binding, raising verbs also trigger S' deletion and thereby permit the trace of the moved subject to be properly governed by the matrix verb. If S' deletion must be learned for particular verbs on the basis of positive evidence, we expect that subject raising, like ECM cases, will not be among the earliest complex constructions.

1.2.2 The Semi-auxiliaries

One question which arises at this point concerns the status of sentences like those illustrated in (8) which contain semi-auxiliaries. Since there is some evidence that in the adult grammar of English the semi-auxiliaries are raising verbs, it is important to consider the structure of this construction in the early grammar. Let us diverge briefly to discuss this point.

Pullum and Wilson (1977) point out that the semi-auxiliaries, like raising verbs, take expletive elements and idiom chunks as subjects, as illustrated in (14).

- (14) a. There $\left\{ \begin{array}{l} \text{is going} \\ \text{seems} \end{array} \right\}$ to be a riot in the park
- b. There's $\left\{ \begin{array}{l} \text{gotta} \\ \text{seems to} \end{array} \right\}$ be a solution to this problem
- c. Tabs $\left\{ \begin{array}{l} \text{have to be} \\ \text{seems to have been} \end{array} \right\}$ kept on the students

While the semi-auxiliaries may have a syntactic structure associated with raising verbs, they are semantically distinct in certain respects. True raising verbs, for example, seem, appear never θ -mark the matrix subject position. The semi-auxiliaries, in contrast, can be thematically related to the subject. Thus, in the adult language sentences containing have to and going to are ambiguous between a root and epistemic reading. Consider, for example, the sentences in (15a,b).

- (15) a. John has to leave immediately
- b. John is going to visit his mother

On the root interpretation (15a) means 'John is obliged to leave'; on an epistemic reading, the sentence means 'it is necessary that John leave.' Similarly, (15b) on a root interpretation expresses John's intention to visit his mother, while the epistemic interpretation is that of a future visit. Following in the spirit of proposals in Zubizarreta (1982), we may assume that the semi-auxiliaries optionally assign a θ -role to the matrix subject position (perhaps an adjunct θ -role as

suggested by Zubizarreta). The epistemic interpretation results when the semi-auxiliary fails to θ -mark the subject position; when the semi-auxiliary does θ -mark the subject position we have the root reading.

Returning to the acquisition data, note that while young children certainly produce semi-auxiliaries (cf. (8)), there is little evidence that they are initially analyze them as raising verbs. First, children do not use expletives and idioms early on and hence there is no direct evidence of a raising analysis. Second, as is often noted, young children do not produce verbal passives. Thus, if the early grammar did license raising, this would constitute the only instance of NP movement in the the grammar - an unlikely situation. Finally, it has frequently been observed that young children treat the predicates hafta, wanna and gonna as a unified semantic class, typically used to express the child's wish or intention to act (Brown, 1973; Bloom et al., 1975). That is to say that initially children use the semi-auxiliaries in only their root sense; the epistemic meaning is acquired later (Kuczaj, 1977; Shepherd, 1981). This final observation suggests that on the child's analysis the semi-auxiliaries always bear a thematic relation to the subject, much as want does. The unambiguous interpretation associated with these elements can be explained straightforwardly if we assume that the early grammar analyzes the semi-auxiliaries as control verbs rather than as raising verbs. The child is forced to a control analysis of semi-auxiliaries because the grammar lacks a marked process of S' deletion. [11] Note, however, that while

the input data are ambiguous in the case of the semi-auxiliaries, this is not true for the pure raising verbs; that is, there is no evidence to suggest to the child that verbs like seem and appear are thematically related to the subject. Hence, in contrast to the situation that exists with the semi-auxiliaries, we do not expect children to acquire pure raising verbs under a control analysis.

1.2.3 Overt complementizers

Let us now consider a second aspect of complementation which is governed by specific lexical items - the choice of complementizer, which reflects the tense specification of the embedded clause. Verbs must be lexically specified as to whether their sentential complements are headed by for, that, or an empty COMP. Thus, want but not try may take a for complementizer, as in (16a,b); guess but not want may take a that complementizer, as in (16c,d), and so on.

- (16) a. I want (for) John to leave
b. *I tried for John to leave
c. I guessed (that) John left
d. *I want that John leave

Given a clausal analysis of complementation, sentences (16b,d) represent "accidental gaps" in the sense that English would not be a fundamentally different language if (16b,d) were grammatical. The choice of complementizer is an idiosyncratic property of particular verbs and thus needs to be learned (but see note 10).

If we look at the acquisition data given in (3) and (4) we

note that the sentences invariably lack overt complementizers. These elements begin to appear at roughly age 3.0, that is, towards the end of the developmental stage in which children acquire complex sentences (Limber, 1977; Bloom et al., 1984). The embedded interrogatives illustrated in (4b) argue against the hypothesis that the early grammar simply fails to generate a COMP position at this stage. Moreover, it is not the case that children lack the lexical item that since this element does occur as a relative pronoun at this stage. Rather, I will assume that the COMP position is present and that the child's initial hypothesis is that all embedded S's are headed by an empty COMP. [12] This initial hypothesis will be revised for particular lexical items based on positive data; that is, by exposure to sentences which contain that and for. As in the case of S' deletion, the learning of lexical complementizers is a process which is strongly "data-driven" and hence not an early acquisition.

One last peripheral aspect of English complementation which I wish to mention is that of ECM from COMP, illustrated in the example in (16a). Chomsky (1981) proposes that the lexical subject embedded under verbs like want, like etc. is governed and Case marked by the prepositional complementizer for. He further suggests that for may undergo deletion in the PF (phonological) component, at which point the Case requirement of the embedded subject has been satisfied.

Chomsky's analysis of want type verbs together with the

hypothesis that the child must learn particular lexical complementizers makes a clear prediction concerning the point at which the child will control sentences like that in (16a). All else being equal, the child should not produce lexical subjects in infinitives prior to the point at which he produces lexical complementizers. This prediction is confirmed by the acquisition data. Bloom et al. report that sentences like that in (17) are first produced at roughly age 3. Recall that this is the point at which children begin using lexical complementizers.

(17) I want Mommy get it
I want this doll to stay here

There is, however, a narrower prediction, namely, that children will not produce the sentences in (17) until they give evidence of knowing specifically that want takes a for complementizer. We thus expect to find alongside the sentences in (17), those in (18).

