On the Nature of Syntactic Variation:

Evidence from Complex Predicates and Complex Word-formation

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The existence of substantive parametric variation in syntax, as characterized in (Chomsky 1981), has been questioned in the more recent generative literature, notably in (Borer 1984), (Fukui 1986), and (Chomsky 1993). The present paper provides converging evidence from child language acquisition and comparative syntax for the existence of a syntactic parameter in the classical sense of (Chomsky 1981), with simultaneous effects on syntactic argument structure (e.g. verb-particle constructions) and complex word-formation (root compounding). The implications are first that syntax is indeed subject to points of substantive parametric variation as envisioned in (Chomsky 1981), and second that the time course of child language acquisition is a potentially rich source of evidence concerning the innate constraints on language variation.[*]

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1. Theoretical background. A central question for syntactic theory is whether cross-linguistic variation is a "deep" domain of inquiry - in other words, a domain in which general, explanatory principles are operative. The question is logically independent of the existence of substantive universals of human language. In principle, points of syntactic variation could be limited to superficial, listed idiosyncrasies within an otherwise invariant and richly structured language faculty.

1.1. The Nature of Syntactic Variation. The Principles-and-Parameters Framework introduced in (Chomsky 1981) permitted the statement of highly abstract constraints on cross-linguistic variation (in the form of parameterized principles of Universal Grammar, or UG), as well as "absolute" universals of human language (in the form of unparameterized UG principles). Indeed, early research in the P&P Framework led to the proposal of a number of parameterized principles, each permitting two or more distinct parameter settings with broad consequences for the surface characteristics of the resulting grammar. For example, Travis (1984) proposed parameterized principles of Head Government and Theta Government, whose interaction with independently motivated universals of Government Theory accounted for complex patterns of cross-linguistic variation in word order.

More recent research within the generative tradition, however, has called into question the existence of broad, parameterized principles of the kind envisioned in (Chomsky 1981). Notably, work of Richard Kayne (1984) and Luigi Rizzi (1982) has emphasized the importance of "microparameters" in accounting for the syntactic variation observed across closely related Romance dialects. Proposed microparameters are typically expressed in terms of lexically listed, morphosyntactic requirements of functional heads. The recent emphasis on microparameters, in combination with various empirical and conceptual problems that were discovered in earlier

"macroparametric" proposals, has led many generativists to doubt the existence of genuine macroparameters of syntax (cf. among others Rizzi 1989 on the Subjacency Parameter).

A competing view, however, has been championed by Mark Baker in his (1996) work on polysynthetic languages. Baker argues that both macroparameters and microparameters are needed to account for observed patterns of cross-linguistic variation. The greater explanatory role of microparameters in the research on Romance dialects is attributed by Baker to a methodological artifact: The operation of macroparameters is evident only if one compares genetically and typologically diverse languages, because closely related languages tend to be extremely similar in their macroparametric choices.

Questions of methodology are critically important for the additional reason that macroparameters, by definition, are more abstract than the surface characteristics of grammar that they help to determine. Thus, macroparameters are relatively unlikely to be discovered by simple cross-linguistic comparisons of surface properties, in the absence of a larger theoretical framework derived from fine-grained analyses of individual languages.[1] For example, the operation of a macroparameter could easily be obscured by the existence of two distinct arrays of parameter settings, each of which gives rise to similar surface constructions: A given language could present a spurious counterexample to a valid macroparametric generalization, by allowing (the semblance of) a particular surface construction without the predicted grammatical concomitants.

Hence, the present paucity of convincing macroparametric analyses may well reflect the limited number and variety of languages for which there exist detailed, theoretically sophisticated grammatical analyses; or indeed may reflect more general deficiencies in the grammatical framework theories that are currently available. In order to circumvent the limitations of a purely

comparative approach, the present study adds a novel source of evidence: the time course of

child language acquisition.[2]

1.2. Complex Predicates. The present investigation focuses on argument structure, and more

specifically on structures that are typically analyzed as either "complex-predicate" or "small-

clause" constructions. English, for example, permits a main verb to combine with a secondary

predicate and form a new expression that semantically resembles a simple verb. Examples are

provided in 1. The paradigm cases are the resultative (1a), in which the main verb combines with

an adjective phrase (AP) (paint red); and the verb-particle construction (1b), in which the main

verb combines with a post-verbal particle (pick up).

(1)	a.	John painted the house red.	(Resultative)
	b.	Mary picked the book up / picked up the book	(Verb-Particle)
	c.	Fred made Jeff leave.	(*Make*-causative)
	d.	Fred saw Jeff leave.	(Perceptual report)
	e.	Bob put the book on the table.	(*Put*-locative)
	f.	Alice sent the letter to Sue.	(*To*-Dative)
	g.	Alice sent Sue the letter.	(Double Object Dative)

Certain syntactic analyses treat the main verb and secondary predicate of these constructions as

forming a syntactic "complex predicate." Analyses of this type can be found in (Larson 1988a,b;

1990), (Hale & Keyser 1993), (Chomsky 1993), and (Marantz 1993), among others, although

some of these authors do not extend the approach to the full range of constructions in 1.

Alternative approaches include the small-clause analyses of (Stowell 1983), (Kayne 1985),

(Hoekstra 1988), and (Den Dikken 1995), and the Zero-Syntax analysis of (Pesetsky 1995). For

expository convenience I will refer to the constructions in 1 simply as "complex predicates," but with the understanding that several different syntactic approaches are possible.

An illustration of the distinctive semantic properties of English complex predicates is provided in 2. The simple transitive sentence in 2a describes a pure process or activity (cf. Vendler 1967), and is therefore more fully compatible with the simple durative modifier for an hour, than it is with the telic (or "endpoint-bounded") modifier in an hour.

(2)   a. John hammered the metal (for an hour)/(?? in an hour).

b. John hammered the flat metal (for an hour)/(?? in an hour).

c. John hammered the metal until flat (?for an hour)/(?? in an hour).

d. John hammered the metal flat (?for an hour)/(in an hour).

Addition of the attributive adjective flat in 2b, or even the adverbial modifier until flat in 2c, does not substantially alter the acceptability of the aspectual modifier in an hour. Yet, creation of the complex predicate (resultative) in 2d profoundly alters the aspectual properties of the sentence, as indicated by the full acceptability of in an hour. The complex predicate thus exhibits the aspectual character of an accomplishment predicate, in which the eventual flatness of the metal provides a natural endpoint (or "telos") for the hammering process.

