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DISSECTING THE ADJECTIVE
ORDERING CONSTRAINT IN ENGLISH

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English exhibits a number of phenomena which can be explained only by appealing to an interaction of different parts of the grammar. One of these is a constraint on adjective order. When a noun phrase contains more than one prenominal attributive adjective, the adjectives observe a strict ordering among themselves relative to the head noun. In this paper I present evidence for the mixed nature of this constraint. Previous accounts of the ordering constraint based on uniquely syntactic aspects of adjective-noun modification have been unable to predict adjective order, and explanations based on only semantic properties of the modification have failed as well. This study discusses the interaction of the syntax and the semantics in constraining adjective order.

But it is not enough to describe the mechanisms involved. We must look as well for reasons why there should be such a constraint on strings of adjectives. Drawing on research on the acquisition of modification, specific aspects of adjective order are seen to be related to strategies instituted for language learning. The role of the ordering effect is to serve as an aid

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in comprehension of an utterance during acquisition. I propose the Referent Identification Hypothesis, a heuristic principle which guides acquisition of modifier-noun sequences. While not all of the facts are accounted for, a significant reduction is made in what remains unexplained. Predictions of the analysis, as well as directions for further research, are discussed in the final section.

1. The Adjective Ordering Constraint

It is well recognized that there is a constraint on the order of prenominal adjectives. Dixon (1982), Hill (1958), Bever (1970), Quirk et al. (1985), and many others, have documented the Adjective Ordering Constraint (AOC), but with very few exceptions, they have fallen back on descriptive accounts of its function. In this section I review the facts concerning the AOC and the explanations which have been advanced for it. After discussing a few of these accounts, I summarize their common points.

1.1 Domain of the AOC

Since this portion of the paper is intended to be a pretheoretic discussion, I will use terms familiar from traditional grammars rather than more technical ones suggesting a formal analysis. First, I want to explicitly restrict attention to prenominal "attributive" adjectives, as in *the tall building*. I have nothing to say at this point about post-copular or "predicative" adjectives as in *the building is tall*, nor about any relationship between adjectives in the two positions.

Attributive adjectives follow any quantifiers or determiners in the noun phrase, but precede the head noun. They can be modified by degree terms, such as *really*, *quite*, *very*, *not particularly*, etc., but they may not have complements of their own.

- (1) a. a red dress
- b. many red dresses
- c. a very red dress
- d. *a red to the waist dress

There may be more than one prenominal adjective:

- (2) a. *depressing French novels*
 b. *the next great American hero*
 c. *a big round red cushion*
 d. *a poor little smashed pink plastic doll*
 e. *an ugly big round chipped blue Chinese vase*

The order of multiple adjectives is highly restricted. Other orderings of the adjectives in the examples given in (2) are extremely marked, if not strictly ungrammatical:

- (3) a. ?*French depressing novels*
 b. **the great American next hero*
 c. **a red round big cushion*
 d. **a plastic little smashed poor pink doll*
 e. **a blue Chinese ugly round chipped big vase*

Note however, that (3a) is acceptable when the adjective is contrastive:

- (4) *French depressing novels are usually more romantic than Australian ones.*

Further, if a comma, or list, intonation is used, all of the examples in (3) improve. Focus, contrast, and lists all involve a change in intonation. They also permit adjective orders which are not generally allowed under the AOC, so they are outside the purview of this paper. When an example is starred, "*" must be interpreted as unacceptability in normal speech, without special intonation or stress and outside of contrastive contexts.

Although the restrictions on adjective order have long been noted by grammarians, the basis for the constraint remains obscure. I will present some of the distinctions which have been made among adjectives and the ways these distinctions have been used to predict or describe adjective order.

1.2 Previous Treatments of the AOC

Dixon (1982:24) distinguishes pre-adjectival modifiers (determiners, possessives, cardinal and ordinal numerals) and post-adjectival modifiers (nouns indicating origin/composition or purpose/beneficiary) from adjectives proper. The ordered list of adjective classes which he gives is

- (5) Value (*good*) > Dimension (*tall*) > Physical Property (*rough*) > Speed (*slow*) > Human Propensity (*happy*) > Age (*old*) > Color (*green*)

Drawing on a literature-based corpus of 1150 examples, Goyvaerts (1968) provides a "scale" (shown in Table I) which incorporates the major divisions among adjective groups and gives a linear ordering of these finer distinctions. He includes some prenominal modifiers which the present work ignores, such as determiners and gerunds. Goyvaerts notes that certain adjectives seem to have privileged positions of occurrence unrelated to their categories, such as those in group 6a or "little", when used as a diminutive. His general principle places those adjectives which are

Table I. (21:Table 7)

9	8	7	6a	6b	5	4	3	2	1
DET	quality	size	old	color	nation-	style	gerund	noun	head
		shape	new		ality			little	
		length	young					(dim.)	

an	ugly	long	old	green	Spanish	---	---	---	boat

"broader, more comprehensive, more general, commoner, before the more specific, more particularising, more detailed, less common" (18).