(18) #I want for Mommy get it
#I want for this doll to stay here

Unfortunately, as indicated by the # sign, the sentences in (18) are unattested at this stage (Bloom et al, 1984). It is possible, however, that the non-occurrence of (18) is actually an effect of sample size. In the study conducted by Bloom et al, for example, they found that sentences containing infinitives with lexical subjects (i.e., the context in which we would expect to find for) constituted only 4% of the total number of complex sentences. [13] Given the relative unnaturalness of the construction, as compared, for example, with sentences containing an intervening

adverb as in (19) (below), it is likely that even in a random sample of adult utterances, sentences like (18) would be extremely rare. [14]

(19) I want very much for John to go

Summing up, we have seen that the acquisition of complementation can be factored into "core" versus "peripheral" properties. The latter include choice of complementizer, S' deletion, and ECM from COMP. Each of these was shown to be a relatively late acquisition as compared to the acquisition of clausal structure of complements, the "core" property. I have also suggested that the acquisition of peripheral properties is strongly "data-driven"; that is, such properties are learned in association with particular lexical items on the basis of positive evidence.[15] This is consistent with the fact that choice of complementizer and ECM, for example, are not generalized. Thus, we do not typically find acquisition errors of the sort illustrated in (20).

(20) a. ~~#~~I tried for John to go
b. ~~#~~I want that John go

1.3 Summary

In Section 1 I have proposed that the core/periphery distinction (and a fortiori, the modularity hypothesis) has rather direct empirical effects on the development of complex sentences. We saw that children assign a clausal structure to all propositional complements. This represents the core property of complementation which emerges abruptly and at a relatively

early point in acquisition. The effects of this grammatical development are pervasive. It provides the basic structure for all the child's propositional complements and is generalized to instances in which it does not apply in the adult grammar, as illustrated by the acquisition errors in (11) and (12). This is in marked contrast to the acquisition of peripheral aspects of complementation which are acquired late relative to the basic phrase structure of complements and in a less systematic manner. Because the periphery is associated with idiosyncratic properties of particular lexical items acquisition in this domain is strongly data-dependent.

In the following section I turn to the acquisition of inflectional morphology, specifically verbal inflection. I will argue that with respect to this aspect of grammar as well the core/periphery distinction provides an explanation for the actual time-course of development and a number of otherwise unexplained cross-linguistic acquisition facts. In Section 3 I will discuss the use of verbal inflection by agrammatic aphasics. The aphasia data will provide further support for the core/periphery distinction in the area of verbal morphology.

2.0 The Acquisition of Inflection

The first question I would like to address is 'why is an impoverished morphological system like that of English so difficult to acquire?' It is well-known that English speaking children achieve productive control of verbal inflection relatively late in the acquisition process. Brown (1973), in his

study of the 14 grammatical morphemes, ranks the the '3rd person regular' (-s) as 9.66 in order of acquisition. The mean age of the three children studied by Brown at the point at which they had productive control of this verbal inflection is 2;9. Similarly, Brown ranks acquisition of the regular past tense ed morpheme as 9.00, only slightly earlier. This latter observation suggests that the child's difficulty with the 3rd person regular morpheme is not a function of whatever grammatical complexity is inherent in agreement rules since the English past tense morpheme does not agree with the subject in any sense, though it is also a late acquisition. Rather, it seems that the English speaking child has difficulty with verbal inflection in general. As noted by Brown and others, the absence of inflectional affixes is of course one of the salient properties of early language which contributes to its "telegraphic" quality. There is one apparent exception to this generalization; the present progressive morpheme -ing, which Brown ranks as the first of the 14 morphemes to be acquired. I will return to this later.

This late mastery of English inflection is particularly surprising in light of recent research which shows that children acquiring much more richly inflected languages learn the inflectional system of these languages at a strikingly early age and with relatively few errors. Consider, for example, the child acquiring Polish. Weist & Witkowska-Stadnik (1985) report that the children they studied had productive control of the nominal case system (which contains 7 cases), and subject-verb agreement for person, number and gender by age 1;9. Similarly, in my

own study of the acquisition of agreement rules by Italian speaking children (Hyams, 1984), I found that they had mastered the present tense verbal paradigm by roughly age 2;0.

In Italian the verb is inflected to agree with the subject in person and number. One of the present tense paradigm is given in (21).

(21) parl- (to speak)

	singular	plural
1p	-o	-iamo
2p	-i	-ate
3p	-a	-anno

If we compare the matrix in (21) with that in (22), the present tense paradigm for English, it seems clear that the English speaking child's problem does not lie in the learning of particular affixes. Common sense (and any learning theory) tells us that it should be more difficult to learn the 6 Italian affixes than the single English one.

(22) speak

	singular	plural
1p	0	0
2p	0	0
3p	-s	0

What then accounts for the relative difficulty which English children exhibit in learning the inflectional system of their language? In the section that follows I will offer an answer to this question.

2.1 The Stem Parameter

The above facts lead to the conclusion that the rate at which a child learns the inflectional system of his language is not a function of the intuitive complexity of the system. Instead, what I would like to suggest is that the relative ease of acquisition depends in large measure on how the system interacts with principles of UG, or more to the point, whether the inflectional system is a core or peripheral property of the language being acquired.

Before turning to the acquisition facts, however, let us consider the structure of the systems to be acquired. Notice that there is an obvious difference between English on the one hand, and languages like Italian on the other. In English, a verbal stem may surface without an overt affix. Thus, speak is a well-formed word in the language. In Italian, in contrast, the verbal stem requires an overt affix; the form parl- is simply ill-formed. We can express the different morphological requirements of the two languages as a parameter, informally stated as in (23).

(23) The Stem Parameter

A verbal stem does/does not constitute a well-formed word.

Since languages may vary in the manner suggested in (23), this parameter must be fixed by the child at the value which is appropriate for the particular language he is exposed to.

Let us turn now to the acquisition facts noted earlier. Young English speaking children typically produce uninflected verb forms, as illustrated in (24).

(24) Mommy throw it away
Man sit down
Kathryn want build another house
Gia ride bike

(from Bloom, Lightbown & Hood, 1975)

These sentences violate a syntactic rule of agreement, which requires that the verb agree with a 3rd person singular subject. However, given the parameter in (23), these productions are well-formed at the morphological level since in English a verbal stem constitutes a well-formed word. In Italian-like languages, in contrast, the verb must surface with an overt affix. Children acquiring Italian and similar languages, rarely, if ever, produce uninflected verbs. Thus, like English-speaking children, their verbs are well-formed at the appropriate grammatical level. These facts suggest that language particular conditions on word structure are learned at a very early age, or given the analysis proposed here, that the parameter in (23) is set very early on.