The availability of the complex-predicate constructions in 1 varies across languages. For example, Romance appears to be a strong candidate for a language group in which complex predicates of the English type are systematically excluded. The Romance languages have long been noted to contrast with English and other Germanic languages in that they exclude resultative constructions of the type in 2d (cf. Green 1973, Kayne 1984, and especially Levin & Rapoport 1988). Furthermore, the Romance languages systematically lack direct counterparts to the English verb-particle, make-causative, and double-object dative constructions.[3] If we speculate that the availability of the "complex-predicate family" of constructions is indeed a point of

parametric variation, then the resultative construction is perhaps the most appropriate diagnostic for the family's availability, because it does not involve any idiosyncratic, closed-class lexical items (in contrast to the verb-particle construction), and because it displays, in an especially clear-cut form, the characteristic semantic properties of the complex-predicate class (e.g. the creation of an accomplishment predicate, in 2d, from an activity verb and an adjective).

Evidence from child language acquisition supports the hypothesis that English complex-predicate constructions constitute a natural class, interrelated by shared dependence on a single, parametric property of English. Stromswold & Snyder (1995) and Snyder & Stromswold (1997) have employed longitudinal transcript data from the CHILDES database (MacWhinney & Snow 1985, 1990) in a study of the spontaneous speech of twelve children learning English. Age of first clear use served as a measure of acquisition for each of the sentence-types in 1b-g, all of which are used with high frequency in the speech of adults and older children.[4] The major result, supported by a variety of statistical measures, was that <u>every child</u> acquired the sentence-types in 1b-g as a group.[5]

Thus, evidence from child language acquisition supports the view that the complex-predicate constructions of English depend on a single, parametric property of the grammar. As soon as a child acquires any one of these constructions, the others quickly follow. Yet, a major question remains: What, precisely, is the parametric property that the children are acquiring? In particular, can the property be represented within the lexical entry for some single, abstract functional head, or is it a more "global" characteristic of the grammar that cannot be reduced to the properties of any single lexical item?

A possible answer to these questions is suggested by research on the syntax of Dutch and Afrikaans: Complex-predicate constructions in these languages commonly involve overt morphological compounding. This suggests that the morphological availability of productive

root compounding, as a global property of the language, could perhaps be the crucial prerequisite

for syntactic availability of complex predicates.

In Dutch (Neeleman & Weerman 1993, Neeleman 1994), the word order possibilities for

resultatives and verb-particle combinations are unusually restrictive (3a,b) (Neeleman &

Weerman:436, ex.6-7).

(3)   a. ... <u>dat Jan de deur (vaak) groen (*vaak) verfde</u>.

                  that John the door (often) green (*often) painted

              '... that John often painted the door green.'

        b. ... <u>dat Jan het meisje (vaak) op (*vaak) merkte</u>.

                  that John the girl (often) up (*often) noticed

              '... that John noticed the girl.'

Despite the usual flexibility of word-order in the Dutch <u>Mittelfeld</u>, an adverb cannot intervene

between a verb and an associated result predicate (3a) or particle (3b).

Similarly, LeRoux (1988) reports that Afrikaans verb-particle combinations (e.g. <u>af+kyk</u>

'off+look') behave as a unit in a variety of syntactic contexts, as for example when V-raising

applies to an embedded clause in 4a, b (Le Roux:241, ex.9a).

(4)   a. <u>Hy sal nie [die antwoorde by   my e] kan af + kyk   nie</u>.

                  he will not the answers   from me   can off look not

              'He will not be able to crib from me.'

        b. *<u>Hy sal nie   [die antwoorde by   my af   e] kan kyk nie</u>.

                  he will not   the answers   from me off   can look not

              'He will not be able to crib from me.'

Both Neeleman and Le Roux analyse the Dutch/Afrikaans facts as follows: The complex

predicates in these examples are morphological compounds. In other words, certain complex

predicates in Dutch and Afrikaans have not only the semantic properties, but also the morphological properties, of a single, complex word.[6]

1.3. Morphological Compounds. The present investigation tests the following hypotheses: First, English complex predicates necessarily involve a morphological compound at some abstract level of grammatical representation, even though they do not exhibit the morphological characteristics of a compound in the surface form of a sentence. Second, the point of grammar that children are acquiring when they suddenly begin producing English complex-predicate constructions, is the knowledge that the type of compounding required for complex predicates is available in English. Third, the relevant type of compounding is productive, endocentric root compounding.

More precisely, the proposal is that the constructions in 1 all depend on the marked value of a parameter that is fundamentally a parameter of morphological compounding:

(5) Compounding Parameter: The grammar {disallows*, allows} formation of

endocentric compounds during the syntactic derivation. [*unmarked value]

The idea behind the formulation in 5 is that morphological compounds can be created in at least two ways: as deliberate coinages (independently of the setting of 5), and as automatic products of syntactic derivation (when 5 assumes the marked value). The latter process accounts for the extreme productivity of endocentric compounding in English (taking the marked setting of 5), where a compound such as frog man, for example, can be called into service to designate a man with almost any type of connection to frogs: a man who resembles a frog, behaves like a frog, or collects frogs, for example.

As detailed in (Bauer 1978), the situation is quite different in French (taken here to have the unmarked setting of 5), where the corresponding compound homme grenouille (lit. 'man frog') is

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restricted to its original, lexical sense of 'underwater diver'. Deliberate coinages of the French type have an interpretation fixed at the time of coinage, while syntactically derived compounds of the type permitted by English can be interpreted compositionally, in much the same way as syntactic phrases. For this reason, English root compounds can be created spontaneously, unconsciously, to fit the needs of the moment.

The present view of productive compounding is an extension of ideas in (Baker 1988). Baker abandons the Strong Lexicalist Hypothesis of (Chomsky 1970), and argues instead that certain processes of word-formation occur by means of the syntactic combination of heads (especially head-to-head movement). On his approach, morphology simply imposes well-formedness conditions on heads, and applies equally to heads formed during, and heads formed outside of, the syntactic derivation. As in the present discussion, operations of word-formation that occur in the syntax are associated with particular productivity, while operations of word-formation that take place "in the lexicon" (i.e. outside the syntactic derivation) are less productive.