The scale established by Svatko (1979) differs from Goyvaerts' in drawing more distinctions among size, shape and condition adjectives, but otherwise

seems to be essentially in agreement. The bottom line of Table II represents the correlations that Svatko found between this predicted order and the actual order of adjectives given by informants. Celce-Murcia and Larsen-Freeman (1983) comment that the ordering constraint seems not to be equally fixed for all types of adjectives and speculate that "adjective length" (i.e. phonological weight) may be a factor in the variability.

Table II. (from Celce-Murcia & Larsen-Freeman 1983:397)

determiner	opinion	size	shape	condition	age	color	origin	noun
an	ugly	big	round	chipped	old	blue	Chinese	vase
	.80	.96	.66	.79	.85	.77	1.0	

Clearly, occurrences of strings of seven adjectives modifying a head noun are extremely rare in actual speech. While these scales have descriptive value, it seems obvious that speakers of English would rely not on rules such as those encoded in the tables above, but rather on more limited comparative orders among groups of two or three adjective classes. This is what is more likely to be available to the language learner as input, and an approach which requires fewer distinctions to be made and remembered is, in general, to be preferred over one with more distinctions.

Studies of preferred order in noun phrases containing two or three prenominal adjectives have also been done. One recent work which draws on the predictions given above but restricts its focus to shorter noun phrases is Sproat and Shih (1988). Their data are used to support the claim that there are cognitively-based adjective ordering constraints in English, as well as in Mandarin, while their main theoretical point is that constraints of this sort occur cross-linguistically only in a specific type of noun modification structure. I will return to this theoretical claim below, in Section 3.2, but for now I will pay attention only to the data themselves.

In paired comparison tests controlled for phonological weight of the adjectives, Sproat and Shih found the following preferred orderings:

- (6) size > color
 quality > size
 quality > color
 size > shape
 size > shape > color
 color > material

Additionally, they found that adjectives of provenance (nationality, etc.) were usually placed directly before the noun, which they interpret as reflecting the fact that phrases like "Japanese lanterns" or "Swiss chocolate" usually indicate taxonomies, a recognized subclass of the larger class denoted by the head noun.

Sproat and Shih go on to argue that these findings support the claim that adjective ordering is predictable on some cognitive basis. Specifically, they use the criterion of "apparentness" to describe the orderings obtained. Drawing on a hypothesized computational complexity metric, involving the number of perceptual comparisons needed to determine the appropriateness of a given adjective in modifying a noun, they argue that the left to right ordering of prenominal adjectives in English correlates with the lesser to greater apparentness of the properties the adjectives denote. For example, they state that the surface reflectance, or color, of an object is more easily computed than its size, which must take into account what type of object is involved. In the phrase *a large red car*, then, to establish that the object is *red* requires fewer computations than to establish that it is *large* for a car. Apparentness is greater when fewer computations have to be made.

Next they attempt to link this with the semantic property of "predicativity" (cf. Kamp 1975). As Sproat and Shih define it (470, their (14)), an adjective is predicative if it passes the following test:

- (7) All X's are Y's
 Z is an (A)X
 Therefore Z is an (A)Y.

They found that more apparent or more taxonomic adjectives, especially of shape, color and provenance, are also more predicative in general. For example, "All mice are animals. Ralph is a big mouse, therefore Ralph is a big animal," fails the test for predicativeness, and "big" is not, by their criteria, an apparent adjective. "White", on the other hand, is apparent, and passes the test for predicativeness as well: "All mice are animals. Ralph is a white mouse, therefore Ralph is a white animal." Thus they lay claim to both cognitive and semantic grounds for the constraints on adjective order. They do not, however, provide any explanation for why these particular attributes (i.e. apparentness and predicativeness), and not others, should influence the linear order of adjectives.

It is important to note at this point a failing common to all the approaches discussed above. In each case, appeal is made to general conceptual categories such as "shape", "size", "condition", etc. The implication is that these categories are primitives in the grammar. But outside of the observed order of adjectives, these classes have no purpose. Thus an explanation which does not require postulating these classes is to be preferred over one which does. As I show below, it is possible to speak of adjective order in terms of semantic classes which are independently motivated in the grammar and achieve significant results in explaining the ordering facts without reference to the semantic field of the adjective.