With regard to the learning of particular affixes, it seems

reasonable to suppose that their rate of acquisition will depend in part on the choice which the child makes with respect to the Stem Parameter. Once the Italian-speaking child determines that stems require overt affixes in his language, he will need to learn the affixes in order to satisfy this requirement. So the learning of particular affixes is triggered by the parameter setting. [16] The English speaking child sets the Stem Parameter at the opposite value; a verbal stem constitutes a well-formed word. Thus, he need not learn any inflectional morphemes in order to satisfy the well-formedness condition in his language. Obviously, each child will set this parameter based on the linguistic input he receives. [17] The English speaking child hears that the verb is largely invariant in form, while the Italian child receives a much richer and more varied input. [18]

One desirable result of this account is that there is no sense in which the English speaking child is grammatically "delayed" relative to his Italian or Polish speaking cohorts. The difference in linguistic behavior exhibited by the two populations is strictly an effect of different settings along a particular parameter. In each case the child's language conforms to the specifications of the particular grammar he has developed. Moreover, the learning of particular affixes is no more or less difficult for the English speaking children than for the Italian child. Rather, the English speaking child does not learn inflectional morphemes at this stage because this acquisition has not been triggered by his parameter setting. On his analysis English is a language with no verbal morphology.

Assuming that this account is on the right track, what explains the precocious appearance of the progressive -ing morpheme, which, as noted earlier, is the first of Brown's 14 grammatical morphemes to be acquired. Moreover, what do we say about the eventual acquisition of 3rd person regular and past tense morphemes? How are they acquired -- and why? These questions will be addressed in the section that follows.

2.2 Learning the Periphery

I turn first to the progressive morpheme, illustrated in the sentences in (25) (from Bellugi, 1967).

- (25) No the sun shining
He eating ice cream
You waking me up
Oh, no raining

Although sentences of this sort are frequent in early language during a time when children are not using the present or past tense affixes, there is some reason to suspect that the child does not initially analyze the progressive form of the verb as consisting of a verbal stem and affix.

First, as exemplified by the examples in (25), the progressive verb is first used without the auxiliary be, suggesting that -ing is not a separate morpheme which is selected by the auxiliary, as is the case in the adult grammar. Instead, it may be that the child learns each progressive form as a

distinct verb so that hit and hitting, for example, actual represent two distinct lexical entries. This hypothesis is supported by a second fact, noted by Cazden (1968), that unlike the verbal affixes -s and -ed, -ing fails to overgeneralize. Thus, while errors such as those in (26) are common, forms such as those in (27) are virtually unattested in the acquisition data. [19]

(26) taked
tooks
gots
maked

(27) #taking
#wenting

If we credit the child with actually knowing the progressive morpheme only at the point at which it co-occurs with the auxiliary be, then its acquisition occurs significantly later. According to Brown (1973) the auxiliary be is the last of the 14 grammatical morphemes to be acquired.

Let me now turn to the question of how the child eventually acquires the verbal inflections of English. Here the core/periphery distinction becomes relevant. Recall that core properties of grammar are those which are determined by fixing the parameters of UG, while marked or peripheral processes often involve exceptions or a relaxation of particular parameter settings. We saw that the acquisition of the Italian affixes is triggered by a particular setting along the Stem Parameter, one which requires that verbal stems bear affixes. On this account,

then, inflectional morphology in a language like Italian represents a core property of the language insofar as it is closely related to (i.e. triggered by) the setting of a particular parameter. Consider, on the other hand, the English case. In English the setting along the Stem Parameter specifies that verbs are uninflected. Such inflections as there are thus represent a "departure" from the core grammar of English. Assuming, as we have been, that the peripheral aspects of a grammatical subsystem take longer to sort out than the core properties (requiring either more exposure to data or more computation), it is clear why the relatively weak inflectional system of English i.e., the 3rd person, past tense, and progressive morphemes, are acquired later than the inflectional paradigms in more richly inflected languages.

The hypothesis is then that that inflectional systems (and perhaps other properties of grammar as well) have a variable status across languages; in English inflection is a peripheral property of the language, while in Italian, for example, it is a core property. Naturally, we would expect this difference in the two language types to have effects which extend beyond acquisition. This is indeed the case and some of these effects will be discussed in Section 3. With respect to acquisition, however, the crucial point is that on this account it is the markedness of rule systems, that is, the degree of deviation from the core grammar, rather than the intuitive complexity of the data which is responsible for the relative ease or difficulty of acquisition.

2.3 The overgeneralization of affixation

The analysis which I am proposing allows us to explain another curious acquisition phenomenon, namely, why children acquiring languages with relatively rich inflectional systems tend to avoid 0 affixation, even where the latter would be correct in the adult language. Slobin (1973) observes that children acquiring Russian mark all accusative nouns with the feminine accusative -u affix although in the adult language, masculine non-human and neuter accusative nouns bear a 0 affix. Similarly, he reports that Gvozdev's (1961) Russian child used the affix -ov for all plural genitive nouns, replacing the feminine plural genitive 0 affix. He further notes that the replacement of 0 affixes also occurs in the acquisition of Serbo-Croatian. Slobin expresses the generalization as in (28).

- (28) There is a preference not to mark a semantic category by 0 (zero morpheme). If a category is sometimes marked by 0 and sometimes by an overt phonological form, the latter will, at some stage, also replace the 0. (Slobin, 1973; p. 202)

The Stem Parameter formulated in (23) (modified slightly to include nouns as well as verbs) provides a straightforward explanation for this phenomenon. Russian, and the other languages noted by Slobin, are richly inflected languages which typically do not allow bare stems; the obvious exceptions being the cases of 0 affixation like those discussed above. Thus, we may assume that Russian adopts the [-bare stem] option along the Stem Parameter. Having determined that bare stems are ill-formed

in his language, the Russian-speaking child replaces all zero morphemes with overt affixes. Those instances in which the noun is indeed uninflected represent a marked extension of the Russian system, a relaxation of the Stem Parameter; they are therefore a later acquisition.

A similar situation exists in German. Adult German has a richly inflected verbal system, which does, however, exhibit instances of 0 affixation. The imperative form of the verb bears no overt affix and the 1st and 3rd person singular past tense form of the so-called 'strong verbs' is uninflected, though it does undergo a vowel alternation, as illustrated below.

(29) kommen 'to eat'

<u>komme</u>	1st per. pres.
kam	1st per. past
komm	imperative

Clahsen (1986 and personal communication) notes that German children pass through a developmental stage (his Phase III), which lasts up to about age 3;0, in which they overgeneralize affixation to forms which would be uninflected in the adult language. This is done predominantly by using the 1st person singular e affix with 'strong' or irregular verbs, as in (30), and also by a strategy which Clahsen refers to as 'pronominal copying.' In the latter case the child attaches a copy of the subject pronoun to the verb, as in (31). The examples below are from Clahsen (p.c.).

(30) ich kanne drinsitzin
'I can in sit' (=I can sit in there)

(31) ich kannich
'I can-I'

By age 3;0 (Clahsen's Phase IV) the overgeneralizations and pronominal copies cease and the children establish the correct verbal paradigms.