Yet, actually allowing English root compounding to take place in the syntax is a departure from Baker's system. Baker assumes that the formation of English compounds occurs in the lexicon, because of the generic, non-referential interpretation of the N in an English (gerundive) N-V compound such as man-watching (Baker 1988:78-81). Following DiSciullo & Williams (1987), he assumes that words are "islands" with respect to referential properties. At the same time, he takes the process of N-incorporation in Nahautl, for example, to involve syntactic head-to-head movement, with the result that the N kočillo 'knife' in a structure such as ki-kočillo-tete'ki '3sS/3sO-knife-cut' binds a trace outside the complex word, and is potentially referential ('He cut it with the knife'; Baker 1988:79, based on Merlan 1976).

An alternative explanation for this difference in referentiality, however, would be that N-incorporation in Nahuatl involves head-to-head movement of the N out of the head position of a

full NP, while root compounding in English involves the direct syntactic merger of two heads (cf. Chomsky 1995, 1998 on "Merge" as a generalized transformation). If referential interpretation of the N depends on having a full NP (and perhaps a DP) in the tree, but only N-incorporation is compatible with this additional structure, then we can capture the observed difference in referentiality even if English root compounding occurs in the syntax.[7]

2. Method and Results. Two empirical predictions follow immediately from the idea that the formation of complex predicates depends on syntactic compounding. First, across languages, the availability of complex predicates (as found in English) should pattern closely with availability of productive root compounding (e.g. N-N compounding). Second, in children acquiring English, the age at which complex predicates are first used productively should correspond very closely to the age at which novel root compounds are first produced.

2.1. Cross-linguistic Survey. The first prediction was evaluated by a cross-linguistic survey, the major results of which are summarized in Table 1. The survey was limited to languages for which native informants were readily available, but nonetheless included a substantial range of language groups: Afroasiatic, Austroasiatic, Austronesian, Finno-Ugric, Indo-European (Germanic, Romance, Slavic), Japanese-Korean, Niger-Kordofanian (Bantu), and Sino-Tibetan, as well as American Sign Language and the language-isolate Basque.[8] A language was judged to have productive N-N compounding only if it permitted truly novel (non-lexical) N-N compounds, and did not require any overt morphological or syntactic connective to combine the nouns.[9] As can be seen in Table 1, complex predicates (as diagnosed by resultatives of the type in 2d) patterned quite closely with productive root compounding (as diagnosed by grammaticality of novel N-N compounds). Examples are provided in Appendix A.[10, 11]

Insert Table 1 about here.

Observe that Basque provides a clear example of a language in which nominal compounding is fully productive, yet resultatives are unavailable. Hence, despite the strong tendency in Table 1 for nominal compounding and resultatives to pattern together, the relationship must be unidirectional: Root compounding is a necessary, but not sufficient condition for the availability of resultatives.[12]

Notice also that Arabic and Hebrew receive here a tentative classification as non-compounding languages, despite the availability in these languages of construct-state expressions. This is because Semitic construct states overlap, in their morphological and syntactic properties, both with nominal compounds (Borer 1988) and with possessive phrases (Ritter 1991). Yet, given that both Arabic and Hebrew lack the resultative construction, either decision on the productivity of compounding will be consistent with the more general pattern observed in the cross-linguistic survey: Resultatives are available in a given language only if nominal compounding is productive.[13]

While the evidence reported here, from my own informant work, is fully consistent with this generalization, certain potential counterexamples have been reported in the Romance syntax literature. In particular Italian, like the other major Romance languages, lacks productive, endocentric compounding. Yet, Napoli (1992) argues that Italian does permit certain resultative constructions (cf. also DiSciullo 1996). Thus, although Italian disallows 7, some speakers reportedly permit 8.

(7)   *Gianni ha martellato il metallo piatto. (ex. 73)

'Gianni hammered the metal flat.'

(8)   Ha dipinto la macchina rossa. (ex. 74)

'He painted the car red.'

Napoli argues that sentences with AP result predicates are possible in Italian, but only if the main verb is interepreted as "focusing on the endpoint" of the event it describes (Napoli 1992:53).[14] In other words, the relevant difference is that in English, but not Italian, one can add a result AP to a simple activity predicate and thereby create an accomplishment predicate. Hence, I conclude that the type of resultative requiring productive root compounding is this "English" type that potentially converts an activity verb into an accomplishment predicate.

In summary, the generalization remains that resultatives of the English type are found only in languages with productive endocentric compounding. Nonetheless, confident identification of surface constructions from different languages as grammatically equivalent or disparate is clearly a delicate matter. Confidence in the general picture presented by the cross-linguistic survey of this section will be greatly increased if supporting evidence can be provided from a second domain of investigation. The following section presents converging evidence from child language acquisition.

2.2. Children's Acquisition of English. The second prediction of Section 1.3, namely that any given child learning English should acquire complex predicates and productive endocentric compounding at approximately the same age, was tested in a study of spontaneous production data for ten children from the CHILDES database (MacWhinney & Snow 1985, 1990). The ten children were a subset of those studied in (Snyder & Stromswold 1997). The age of acquisition for a given grammatical construction was taken as age of first clear use; later transcripts were checked in all cases to confirm that the "first clear use" was followed soon afterward by regular use (cf. Stromswold 1996).

The diagnostic for productive compounding was novel N-N compounding; N-N compounding is the most frequently used form of compounding in English. To count as novel, a child's N-N

compound could not be a lexicalized form (e.g. toothbrush, apple juice), and the context of the

child's utterance had to support the interpretation that the compound was invented on the spot.

Indeed, the latter criterion was surprisingly easy to satisfy, as children were often found

"teaching" new compounds to the adults in the transcripts.