In their discussion of apparentness and predicativeness, however, Sproat and Shih do not make use of the classes they establish. They do not speak of the apparentness of "size" adjectives so much as that of *small*, for example. Thus they make a break from their own system towards evaluating the properties of the adjectives themselves rather than of the classes. The classes are essentially superfluous in their approach if we order adjectives on the cognitive basis of apparentness.

In a series of articles published in the late 1960s and early 1970s, J.E. Martin pursued the psycho-

logical foundations of adjective ordering. He reviewed (in Martin 1969b) the attempts to explain adjective ordering operationally in the syntactic portion of the grammar (Vendler 1963a,b; Katz 1964; Annear 1964) and found them post hoc in that all of the mechanisms proposed served only to explain the observed ordering and played no other role in the grammar.

Next he surveyed the nonsyntactic proposals which emerge from the prescriptive grammars mentioned above. These include placing the adjectives closer to the noun according to

- 1) the extent to which their denotations depend upon the nouns they modify ("definiteness of denotation"),
- 2) the degree to which they denote properties inherent or essential to the denoted object ("closeness to the noun in meaning", or "substantiveness"),
- 3) the number of comparisons needed to decide if the adjective is appropriate to the noun modified ("absoluteness", cf. Sproat and Shih's "apparentness" discussed above), and
- 4) the adjective's ability to evoke imagery.

Martin ran a number of experiments designed to "...motivate discrimination of adjectives along a dimension in terms of which adjective order may be described" (1969b:698), testing each of the proposals listed above for the correlations between adjudged definiteness, absoluteness, etc., and actual adjective order.

His results showed that "definiteness of denotation" was the most accurate predictor of adjective order at a correlation of .92. Absoluteness correlated at .90 with adjective order, while substantiveness and imagery were at .87 and .51, respectively. He concluded that absoluteness and definiteness of denotation were essentially the same dimension, while imagery and substantiveness were predictors only by virtue of their correlations with definiteness. The same results were found with the antonyms of the adjectives Martin used in the initial studies, lending further support to the

hypothesis that the adjective order classes are semantic in nature.

Martin's research attempted to verify some of the predictions made by his hypothesis that definiteness of denotation was the major constraint on adjective order. Beginning with the claim that lexical item selection is an operation involving the choice of morphemes to express portions of the mental representation held by the speaker of what s/he wants to say, he proposed to test the idea that the order of adjective production in English is the inverse of the order of adjective choice. Head nouns were postulated to be chosen first, as evidenced both by the insight that topics are chosen prior to comments and by the context-sensitivity of many adjectives. Further scanning of the mental representation leads to choosing adjectives which denote specific properties of the noun to be modified. Definiteness, absoluteness, and substantiveness were three possible candidates for determining how adjectives matched up to nouns.

Martin studied the correlations between each of these dimensions and the accessibility of adjectives by measuring response latency times in a series of experiments designed to isolate these factors (Martin 1969a). Using visual input which could be classified on two equipollent dimensions, he first tested subjects' preferred order of adjectives, confirming his other work on the correlations between definiteness, absoluteness, or substantiveness and adjective order. Next he tested the hypothesis that adjective order encoding was a function of adjective accessibility. This involved cuing the subjects with the dimension term (e.g. "size") and eliciting an adjective as a response (e.g. "large"). The studies were run both for English and Indonesian, for reasons which I will discuss in a moment.

The results of these experiments supported the hypothesis that a shorter time was needed to access adjectives which were preferred closer to the noun. Positive correlations were found between the degree of definiteness of the adjective and its accessibility, as measured in reaction time of subjects to the verbal dimension cue.

I have many reservations about the experimental design which Martin used. First are those which arise from the difference in theoretical assumptions between

the model of syntax on which he based his hypotheses and those of more recent syntactic work. Martin assumes that the base-generated input is {N+VP, N+copula+A}, where this left to right order reflects the real-time ordering of the choice of morphemes while scanning the mental representation of the speaker's intended message. Three transformations are required to arrive at the surface, or production, order. The first creates a sort of relative clause construction, {N (N+copula+A) +VP}, which then undergoes reduction of the copula to {NA+VP}, and finally flips the adjective to prenominal position, the resultant surface order being {AN+VP}. We would not now claim the same copular deep structure for prenominally modified nouns, nor the transformations necessary to reduce it. (However, the claim that adjectives are initially generated post-nominally and later moved to prenominal position is still around, though in revised form, see Pesetsky (1987).) Rejecting this derivation would of course invalidate his interpretation of the cued response times.