As Clahsen (personal communication) points out, the German child's behavior during this stage is easily explained by the parameterized account of the acquisition of inflection proposed in this paper. As occurs in the acquisition of Russian and Serbo-Croatian discussed above, the German speaking child, confronted with a rich system of verbal inflection, sets the Stem Parameter at the [-bare stem] option. He "avoids" 0 affixation since such forms are ungrammatical in his grammar. As in the previous case, he later learns the zero forms as a marked extension of the system. [20]

Closely related to the 'avoid 0 affixation generalization' is a phenomenon which Slobin (1973) refers to as "inflectional imperialism." This acquisition phenomenon as well can be partially explained by the analysis proposed in this paper. Slobin notes that in acquiring a set of affixes for a particular grammatical class children will very often first learn only one member of the set and overgeneralize it to all words in the class. A typically example is the child who is acquiring a

language with a case system who first learns the feminine form of the nominative and uses it with masculine and neuter nouns as well as feminine ones. A concrete example is offered by Levy (1980), who observes that the Hebrew speaking child first marks plurality on nouns by the invariant addition of the masculine suffix -im, and only later distinguishes the feminine nouns by the affix -ot.

Although it is unclear why the child chooses a particular affix to begin with, for example, why the Hebrew-speaking child first chooses the -im affix, the account proposed here does provide an explanation for why the first affix acquired is overgeneralized. The alternative would be to leave the other forms (for which the appropriate affixes have not yet been learned) without any affix whatsoever. This latter option, however, is excluded by the requirement that the stem bear some affix. Thus, 'inflectional imperialism' is a kind of stop-gap measure which allows the child to satisfy the grammatical requirements imposed by the Stem Parameter during the period in which he is learning the full range of affixes.

2.4 Modularity in the acquisition of inflection

Before concluding Section 2, it is worth noting that the overgeneralization of affixation, whether in the form of avoiding 0 forms or "inflectional imperialism," does not really correspond to what we would intuitively think to be the simplest or most efficient learning procedure for acquiring an

inflectional system. A priori, it would seem that the simplest way to accomplish this task would be to learn each affix and its context and leave uninflected those forms for which the appropriate affixes have not yet been mastered, an option suggested above. The Hebrew speaking child who learned by this deterministic method, for example, would first mark masculine nouns with -im and leave the feminine forms uninflected; inflected feminine forms would come later with the acquisition of -ot. Certainly, if we were to program a computer to acquire an inflectional system, this would be the way to go. Thus, the question that arises here is why isn't the child an efficient, albeit conservative, learner in this domain?

In order to answer this question satisfactorially we need to tease apart two tasks which face the child. One is the learning of particular affixes and their surface distribution. Let us refer to this simply as "affix-learning." The second task facing the child involves real grammatical development; he must determine the function of the inflectional system within the grammar as a whole, in our terms, whether it is a core or peripheral property of the language. Most accounts of the acquisition of inflection are concerned exclusively with the problem of affix-learning. The analysis proposed in this paper, in contrast, is directed at the issue of grammatical development. This is not to deny that affix-learning represents a formidable learning task for the child, comparable in many respects to word-learning. It seems, however, that many of the most interesting phenomena associated with the acquisition of morphology, for

example, the variable rate of acquisition across languages, overgeneralization (as in Russian), and undergeneralization (as in English) are more readily explained as effects of grammatical development, in particular of parameter setting, rather than of affix-learning. The suggestion that the learning of inflection involves development in separate domains is obviously very much in the spirit of the modularity hypothesis discussed at the outset of this paper.

In the section that follows I would like to briefly discuss the acquisition of inflection in American Sign Language (ASL). As we will see, ASL falls somewhere between the Italian-type languages with their rich inflectional system, and English-like languages with a impoverished morphology and thus represents an interesting case.

2.4 American Sign Language

ASL is a language which exhibits subject-verb agreement. The agreement is marked by the movement of the verb in relation to specific points in space. A priori, it would be reasonable to expect the acquisition of the agreement system to pattern like that of other inflected languages, for example, Italian. As it turns out, however, ASL speaking children acquire subject-verb agreement quite late. Lillo-Martin (1986) reports that with non-present referents, that is, instances in which the subject of the sentence is not physically present and is designated by a point in signing space, the children did not achieve productive control of agreement until 5-6 years. Agreement with present referents,

though an earlier acquisition, is still late as compared with Italian and Polish speaking children. According to Meier (1982), agreement with present referents is typically achieved around 2 1/2 or 3 years. Thus, ASL speaking children appear to pattern like English speaking children, as against Italian or Polish speaking children - a rather surprising result on the face of it. [21]

This result is somewhat less surprising, however, when we consider the nature of the input data in ASL. Although ASL has a much richer system of verbal morphology than English, since all grammatical persons are marked, this is true only for a subset of the verbs in the language. There is an entire class of verbs in ASL which do not inflect to agree with the subject, the so-called 'plain verbs.' Moreover, the inflection on the 'inflecting verbs' is optional. (As we will see shortly, this optionality is an important factor determining the setting of the Stem Parameter in ASL.) Thus, the input data in ASL are extremely variable as regards the presence of inflection. This is a very different situation than exists in Italian or Polish, for example, where the input data are quite consistent in this respect.

However, the fact that the data are variable still does not explain why the ASL speaking child chooses the [+bare stem] option. Given such variable input, the ASL child could easily choose either value of the Stem Parameter. Thus, unlike the previous cases we have considered the input data do not determine

the parameter setting in any straightforward way. Other factors appear to be at play here.

The reason for the [+bare stem] setting in ASL becomes obvious once we consider the nature of the learning task that the child is faced with. On the well-motivated assumption that the child learns from positive evidence alone (Baker, 1979), the only way the ASL speaking child could learn the inflectional system of the language is to assume a [+bare stem] setting. If the child starts out under the assumption that there is no inflection in the language, s/he can learn from positive evidence alone - tokens of inflected verbs in the input - that some verbs can bear inflection. If, on the other hand, the child were to assume that all verbs are inflected, the [-bare stem] option, s/he could not tell, based on positive evidence alone, whether a particular uninflected form is a 'plain' verb (which should never be inflected) or simply an uninflected token of an inflecting verb (which can be inflected optionally). Thus the ASL speaking child initially assumes that bare verbal stems are well-formed words and set the Stem Parameter accordingly. [22] If this is the case, verbal inflection is late in ASL because, as in English, it is acquired as a peripheral property of the language. The child needs to learn, more or less on a verb-by-verb basis, which ones are inflectable.

The peripheral status of inflection in ASL will be discussed in more detail in the following section, where we turn to a more general discussion of language development and the theory of

markedness.