The age of acquisition of a variety of complex predicate constructions had already been

determined for each child in (Snyder & Stromswold 1997). In addition to the age of acquisition

of productive N-N compounding, a number of new control measures were obtained for each

child: the age at which the child's mean length of utterance (MLU) first reached or exceeded 2.5

words; the age of first clear use of a lexical N-N compound, such as toothbrush; and the age of

first clear use of an Adjective-Noun combination, such as big dog. The MLU measure was a

control for the possibility that complex predicates and productive compounding might be

acquired together simply because both form a part of the "grammar explosion" that occurs at the

transition between Brown's (1973) Stages II and III. More generally, MLU=2.5 serves as a

proximate developmental milestone, allowing one to assess the contribution of general

developmental factors to the timecourse of acquisition for compounding and complex predicates.

Lexical N-N compounds and Adjective-Noun combinations serve as closely matched controls for

the conceptual complexity and length of utterance of novel N-N compounds.

The results, in brief, were as follows. Ages of first clear use of a novel N-N compound were

exceptionally well correlated with the ages of acquisition reported in (Snyder & Stromswold

1997) for verb-particle constructions (1b) ($\underline{r}$=.98, $\underline{t}$(8)=12.9, $\underline{p}$<.00005); these ages are graphed in

Figure 1. The ages for novel N-N compounding were also robustly correlated with the ages of

acquisition for causative and perceptual constructions (1c,d) ($\underline{r}$=.91, $\underline{t}$(8)=6.27, $\underline{p}$=.0002), put-

locatives (1e) ($\underline{r}$=.95, $\underline{t}$(8)=9.09, $\underline{p}$<.00005), to-datives (1f) ($\underline{r}$=.88, $\underline{t}$(8)=5.18, $\underline{p}$=.0008), and

double object datives (1g) ($\underline{r}$=.77, $\underline{t}$(8)=3.45, $\underline{p}$=.0086). Indeed, beyond a simple correlation, the

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ages of acquisition for novel N-N compounding and most types of complex predicates were extremely similar, as illustrated by the fact that the best-fitting line indicated in Figure 1 is very nearly an identity function.[15] On the other hand, to-datives were generally acquired somewhat later than the other complex predicates, as discussed in (Snyder & Stromswold 1997).

<center>INSERT FIGURE 1 ABOUT HERE</center>

When the contribution of each of the control measures is subtracted out, through a partial regression procedure, all of the above correlations remain statistically significant, except for the correlation between compounding and double object datives. The double object construction thus appears to be something of an outlyer among the complex predicate constructions, when viewed in relation to morphological compounding. After partialing out the contribution of the ages at which MLU first reaches or exceeds 2.5 words, a statistically significant portion of the remaining variance in the ages of acquisition for novel N-N compounding can still be accounted for by the ages of acquisition for verb-particle constructions (r=.94, t(7)=7.41, p=.0001), causative/perceptual constructions (r=.77, t(7)=3.14, p=.0164), put-locatives (r=.88, t(7)=4.87, p=.0018), or to-datives (r=.80, t(7)=3.41, p=.0133), but not double object datives (r=.59, t(7)=1.95, p=.0919, marginally significant).

Similarly, when ages of first clear use of a lexical N-N compound are partialed out, a significant portion of the remaining variance in ages of acquisition for novel N-N compounding can still be accounted for by verb-particle combinations (r=.95, t(7)=7.72, p=.0001), causative/perceptual constructions (r=.79, t(7)=3.34, p=.0124), *put*-locatives (r=.90, t(7)=5.54, p=.0009), or to-datives (r=.86, t(7)=4.55, p=.0026), but not double object datives (r=.37, t(7)=1.06, p=.3259, NS). Finally, when ages of first clear use of an Adjective-Noun combination are partialed out, a significant portion of the remaining variance in ages of acquisition for novel N-N compounding can once again be accounted for by verb-particle combinations (r=.95,

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t(7)=8.45, p=.0001), causative/perceptual constructions (r=.82, t(7)=3.77, p=.0070), put-locatives (r=.91, t(7)=5.87, p=.0006), or to-datives (r=.88, t(7)=4.99, p=.0016), but not double object datives (r=.48, t(7)=1.43, p=.1954, NS). (First clear uses of novel compounds, lexical compounds, and A-N combinations are provided in Appendix B.)

Double object datives are thus a possible exception to the compounding/complex-predicate generalization. While the ages of acquisition for double object datives are significantly correlated with the ages for novel N-N compounding, the correlation becomes non-significant after one subtracts out the contribution of a control measure (MLU=2.5, A-N, or lexical N-N), through partial regression. At least two explanations are possible: First, the English double object construction may not in fact depend on the availability of productive root compounding. Second, the double object dative may depend on both productive compounding and some other, late-acquired prerequisite; hence, compounding alone would be a relatively weak predictor of when the double object datives become available to the child.

The first possibility predicts that double object datives and novel compounds can enter the child's speech in either order. The second possibility, however, makes a distinctive prediction: No child will begin to produce double object datives significantly earlier than novel compounds. This prediction was checked against the data from the ten children in the study, and appears to be correct. Of the ten children studied, five produced their first double object dative later than their first novel N-N compound, three produced their first double object dative in the same transcript as their first novel N-N compound, and two ("Eve" and "Allison") first produced a double object dative earlier than their first novel compound.

Yet, for neither Eve nor Allison is the delay statistically significant. Eve produced exactly one double object dative in her corpus before the first novel N-N compound. The relative frequency of double object datives and novel N-N compounds in her later speech (based on the

last two transcripts in her corpus) was 4:15 (datives:compounds). Hence, sampling one double

object dative before the first novel compound is fully consistent with the two constructions

becoming available concurrently, and the gap is non-significant by modified sign test ($\underline{p}$ = .211,

NS). Similarly, Allison produced only two double object datives before her first novel N-N

compound. Based on the relative frequency of 4:3 (datives:compounds) in her speech in the last

transcript of her corpus, the gap is again non-significant, and fully consistent with concurrent

acquisition of the two constructions ($\underline{p}$=.327, NS). Hence, despite the relative "noisiness" of the

data for double object datives (and leaving open the identity of the proposed second prerequisite),

the available evidence still supports the conclusion that the double object dative has productive

compounding as one of its prerequisites.[16]

3. Discussion. The preceding sections have presented converging evidence, from cross-

linguistic variation and child language acquisition, for a strong association between complex

predicates and morphological compounds. These findings are problematic for the view that

points of parametric variation in syntax are strictly confined to the lexical entries of functional

heads, such as T^0 and D^0 (cf. in particular Chomsky 1993). This view would require that some

single, independently motivated functional head find a natural role both in complex predicates

and in a morphological compound such as coffee cup. Yet, English compounds are well-known

to resist the inclusion of overt functional morphology (cf. Kiparsky 1982), rendering doubtful any

proposal of a null functional head in such a compound.

The inclusion of covert syntactic material in root compounds would perhaps gain plausibility

if root compounds could in fact be syntactically derived from whole sentences, as in the

proposals of (Lees 1960, 1970) and (Levi 1973, 1974, 1975). Yet, such proposals have been

sharply criticized by Downing (1977), who argues that there is no fixed, finite set of possible

semantic relations between the modifier and the head in English nominal compounds (cf. also

Gleitman & Gleitman 1970). Rather, the possible semantic relations vary as a function of

pragmatic factors, such as whether the compound is intended "as a category label or merely a

demonstrative device" (Downing 1977:839), and also as a function of the semantic class of the

head N (e.g. natural object vs. synthetic object). If Downing is correct that the possible

interpretations of an English N-N compound cannot be deduced from the details of its syntactic

derivation, then the argument for a rich syntactic structure in such compounds is correspondingly

weakened.

   Thus, somehow reducing the Compounding Parameter of 5, repeated below, to the

information contained in the lexical entry of a single functional head, would seem to be a

distortion of a qualitatively different type of parameter.

  (5) Compounding Parameter: The grammar {disallows*, allows} formation of

     endocentric compounds during the syntactic derivation. [*unmarked value]

The setting of the parameter in 5 is presumably a general property of morphology, potentially

affecting a vast range of open-class morphemes. This parameter is "lexical" in the very general

sense that it governs principles of word-formation, but it is not by nature tied to any single lexical

entry. Hence, 5 is perhaps compatible with the view that the child's acquisition of syntax reduces

to acquisition of the lexicon, but only under a very broad sense of "lexicon" that would include

quite general properties of word-formation, independent of any single lexical entry.

   An interesting characteristic of the "Lexical Hypothesis," as developed in (Borer 1984),

(Fukui 1986), and (Chomsky 1993), is that acquisition of syntax might proceed in a manner

parallel to word-learning: The child learning syntax would simply be acquiring the lexical entries

for closed-class, null and overt, word-level items. The type of connection between syntactic

knowledge and the lexicon that is most compatible with the compounding/complex-predicate

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parameter, however, does not permit an exclusively "word-learning" approach to the acquisition

of syntax, although it is of acquisitional interest in the somewhat weaker sense that it adds a new

domain of morphology (viz. complex word-formation) as a possible source of evidence about

language-particular properties of syntax.[17]

The central role of productivity in characterizing the relevant type of morphological

compounding is also noteworthy. As observed by Spencer (1991:323,324), the generative

literature on morphological compounding has (surprisingly) tended to neglect the issue of

productivity in general, and the issue of cross-linguistic variation in productivity in particular. If

one adopts the view that productivity is an essential property of Germanic compounding, then the

lack of <u>productive</u> N-N compounding in Romance might in itself be taken as a clear example of a

point of grammatical variation that cannot be tied to any single lexical item. With the evidence

from syntactic complex-predicate constructions, however, the argument that productivity of

compounding is a genuine point of parametric variation becomes considerably stronger.

Moreover, the evidence from complex predicates makes it clear that the point of parametric

variation cannot be restricted, in its consequences, to morphology proper.

The nature of the connection between productive compounding and complex predicates is an

important issue, but will only be touched on here, as it remains a topic of on-going research. (For

additional discussion see Snyder 1995a; Snyder 1995b, Section 2.4; and Beck & Snyder 2001).

In brief, the connection appears to be semantic in character: The distinctive semantic

characteristics that unify the complex-predicate constructions derive from a mode of semantic

composition available only within endocentric compounds. The restriction can be stated more

precisely as in 7.

(7) The Complex Predicate Constraint: Two syntactically independent expressions can

jointly characterize the event-type of a single event-argument, only if they constitute a

single word (endocentric compound) at the point of semantic   interpretation.

To see how 7 works, recall that the resultative predicate in 2d describes a (telic) accomplishment

event, while the non-resultative predicates in 2a-c instead describe (atelic) activities.

(2) a. <u>John hammered the metal (for an hour)/(?? in an hour)</u>.

b. <u>John hammered the flat metal (for an hour)/(?? in an hour)</u>.

c. <u>John hammered the metal until flat (?for an hour)/(?? in an hour)</u>.

d. <u>John hammered the metal flat (?for an hour)/(in an hour)</u>.

Moreover, the accomplishment event described by 2d comprises two subparts: in the

terminology of (Parsons 1990), a "development" subpart (the activity of hammering the metal)

and a "culmination" subpart (the achievement event in which the metal finally becomes flat).

Crucially, both the verb <u>hammered</u> and the adjective phrase <u>flat</u> participate in characterizing the

event-type described by the verb phrase; in this case, <u>hammered</u> contributes the development, and

<u>flat</u> contributes the culmination, of an accomplishment-type event.[18]

According to 7, this state of affairs is possible only if <u>hammered</u> and <u>flat</u> are subparts of an

endocentric compound at the point of semantic interepretation (LF). Yet, these expressions

clearly function independently in the syntax, as evidenced by the fact that they are discontinuous

in the sentence's surface structure. Hence, formation of the relevant endocentric compound must

take place during the syntactic derivation, and such compound-formation in the syntax is possible

precisely because English takes the marked setting of the Compound Parameter in

5.[19, 20]

4. Conclusions. Language acquisition and comparative syntax provide converging evidence for a parameter that determines both the availability of productive, endocentric compounding, and the availability of a range of syntactic "complex-predicate" constructions. This Compounding Parameter resists reduction to the lexical entry for a functional head or other closed-class lexical item, however, because no such closed-class lexical item has yet been independently motivated in root compounds. Thus the Compounding Parameter appears to be a substantive parameter, in the classical sense of (Chomsky 1981). The present study demonstrates the considerable potential of child language acquisition as a testing ground for hypotheses about the nature of Universal Grammar.

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Appendix A: Cross-linguistic Data

[Transliteration of non-Roman writing systems is only approximate.]