3.0 Markedness Theory

The primary aim of this paper has been to show that the core/periphery distinction has rather direct empirical consequences for actual grammatical development. Two cases in point were presented. We first considered the acquisition of complex sentence in which children first acquire the basic clausal structure of propositional complements followed by the emergence of various peripheral aspects of complementation. In the second part of the paper we examined the acquisition of verbal morphology. We saw that in languages in which inflection represents a core property of the language, it is acquired early, while it is a very late acquisition in those languages with peripheral morphology. In addition, various error patterns, including the overgeneralization and undergeneralization of inflection, could be explained as effects of the core/peripheral status of the inflectional system in a particular language.

A central point of the analysis of inflection was that the status of verbal morphology varies from language to language. This view of syntactic markedness, in which a particular phenomenon may be marked or peripheral in one language, but part of the core grammar of the next language is somewhat unusual and perhaps not uncontroversial. Thus in the last part of this paper I would like to provide some additional support for this claim, particularly as it applies to the analysis of inflection in the previous section. I will first consider some psycholinguistic

evidence, production data from aphasic speakers. We will see that the cross-linguistic variation which one finds in the aphasic's use of inflection follows from the markedness claims being proposed. Following that I will propose a more theory-internal kind of argument which relates the core/peripheral status of inflection to the Null Subject Parameter.

3.1 Language Dissolution

The claim that the formal grammatical status of inflectional systems varies from language to language receives some further support from cross-linguistic studies of agrammatic aphasics, in particular the work of Y. Grodzinsky (1984). Agrammatic patients, a subclass of Broca's aphasics, are typically characterized as having "telegraphic" speech. Like young children, their speech is marked by an absence of grammatical formatives, including inflections. Interestingly, Grodzinsky notes that of the languages he studied, the omission of inflectional morphology only occurs with English speaking aphasics. Speakers of Italian, Russian and Hebrew, in contrast, never drop inflectional affixes - though the affixes frequently fail to agree appropriately. Thus, while the Italian aphasic might utter sentences of the sort given in (32a,b), where the verb bears some inflection which fails to appropriately agree with the subject, he will never make the error of producing a bare verbal stem, (as in (32c)), as the English speaking agrammatic typically does.

- (32) a. Ragazza parlo.
(girl speak -1st person singular affix)
b. Ragazza parlare.
(girl speak-infinitive affix)
c. *Ragazza parl
(Girl speak -stem) [23]

This difference between aphasic speakers of English on the one hand, and speakers of languages like Italian, Russian, and Hebrew, on the other, is exactly what we would expect under the assumption that marked or peripheral grammatical processes are somehow more vulnerable or easily disrupted in the event of neurological damage, as originally proposed by Jakobson (1968). The inflectional requirements of the other languages, however, which are more closely connected to core grammar, appear to be more stable.

To conclude the discussion of agrammatism let us turn briefly to ASL. The analysis presented earlier, in which inflection in ASL is peripheral, leads us to expect that ASL agrammatic aphasics will pattern like English speaking aphasics in omitting verbal inflection. I know of only one relevant case, discussed in Bellugi et al (1983), and this aphasic patient did indeed drop the agreement morphology, as predicted.

3.3 The Null Subject Parameter

Thus far the evidence which we have considered in support of the analysis of inflection has been in some sense external to the theory of grammar. That is to say, we have seen that the analysis explains a number of properties of child language and

of language dissolution in aphasic speakers, but we have not yet considered how the Stem Parameter and related hypotheses might interact with other principles of grammar. Notice that the claim that inflection is a core component of a language leads us to expect that the grammatical role that it plays and its interaction with other aspects of grammar will be significant. Conversely, in those language where inflection is a peripheral property of a particular language we would predict that its grammatical function would be minimal. In this section I would like to show that this hypothesis is indeed supported. The evidence I will present relates to the interaction of the Stem Parameter and the null subject phenomenon.

It is well-known that certain languages permit phonologically null elements in subject position of tensed clauses. Examples from Italian are given below.

- (33) a. Vado al cinema stasera
'(I) go to the movies tonight'
- b. Piove spesso durante la primavera
'(It) rains often during the spring'

The languages which exhibit the null subject phenomenon seem to fall into two classes. On the one hand, there are languages like Italian, which have a relatively rich verbal morphology. In particular, in these languages the verb is inflected with the person, number and gender features associated with the subject. The second type of null subject language is the Chinese-like language which has no verbal morphology whatsoever.

Most accounts of the Null Subject Parameter have been concerned primarily with the Italian-like languages. A standard assumption made by virtually every theory of null subjects in these languages is that the agreement morphology is in some sense "rich" enough to license the null element in subject position (Taraldsen, 197 ; Chomsky, 1981; Jaeggli, 1982; Rizzi, 1982, and many others). Of course, the 'rich agreement analysis' cannot explain the presence of null subjects in languages like Chinese. Huang (1984) argues, however, that Chinese and similar 'discourse oriented' languages employ different grammatical devices for the licensing of null elements. In these languages the null subject of a non-embedded tensed sentence is sanctioned by the presence of a null sentence topic, which is in turn linked to the discourse topic via a rule of 'topic-chaining'; in a embedded context the null subject may also be licensed via control from the matrix subject.

Recently, Jaeggli & Safir (to appear) have suggested a different approach to the null subject phenomenon which provides a more unified account of the two kinds of null subject languages. According to Jaeggli & Safir, the crucial property which determines if a language permits null subjects is whether or not the language has "morphologically uniform" inflectional paradigms. If the paradigms are uniform, null subjects are permitted; if the paradigms are not uniform, but rather "mixed", null subejcts are not permitted. Their definition of morphological uniformity is as follows: A paradigm is uniform if all its forms are morphologically complex (consisting of stem and

affix(es)) or none of the forms are. A "mixed" paradigm, on the other hand, is one in which some of the forms are morphologically divisible while other forms are bare stems. Thus, on the Jaeggli-Safir analysis null subjects are possible in languages like Italian and Spanish since verbs are always inflected. Similarly, null subjects are permitted in Chinese-type languages since verbs are never inflected. In languages like English, in contrast, in which the verbal stem sometimes bears an affix and other times not, null subjects are out.

The Morphological Uniformity Principle is obviously very close in spirit to the Stem Parameter, though the latter was not intended to explain the null subject phenomenon. The intuition behind both proposals is that the grammatical status of verbal morphology varies from language to language. In certain languages, English for example, it is grammatically irrelevant, while in other languages, Italian for example, it plays a central role, interacting in a rather direct manner with other grammatical phenomena, such as the possibility for null subjects. And even in inflectionless languages such as Chinese, it is precisely the absence of inflection which is crucially responsible for the licensing of null subjects.[24] It is possible to translate Jaeggli & Safir's proposals into the framework adopted in this paper, and I will return to this shortly. Before doing that, however, I would like to diverge briefly to outline the approach to markedness adopted in this paper since this will be relevant to the discussion of null subjects

and the Stem Parameter.