(A1) <u>Examples of Resultatives</u>

    a. HE HAMMER METAL BECOME FLAT.   (ASL, word-by-word gloss)

       [The word glossed as BECOME is obligatory.]

    b. John hammered the metal flat.   (English)

    c. Hans hämmert das Metall flach.   (German)

       John hammers the metal flat

    d. A munkás lapos-ra kalapácsolta a fémet.   (Hungarian)

       the worker flat-Trans hammer-Pst the metal

       'The worker hammered the metal flat.'

       [The result predicate is marked for translative case; cf. also Marácz 1989:223]

    e. John-ga teeburu-o kiree-ni hui-ta..   (Japanese)

       John-Nom table-Acc clean wipe-Pst

       [The predicate *kireeni* appears in a tenseless form used both for result predicates and

        adverbials]

    f. Kira wai daik kpaet.   (Khmer)

       Kira hit metal flat

       'Kira beat the metal flat.'

    g. John-i   teibl-ul   kekuti tak-at-ta.   (Korean)

       John-Nom table-Acc clean   polish-Pst-Complementizer

       'John wiped/polished the table clean.'

       [The predicate *kekuti* appears in a tenseless form used both for result predicates and

        adverbials]

h. Ta   ba   tie guan da ping.   [Tones omitted]   (Mandarin)

   (s)he BA iron pipe hit flat

   '(S)he beat the iron pipe flat.'

   [The direct object *tie guan* necessarily appears in a preverbal BA phrase.]

i. Ja: t'up lo:ha? haj bae:n.   [Tones omitted]   (Thai)

   neg-imper hammer metal HAJ (be-)flat

   'Don't hammer the metal flat.'

   [The particle HAJ is obligatory.]

(A2) Paraphrases Required in Place of Resultatives

   a. Lokoda taroktuel hadide haete?osbohoh mosoto?han.   (Arabic, Egyptian)

      Lokoda beat   metal/iron until-it-became flat

      'Lokoda beat the metal until it became flat.'

   b. Gorri-z   atz-azal-ak   pintatzen ari naiz.   (Basque)

      red-with/in finger+covering-Pl painting AUX

      'I am painting my finger nails with/in red.'

   c. Jean a martelé le métal jusqu'à ce qu'il était plat.   (French)

      John has hammered the metal until-to that that-it be+Pst flat

      'John hammered the metal until it was flat.'

   d. Dani tzavaA ?it ha-bayet bi-?adoom.   (Hebrew, Modern)

       Dani painted P(Acc) the-house in-red

      'Dani painted the house in (the color) red.'

   e. [Tukang pande-nipun] mande wesi ngantos gepeng.   (Javanese)

       worker forge-Poss   beat iron until   flat

      'The blacksmith beat the iron until (it was) flat.'

f. Joe abisi ndako na modobo motani. (Lingala)

Joe he-paint house with paint red

Joe painted the house <u>with</u> red <u>paint</u>.

g. Ivan pokrasil dom v krasnyj tsvet. (Russian)

John paint-Pst house in red color

'John painted the house <u>in</u> the color red.'

h. John je ofarbao kucu u crveno. (Serbo-Croatian)

John is painted house in red

'John painted the house <u>in</u> (the color) red.'

i. Juan golpeó el hierro hasta que estaba plano. (Spanish)

John beat-Pst the iron until that be-Pst flat

'John beat the iron <u>until</u> it was flat.'

(A3) <u>Examples of Novel Compounds</u>

a. BANANA BOX (ASL, word-by-word gloss)

(for 'a box in which bananas are stored')

b. liburu-kutxa (Basque)

book   box

(for 'a box in which books are stored')

[See Saltarelli (1988:262) on the productivity of nominal compounding in Basque.]

c. worm can (English)

(for 'a can in which fishing bait is stored')

d. Wurmkanne (German)

worm+can

e. giliszta vedér   (Hungarian)

   worm bucket

f. bananabako   (Japanese)

   banana+box

   [Rendaku converts hako to bako.]

g. kapong jole:n   (Khmer)

   can worm

h. pelley-thong   (Korean)

   worm+can

i. you ji   (Li & Thompson p.50, ex.53, tones omitted)   (Mandarin)

   oil stain   (for 'a stain caused by spilling oil on clothing')

   [See Li & Thompson 1981:48-54 on the productivity of nominal compounding in

    Mandarin.]

j. na:m map'raw   (Thai)

   liquid coconut

   'coconut juice'

   [See Warotamasikkhadit 1963:59-69 and Fasold 1968 for early generative treatments of

    nominal compounding in Thai.]

(A4) Paraphrases Required in Place of Novel Compounds

a. sandu? el moz   (Arabic, Egyptian)

   box-of banana [construct state construction]

b. boite aux verres   (French)

   can for-the worms

c. kufsat tulaAim   (Hebrew, Modern)

   can-of worm [construct state construction]

d. bok ngangge wadah pisang   (Javanese)

   box for contain banana(s)

e. linzanza mpo-na mpambo   (Lingala)

    can   for   worms

e. banka dlja chervej   (Russian)

   can for worms

f. konzerva za crve   (Serbo-Croatian)

   can for worms

g. bote de/con gusanos   (Spanish)

   can of/with worms

Appendix B: Examples from Children's speech. (Ages in years.)

(B1) First novel N-N compounds:

Child	Age	Novel N-N Compound
Adam	2.26	tatoo man
Allison	2.33	animal cup
April	2.08	pig book
Eve	1.83	pig (=peg) toy
Naomi	1.92	bunny girl
Nathaniel	2.47	Big+Bird book
Nina	1.99	zoo book
Peter	1.87	tape+recorder button
Sarah	2.59	ribbon hat
Shem	2.25	bunny+rabbit record

(B2) First lexical N-N compounds:

Child	Age	Lexical N-N Compound
Adam	2.26	apple juice
Allison	1.72	baby doll
April	1.83	apple juice
Eve	1.50	tomato soup
Naomi	1.75	tape (re)corder
Nathaniel	2.47	snow ball
Nina	1.98	peanut butter
Peter	1.77	suit case
Sarah	2.27	ice cream
Shem	2.21	orange juice

(B3) First A+N Combinations:

Child	Age	A+N Combination
Adam	2.26	big horn
Allison	1.62	big baby
April	1.83	brown bear
Eve	1.50	good girl
Naomi	1.68	bad girl
Nathaniel	2.47	little boy
Nina	1.96	little rabbit
Peter	1.93	big tunnel
Sarah	2.30	bad lion
Shem	2.21	good juice

	Resultatives	Productive N-N Compounding
American Sign Language	YES	YES
Austroasiatic (Khmer)	YES	YES
Finno-Ugric (Hungarian)	YES	YES
Germanic (English, German)	YES	YES
Japanese-Korean (Japanese, Korean)	YES	YES
Sino-Tibetan (Mandarin)	YES	YES
Tai (Thai)	YES	YES
Basque	NO	YES
Afroasiatic (Egyptian Arabic, Hebrew)	NO	NO (?)
Austronesian (Javanese)	NO	NO
Bantu (Lingala)	NO	NO
Romance (French, Spanish)	NO	NO
Slavic (Russian, Serbo-Croatian)	NO	NO

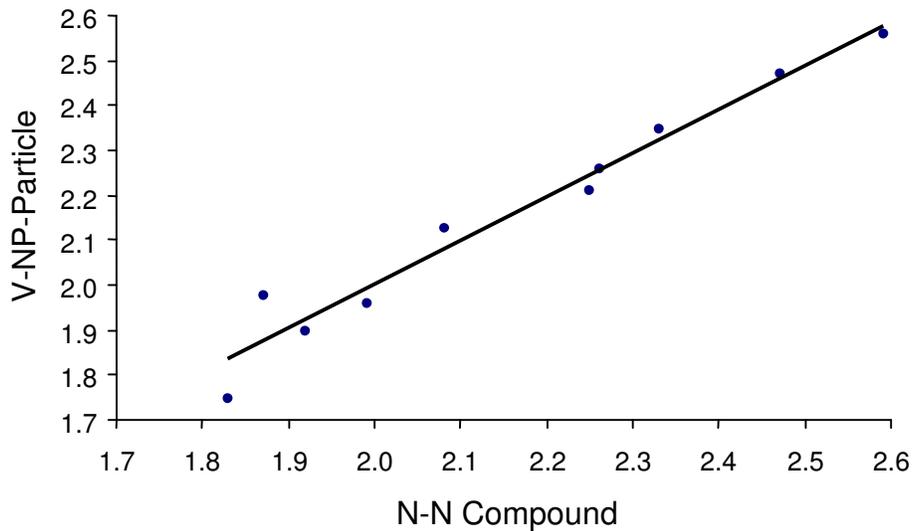Table 1. Results of Cross-linguistic Survey.

Figure 1. First N-N compound versus first verb-particle combination (ages in years).

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[1] In particular, Greenberg's (1966) program for the discovery of implicational universals suffers from this difficulty. See (Hoekstra & Kooij 1988) for discussion.

[2] In this way the present study follows a suggestion of (Croft 1995:91) to supplement typological evidence with "other sources of data (e.g. direct or comparative historical evidence, child language development, and intralinguistic variation)."

[3] Two caveats are in order here. First, it should be noted that Romance does provide at least superficial counterparts to some of the other English constructions (1) that have received complex-predicate analyses. This may simply indicate that some of the surface forms in 1 are ambiguous in structure. Also, it should be noted that the Germanic languages, which generally

resemble English in permitting <u>most</u> of the constructions in 1, do not necessarily permit <u>all</u> of the

constructions. For example, the English double-object (double-accusative) construction (1g)

lacks a direct counterpart in German, as illustrated in i, where morphological dative-marking (not

accusative-marking) is required on the definite article of the indirect object. Hence, even

languages that allow complex predicates in general, may disallow specific complex-predicate

constructions for independent reasons.

(i) *Hans hat den Mann das Geld gegeben.

Hans has the-Acc man the-Acc money given

'Hans gave the man (Acc.) the money (Acc.).'

[4] The resultative construction (1a) unfortunately had to be excluded from the spontaneous-speech

analysis, because of its extremely low frequency in the speech of both children and adults.

[5] A considerable variety of possible non-grammatical explanations for this pattern have been

tested and ruled out. The details are reported in (Snyder & Stromswold 1997).

[6] Notice, however, that neither Dutch nor Afrikaans <u>consistently</u> requires an overt compound in

complex-predicate constructions. For example, as discussed by Neeleman (1994), Dutch V2-

movement routinely separates the main verb from the remainder of a complex predicate.

[7] The present approach to root compounding, based on syntactic merger of heads, is further

developed in (Roeper, Snyder, and Hiramatsu 2001).

[8] Notice that the alternative approach of relying on reference grammars, rather than native-

speaker consultants, would have permitted a larger sample, but with an associated risk that the

terminology and diagnostics could be inconsistent across sources. See (Newmeyer 1998, Section

3.4.1) for discussion.

[9] For example, French constructions involving the preposition *de* or *à* were excluded (e.g. sortie de secours 'emergency exit', lit. 'exit of rescue'). Likewise, constructions involving oblique declensional morphology closely corresponding to French de or à would not be classified as N-N compounds; cf. Russian prazdnik pjesni 'song festival', lit. 'festival of-songs'. Notice that all the languages in the present sample permit N to serve as a nominal modifier with the help of an adposition and/or oblique case-marking, but the availability of bare-N compounding distinguishes a proper subset of the languages.

[10] The results presented here diverge in some cases from the results reported in (Snyder 1995b), because of more flexible diagnostic criteria in the present study. In (Snyder 1995b) a potential resultative construction was excluded if it contained any material absent from the English resultative, such as the ASL word glossed as BECOME in Appendix A, 1a. In the present study, the element BECOME in ASL, and haj in Thai, are regarded as possible overt counterparts to a null morpheme in the English resultative (cf. among others Snyder 1995a). Use of the predicate paint the house red, as a paradigm case of the resultative, has also been reconsidered in light of the finding that certain languages (e.g. Javanese) allow this as the sole example of an (apparent) resultative. Hence, unavailability of paint the house red is taken as evidence for unavailability of resultatives more generally, but a language has been counted as genuinely permitting resultatives only if additional examples are attested (e.g. beat the metal flat, wipe the table clean). Finally, a broader range of examples has been considered in the present study, to assess the productivity of nominal compounding in a given language. See (Miyoshi 1999) for discussion of problems with the (Snyder 1995b) diagnostic for compounding, when applied to Japanese.