Although seldom made explicit, there are two notions of markedness assumed in most syntax and acquisition analyses. The first kind of markedness refers to the various exceptions and relaxations of the principles and parameters of UG, what is referred to in this paper as 'the periphery.' The classic example of this notion of markedness is 'exceptional Case marking', discussed in Section 1. Notice that this kind of markedness is defined by purely formal criteria, that is, by virtue of its relation to (or distance from) principles of core grammar. The second kind of markedness, which is conceptually quite distinct from the first, is what we might call 'core-internal markedness.' This is the case in which one of the options made available by a particular parameter is assumed to be "unmarked" with respect to the other value(s). The unmarked value is typically determined by acquisition considerations. It is the value which is assumed by the child in the absence of evidence, or the value which cannot be learned on the basis of positive evidence alone. For example, Rizzi (1986) has proposed that the unmarked setting of the Null Argument Parameter is one in which null arguments are excluded. The child determines on the basis of positive evidence the contexts in which a particular language licenses null arguments. The view adopted in this paper is that there is no such thing as 'core-internal markedness' as such; that is to say, I assume that all values made available by a parameter are 'unmarked.' Marked rules and structures are those which involve deviations from core grammar.[25] The particular parameter setting which is chosen by

the child in the absence of evidence or seemingly disregarding evidence to the contrary, I will refer to as the default value of the parameter. Thus, the ASL facts suggest that [+bare stem] is the default value of the Stem Parameter, though by hypothesis neither value is marked. Similarly, I have argued elsewhere (Hyams, 1986) that [+null subject] is the default value of the Null Subject Parameter, though such a setting does not necessarily represent an unmarked state. [26]

Returning to 'morphological uniformity' and its relation to the Stem Parameter, we have the following situation. Those morphological systems which Jaeggli and Safir refer to a "uniform" correspond to the two options of the Stem Parameter, [+/- bare stem]. Thus, null subjects are permitted precisely in those languages which reflect the Stem Parameter in one or the other of its unmarked options. The morphological paradigms which Jaeggli and Safir define as "mixed", in contrast, are those which on my analysis involve relaxations of a Stem Parameter setting, that is, systems which we have identified as marked. The absence of null subjects in these languages follows on the assumption that the morphology in these languages is not grammatically strong enough to sanction an empty category. Notice that the claim is not that inflection must be "morphologically rich" in order to permit null subjects. As Jaeggli and Safir and others have pointed out, this is a problematic notion, and clearly will not explain the Chinese-like languages. Rather, I am claiming that there is a more abstract notion of "grammatical strength"

and that this is measured in terms of the distance of an inflectional system from core grammar. In this sense, then, Chinese morphology is grammatically strong since it instantiates an unmarked option made available by a parameter of core grammar, i.e. [+bare stem]. In short, where the inflectional system of a language is unmarked, as in Italian and Chinese, null subjects are possible; where it is marked as in English, null subjects are not permitted. [27]

In this section I have argued that the Stem Parameter and the core/periphery analysis of inflection presented in Section 2 is motivated not only by the acquisition and aphasia data, but also receives theory internal support from the manner in which it interacts with another parameter of core grammar the Null Subject Parameter.

3.4 Conclusion

Let me conclude by saying that the analysis of inflection proposed here obviously needs to be tested against the acquisition data of other languages - especially since morphological systems vary a fair amount from language to language.[28] However, irrespective of the ultimate correctness of the specific analysis I have proposed, I hope to have made several more general theoretical and methodological points: First, that it is not necessarily the intuitive complexity of the data which makes the acquisition of a particular construction or grammatical phenomenon difficult, but rather the complexity of

rule systems, where we understand "complexity" to mean degree of deviation from core grammar; second, that sometimes what appears to be acquisition of a single aspect of grammar, eg. verbal inflection, complex sentences, often involves development in several different domains which interact in very subtle ways; third, that data from language acquisition (and other theory-external areas) can provide insight into the structure of UG and particular grammars; and finally that the core/periphery distinction as a theory of markedness can go quite a long way in explaining a number of properties of real-time grammatical development.

Notes

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[1] Here and throughout this paper, I use the terms "marked" and "peripheral" interchangeably. This may not in fact be exact. It would seem that idiosyncratic lexical properties are peripheral, though they need not be marked. For the purposes of this paper, however, I will continue to ignore this distinction. The acquisition predictions are unaffected by this sloppiness since peripheral properties, marked or not, are expected to be late as compared to core properties.

[2] See for example Hamburger & Crain (1982) who argue persuasively that children acquire relative clause constructions in a step-wise fashion.

I should also note that the term "construction" is used solely for ease of exposition and has no theoretical status.

[3] It is important to emphasize that I am not suggesting that

all of core grammar must emerge before any peripheral properties are realized. Rather, the claim is that with respect to a particular grammatical phenomenon the core properties associated with that phenomenon will emerge prior to the peripheral ones. This point should become clear as the paper proceeds.

[4] I should note that the analysis presented in Hyams (1983; 1986) which explains the acquisition of modals as an effect of the setting of the pro-drop parameter also does not account for the emergence of to alongside the modals.

[5] For example, Limber (1973) notes that most modals appear in simple declarative sentences several months after instances of the complement verbs. Similarly, Bellugi (1967) found that the modals lagged 3 to 8 months behind the semi-auxiliaries. Pinker (1984) reports that modals and semi-auxiliaries do appear at about the same time. However, of the former category he cites only the forms can't and don't as occurring at this early stage. As noted by Bellugi and others, however, can't and don't are initially analyzed by the child as negative markers and not modals.

[6] One prediction of this analysis is that in a language in which modals function as main verbs which take sentential complements, for example Italian, the modals should be acquired alongside true verbs and semi-auxiliaries. This is in fact the case. Abstracting away from the effects of semantic complexity, Italian speaking children do not exhibit any delay in the acquisition of modals relative to other verbs. See Hyams (1986) for further discussion of this issue.

[7] I am grateful to D. Bickerton (personal communication) for first suggesting to me that small clauses are misanalyzed as sentences.

[8] These observations contrast with those of Pinker (1984), who reports that raising verbs and equi (control) verbs emerge at roughly the same point. However, the verbs which Pinker cites as raising-to-subject are the modals (but cf. note 5) and semi-auxiliaries, not pure raising verbs like seem, etc. I will discuss the raising analysis of semi-auxiliaries in the following section.

[9] See Chomsky (1981) and references cited there for discussion of the theories of government and (abstract) Case.

[10] In contrast to Chomsky's analysis, Pesetsky (1985) proposes that the ECM facts associated with believe-type verbs follow from the fact that these verbs, in contrast to the try-type verbs, take true complements, that is, complements which are sisters to V. (The try-type verbs take complements which are sisters to V'.) There are a number of other properties which distinguish these verb classes and also verbs of the want type (see note 14), which fall out nicely from Pesetsky's analysis.

The more general point of Pesetsky's paper is to argue that

the complement structure associated with the particular verb classes noted above is linked in a rather direct manner to certain semantic properties of these verbs. For example, Pesetsky suggests, (simplifying greatly) that if a verb selects an agent subject (eg. try) then its clausal complement cannot be a true complement in the above sense. Thus the verb try, for example, which selects an agent does not take a true complement and hence the subject of its complement is not local enough to be Case marked from the matrix verb. Verbs like want and believe, in contrast, do not select agent subjects.

Theories of semantic bootstrapping of the sort proposed by Pesetsky (see also Grimshaw, 1979;1981 and Pesetsky, 1982) are important because they provide a mechanism by which the child can deduce certain syntactic properties of complements based on lexical properties associated with particular matrix verbs. On the assumption that the idiosyncratic lexical properties must be learned in any case, the more grammatical structure which can be deduced from these lexical properties the easier the acquisition task.

With respect to the particular phenomenon under discussion, that is, the acquisition of complements to these different verb types, Pesetsky's analysis would appear to make somewhat different predictions than the analyses presented in the text. According to Pesetsky's theory children do not need to learn which verbs exceptionally Case mark. Rather, a child acquiring his grammar would need to learn only the selectional properties of the matrix verbs; the syntactic properties, including whether or not the verb is an "exceptional" Case marker, would follow. (On Pesetsky's account the Case marking is not in fact exceptional.) While selectional properties are indeed idiosyncratic to particular verb classes and hence need to be learned by the child, the thematic roles associated with a particular verb is certainly a much more accessible piece of information than learning whether the verb is an exceptional Case marker or not. For one thing, the thematic properties can be learned on the basis of simple sentences, while uncovering the Case marking property requires input of at least one embedding. Thus, it is expected that a syntactic property which is derivable from selectional restrictions should be a rather early acquisition. In effect, once the child knows the meaning of a particular verb, and hence the thematic role assigned to its subject, the syntactic properties should follow immediately. Unfortunately, the acquisition data do not seem to bear out this prediction. As noted in the text, the Case marking properties associated with verbs like want and believe are acquired later than would be expected on a bootstrapping analysis.

[11] In order to explain the absence of passives in early language, Borer & Wexler (1987) argue that the early grammar lacks the principle of A-chain formation, which allows for the non-local assignment of θ -roles. This has the effect of blocking NP movement. If, as Borer & Wexler argue, A-chain formation is not operational, then a raising analysis of semi-auxiliaries would be excluded for this reason as well.

[12] This is also proposed in Pinker (1984).

[13] Bloom et al (1984) report that the first occurrences of for complementizers appear with the following matrix forms: time for, hard for, too early for, enough for, and ready for. They further note that the for complementizer is extremely rare in their data and appears only towards the end of the period under study.

[14] Following work by Friedin & Lasnik (1979) Pesetsky (1985) argues against the for deletion analysis of want. He proposes instead that the exceptional Case marking properties of want-type verbs follow from the fact that they take a "true" complement at S-structure (see note 10). In this respect Pesetsky's analysis of want is more consistent with acquisition facts than the analysis discussed in the text. Specifically, on his analysis it does not follow that the child must know that want takes a for complementizer before producing sentences like (17). However, as noted above (see note 10) a semantic bootstrapping analysis, such as Pesetsky proposes, also predicts that the child will know the idiosyncratic syntactic properties of want once he knows the selectional restrictions of the verb. Thus, contrary to fact, we would not expect sentences like (17) to be delayed relative to simple control structures like 'I want to go.'

[15] Bloom et al. also note that lexical complementizers seem to be learned in connection with particular matrix forms. A similar observation is made in Phinney (1981).

[16] Slobin (1973) and others have proposed that the ease with which a child acquires a particular inflectional paradigm is dependent on a number of different factors, including semantic transparency, perceptual salience, and morphological regularity. While each of these factors certainly influences the rate of acquisition of particular affixes, the hypothesis being advanced in this paper is that the primary determinant of morphological development is the centrality of inflection in the particular grammar being acquired.

Although Slobin's proposals and the one being suggested here are not necessarily incompatible, there are a number of instances in which they do make different empirical predictions. For example, according to Slobin, a paradigm which is regular, semantically transparent and perceptually salient should be a relatively easy paradigm to learn. On my analysis, these factors would be largely irrelevant if inflection is not a core property of the particular language being acquired.

[17] As we will see in the discussion of the acquisition of ASL in section 2.4, when the input data are very mixed; some forms requiring affixes and others not, the child sets the Stem Parameter at the [+bare stem] option. I will refer to this as the "default" value, as distinct from the "unmarked" value. This issue will be discussed further in section 3.3.

[18] Clancy (1987; personal communication) notes that Japanese

speaking children behave very much like Italian and Polish children with regard to the phenomenon under discussion. In particular, she notes that "a striking feature of the acquisition of Japanese is the precocious control of verbal inflection" (1987; p. 425).

Following Slobin (1973), Clancy suggests a number of factors which may account for the early acquisition of verbal inflection in Japanese. She notes that verbal inflections are (1) perceptually salient (occurring in utterance-final position), (2) morphologically regular, (3) usually semantically distinct, and (4) very frequent in the adult input to children. The reason for the frequency, Clancy observes, is that "there is no base form of the Japanese verb so that every verb which a child hears is necessarily inflected for some tense/aspect" (p. 427).

Although factors such as perceptual salience, morphological regularity, and semantic distinctness contribute to the ease with which children learn particular affixes (cf. note 16), I would argue that these factors have a different status than the fourth one which Clancy cites. On the analysis which I am proposing the fact that the Japanese child, like the Italian child, does not hear an invariant verb form leads him to set the Stem Parameter such that bare stems are impossible and it is this setting of the parameter which triggers the early learning of affixes.

The distinction which I am making here (see also note 16) between the acquisition of particular affixes and acquiring the knowledge that affixation is a grammatical requirement of a language will be discussed in more detail in section 2.4.