[11] If we count Slavic, Romance, and Germanic as distinct groupings, the cross-linguistic sample included a total of thirteen language groups. While this is relatively small, the observed

contingency nonetheless reaches statistical significance by Fisher Exact Test; two-tailed

$\underline{p}$=.00466. In other words, the probability of the observed association occurring by chance, if

resultatives and compounds in fact varied independently across language groupings, would be

about five chances in a thousand.

[12] If one chose to exclude from the class of true resultatives those constructions involving extra

morphology (e.g. translative case-marking in Hungarian), then languages in the category of

Basque, with productive compounding but no resultatives, would become more numerous in this

survey.

[13] Clark (1993) provides several reasons to doubt that Hebrew construct states are equivalent to

English compounds. First, their productivity is relatively low in spoken Hebrew, as evidenced by

the fact that many lexical borrowings initially brought into the language as compounds have

since been replaced with non-compound forms (Clark, p.173). Second, in contrast to English,

where nominal compounding is a major source of children's novel words by the age of two to

three years, children acquiring Hebrew make virtually no productive use of compounding

through the age of six years (Clark, p.175).

[14] According to Napoli, the distinguishing characteristics of grammatical and marginally

grammatical resultatives in Italian all serve to make the main verb's natural endpoint more

salient. One of the more exotic focusing devices that she describes is emphatic doubling of the

result predicate, as in i.

    (i) Ho stirato la camicia piatta *(piatta). (exs. 109 and 112, pp. 74-75)

         'I ironed the shirt flat (flat).'

Interestingly, a similar effect of emphasis on the result predicate has been reported by Demonte (1991) for at least one variety of Spanish, as brought to my attention by Liliana Sanchez and Marcela Depiante (p.c.), and as shown in ii:

    (ii) Pedro edificó la casa *(muy) amplia. (ex. 2c, p.166).

       'Pedro built the house (very) wide.'

[15] While the acquisitional evidence presented here is restricted to children's acquisition of English, a number of recent studies provide support from children's acquisition of other languages, and from second-language acquisition in adults. Miyoshi (1999) reports that children acquiring Japanese begin to produce novel N-N compounds at approximately the same age as complex predicate constructions, and that no form of complex predicate construction appears significantly earlier than the first novel N-N compound. Sugisaki & Isobe (2001) find a close association between successful production of novel compounds and successful comprehension of resultatives in a laboratory study of Japanese children. Snyder & Chen (1997) report that children acquiring French, a language with the negative setting of the Compounding Parameter, acquire the N-de-N paraphrase of English N-N compounds significantly later than the paraphrases for English put-locatives, make-causatives, and verb-particle constructions; thus, as expected, the ability to form N-de-N expressions is not a prerequisite for these French argument structures. Slabakova (1999) reports that adult English-speakers learning Spanish exhibit similar performance across tasks testing their understanding that N-N compounding is unproductive in Spanish, and tasks testing their understanding that English-type double-object datives, verb-particle constructions, and resultatives are unavailable in Spanish. (See also Slabakova 1997 for related findings from adult speakers of Slavic languages learning English.)

[16] A reviewer suggests that the second factor could relate in some way to lexical learning, for example if the early double object datives always involved the same one or two verbs. Examination of the data revealed that the first verb used in a double object dative was <u>give</u> (for 5 children), <u>get</u> (3), <u>send</u> (1), or <u>read</u> (1). Other early double object datives (produced before the first <u>to</u>-dative) involved <u>bring</u>, <u>build</u>, <u>buy</u>, <u>make</u>, <u>show</u>, <u>tell</u>, or <u>write</u> (in the sense of 'draw'). The first verb used in a <u>to</u>-dative was <u>read</u> (4), <u>give</u> (3), <u>show</u> (1), or <u>get</u> (1).

While the range of early verbs in double object datives was reasonably large (not simply one or two verbs), the notion that lexical learning could have been exerting an excessive influence on the ages of first use for double object datives does receive some support. First, for six of the children, the frequency of double object datives was initially rather low, and then gradually increased. Hence, the ages of first clear use would have been a relatively "noisy" measure of grammatical knowledge for these children. Second, as noted in (Snyder & Stromswold 1997), the children managed not to overextend the double object dative to verbs with which it is impossible for adults (cf. *<u>Sue whispered Chris a secret</u>). This fact suggests that even when children recognize that the double object dative is syntactically possible in Englsh, they are still conservative in deciding, for a verb, whether it is compatible with the structure. Thus, lexical learning, in this sense, could perhaps be the "second prerequisite" for double object datives.

[17] A reviewer makes the interesting suggestion that functional heads might still play a central role in determining whether root compounding is productive in a given language. Specifically, if the presence of functional heads <u>interferes</u> with compounding, then compounding might be productive precisely in those languages without a layer of functional structure intervening between the head and the modifier of would-be compounds. This idea, in my opinion, warrants further investigation. Yet, it should be noted that it falls outside the realm of the Lexical

Hypothesis. One would need a way to force the presence of a layer of functional structure between the head and the modifier of every would-be compound in a non-compounding language, and it is unclear how to accomplish this, except by means of a global parameter of the sort disallowed by the Lexical Hypothesis.

[18] As discussed above in Section 2.1, Italian differs from English in permitting resultative AP predicates only when the main verb already has a salient end-point for the resultative predicate to modify. In the present terms, Italian cannot perform root compounding during the syntactic derivation, and therefore cannot combine an activity predicate with a stative predicate to create a description of an accomplishment event.

[19] Recall that overt combination of the result phrase with the main verb is found in Dutch examples such as (3), above. A reviewer adds that Swedish and Norwegian similarly permit optional, overt incorporation of a result adjective to the left of the main verb.

[20] Extension of this general approach to the remaining types of English complex predicate constructions in (1) requires that the aspectual properties (event structure) of those constructions be composed in a similar way, from syntactically independent expressions. Analyses of this type have been proposed in (Snyder 1995a) for verb-particle constructions and dative constructions. More general support for the approach comes from the observation that most or all of the constructions in 1 are associated with distinctive aspectual properties; for discussion, see in particular (Tenny 1994).