[19] It is also the case, as noted in Brown (1973), that children do not overgeneralize -ing to stative verbs. This fact has led many researchers to assume that very young children understand the stative/process distinction and the semantic restriction on -ing. While it is possible that children do know the process/stative distinction very early on (see Cziko (1986) for impressive cross-linguistic evidence to this effect.), it does not follow that they analyze the progressive verb form as bimorphemic. An alternative explanation, and one which would account for the absence of overgeneralization, is that the child initially learns each progressive form as a separate unanalyzed verb and hence uses only those forms that he has heard in the input language, that is, non-stative verbs.

[20] Although the Stem Parameter analysis provides an account of the Phase III acquisition data, it does not easily handle the facts of Phase II (to age 2;0). Clahsen notes that during the earlier stage German speaking children use predominantly the 0 affix (discussed in the text) and the n affix (which marks 1st and 3rd person plural in the adult grammar). The account of inflection proposed here predicts that children will either drop inflectional endings completely or avoid bare stems. A parameterized account of this sort precludes a situation in which the child systematically uses both a 0 affix and lexical affixes.

There are a couple of possible explanations for this state of affairs, both of which were suggested to me by H. Clahsen.

First, Clahsen notes that there is some individual variation with regard to the use of 0 and n; some children prefer the former and others the latter verb form. It is thus possible that individual children choose different values along the Stem Parameter. Those that set the parameter at [-bare stem] use -n, while those that set the parameter at [+bare stem] tend to use zero affixation. While there is nothing in the Stem Parameter analysis which precludes individual variation of this sort, it is difficult to imagine, given the degree to which the language is inflected, how a German speaking child could arrive at a [+bare stem] setting.

A second possibility is that the Phase II child has not yet set the Stem Parameter and that this happens only during the period characterized by overgeneralization of inflection and pronominal copying, discussed in the text. This would entail that during Phase II the verbs which the child uses are essentially unanalyzed forms. The question which arises here is why should it take German children longer to set the parameter than the other children discussed thus far. Unfortunately, I have no satisfactory answer to this question.

[21] It is not entirely clear why mastery of the agreement system with non-present referents (age 5-6) is so much later than with present referents (age 3 1/2). At first glance it would seem that the difficulty lie in the child having to associate a referent with an arbitrary abstract point in space (as opposed to a physically present object or individual). While the abstractness does appear to be a contributing factor, Lillo-Martin (1986) found that by age four children were able, in comprehension at least, to associate nominals with points in space. Since acquisition of agreement with non-present referents may involve factors which are not strictly linguistic in nature, we may assume for the purposes of this discussion that ASL speaking children acquire agreement roughly around age 3 1/2.

[22] I should note that the two values of the Stem Parameter generate languages which are disjoint sets, i.e. one language in which all verbal forms are inflected and another in which none are. Thus, the Subset Principle (Berwick, 1982; Manzini & Wexler, 1987)), which requires that when a subset relation exists the child first choose the value which generates the smallest language, is not applicable.

[23] These are hypothetical examples of the phenomenon discussed in Grodzinsky, 1984. The actual Italian examples he cites involve complications which are irrelevant to the present discussion.

[24] As is the case with most recent accounts of the Null Subject Parameter, Jaeggli & Safir distinguish two conditions; a 'licensing condition' on the appearance of null subjects and an 'identification mechanism' responsible for recovering the referential value of the empty subject. The Morphological Uniformity Principle constitutes the licensing condition on null subjects. There are a number of mechanisms by which the content of an empty subject may be identified; rich agreement, as in

Italian, or by null topics and matrix subjects, as in Chinese. Rizzi (1986) and Lillo-Martin (1986) have also proposed that the licensing of null arguments is distinct from identificaiton.

[25] I do not mean to exclude the possibility of other kinds of markedness. For example, it may be that there exist implicational relations between parameters such that in the unmarked case if Parameter A assumes a value x, then Parameter B assumes a value y; otherwise the grammar is marked. This possibility is discussed in more detail in Hyams (1986).

[26] See Hyams (1986) for further discussion of this issue.

[27] ASL is an apparent counterexample to this claim insofar as it is a null subject language with peripheral morphology, if the analysis proposed in the previous section is correct. ASL is a strange kind of null subject language, however, in that null subjects are permitted with both inflecting verbs and the plain (i.e. non-inflecting verbs). Lillo-Martin (1986) argues persuasively that ASL represents a cross between an Italian and Chinese-type language; the inflecting verbs sanction null subjects via rich agreement (the standard analysis of Italian-type languages), while the plain verbs use the devices characteristic of discourse-oriented languages, proposed by Huang (1984). Interestingly, null subjects are also possible with uninflected tokens of inflecting verbs. (Recall that inflection on the inflecting verbs is optional.) In this case, the null subject is also sanctioned in the Chinese way. Thus ASL is a basically a discourse-oriented language which, in addition, allows null pronominal subjects with a specific class of verbs when they are inflected.

In order to reconcile the null subject facts and the inflectional properties of ASL we need to adopt the distinction between the licensing and identification of null arguments (cf. note 24). Intuitively, what seems to be going on in ASL is that null arguments are licensed by the discourse-orientation of the language, though inflection on the inflecting verbs is one of the mechanisms of identification (along with null topics and matrix subjects). Thus, while peripheral inflection is not strong enough to license a null subject, it may nevertheless identify it. Unfortunately I have been unable to formalize this idea within the framework adopted here. However, an analysis along these lines is developed in Hyams & Jaeggli (in preparation).

[28] As a case in point, D. Slobin (personal communication)) informs me that in Turkish, a highly inflected language, the verb does, on rare occasion, surface as a bare stem, for example in the simple imperative form, eg. ver 'give'. Slobin notes further that children do not put affixes on the imperative verb, as would be predicted by the account proposed here. Rather, Turkish children make strikingly few errors of any sort in learning a complex inflectional system, while still using the (marked) imperative in its correct bare stem form.

Closer inspection of the data, however, reveals that Turkish children do not assign the inflected and bare forms

precisely the same status. This is shown by the relative order of acquisition of the inflectional verbal paradigms and the bare stem imperative form. Atso-Koc and Slobin (1985) note that "much of the verbal paradigm is mastered by 24 months of age or earlier. By this age Turkish children inflect ...the verb for tense-aspect (past result, ongoing process, intention), person, negation and interrogation" (p. 845). They also report, in a discussion of the acquisition of 'politeness norms,' that "Request forms expressing degrees of politeness are acquired in a progressive sequence between the ages of 2 and 4 (p. 869)," the first of these forms being the bare infinitive form noted above. Thus, the bare stem imperative form appears to be acquired at age 2, a point at which the child has already mastered many of the other inflected verb forms. If this is the case, the Turkish data are in fact consistent with the analysis proposed in this paper - the later development of the imperative being due to its marked status. I should further note that the relatively late acquisition of the imperative cannot be attributed to any semantic or conceptual difficulty with the construction since the imperative is acquired very early in many other languages.

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