Martin presented data on Indonesian adjective order to further support this hypothesis. Adjectives in Indonesian are postnominal and, according to his research, observe an ordering constraint which produces a mirror image of the English construction. He postulates that the mechanisms of adjectival noun modification in the two languages are identical with the omission in Indonesian of the final transformation which flips the adjectives to prenominal position in English. I return to these data in Section 3.2.

A final objection to Martin's methodology is that his visual displays consisted of four objects whose properties intersect on two dimensions. That is, there might be four circles, two large and two small, where one of each size is red and the other blue, resulting in unique specifications for "large blue circle", "small blue circle", "large red circle", and "small red circle".

Specification of a property, or dimension in Martin's terms, may be of three types. The first type is gradient, or scalar. A progression of values such as *hot/warm/cool/cold* is one of these, as are *tall/short*, *big/small*, *thin/thick*, *heavy/light*, etc. These adjectives denote properties which can only be evaluated relative to the norm expected for the noun which they modify. Second is the polar relation of antonyms such as *living/*

dead, organic/ inorganic. The third type is what I call privative¹. For these modifiers, no antonym is possible, nor are they graded on a scale of values (as, for example, *hot* is high on the scale of HEAT, whereas *cold* is low). The negation of these adjectives gives no information about the value of the property they describe. *Not red* does not tell us what color a thing is, nor does *not oblong* tell us its shape. The only information is from their positive specification: *red, black, square*, and so forth behave in this manner.

Both the second and third types of adjectives denote properties which are independent of the noun. The second divides the members of a given set into two subclasses, where each member will be either positively or negatively specified with regard to the adjective. In the case of the third type, the adjective selects an independent set of objects having the particular property it denotes. Modification of a noun by a privative adjective picks out intersection of the two sets.

Martin's research does not take these differences into account. By establishing "size" as a binary opposition in these tests, Martin moves it from a gradient dimension to a polar one. "Color" may also have become antonymic, as the materials establish *red* and *blue* as opposites. Therefore, "size" is no less absolute or definite than "color" in this study. The usual difference between gradience and intersectiveness, which underlies Martin's notions of relativity/absoluteness and indefiniteness/definiteness of denotation, is effaced.

1.3 Summary

There is a great deal of variety in the descriptive terms used in the studies discussed above. However, they can be summarized in a fairly straightforward manner. All of these data suggest that adjectives which denote properties which are independent of the noun are closer to the head, while those which are

¹My use of the concept privative owes more to phonological theory than it does to its use in Kamp (1975). What I mean here is that failure to have a given property, such as "red", has no consequence in terms of default or antonymic properties. If a thing is not "red", we do not know what color, if any, it is.

dependent on the noun's denotation are ordered farther from it. In general, we can distinguish five classes:

- 1) Adjectives which objectively compare the referent of the noun to the set which is its extension. These include *former, mere, utter, fake, certain, complete*, and others related to adverbs.
- 2) Adjectives which evaluate an individual relative to all the properties shared by the members of the set denoted by the head noun. Adjectives such as *good, useful, obnoxious*, etc. are members of this class.
- 3) Adjectives which evaluate an individual relative to a given property shared by the members of the extension set. This class includes *tall, long, hot, quick, smooth*, and other physical properties which are gradient. They make substantive distinctions within the set identified by the head noun.
- 4) Adjectives which are intersective, representing a property which defines a set independent of the head noun. Shape and color adjectives such as *round, square, oblong, green, blue, striped*, etc. are examples of this class.
- 5) Adjectives which restrict the extension of the noun. For instance, *Japanese, electric, or legal* may be used to limit the referent to a subclass with all the other properties of the extension left intact.

I will concentrate on Classes 3, 4, and 5 in the remainder of this paper, so it is worthwhile to discuss them here at somewhat greater length. Class 3 adjectives are essentially substantive, while Class 4 adjectives are intersective. This difference can easily be expressed in terms of set membership. (8a) represents the denotation of a noun, *chair*, modified by a Class 3 adjective, *big*. (8b) shows the modification of the same noun by a Class 4 adjective, *red*, which denotes a set on its own.

writing, all of which might enter into the evaluation of its goodness as a pen in general. One might wish to view this sort of context sensitivity as reliant on function or on possible worlds in which properties other than those which relate to a pen's utility as a writing device define its quality.

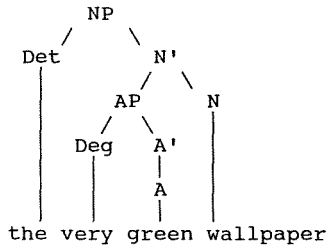
2. Background Assumptions

The present analysis rests on a number of assumptions about the syntax and semantics of adjectival modification. In this section I will digress from the AOC long enough to present the syntactic and semantic groundwork on which the analysis is based.

2.1 The Syntax of Adjectival Modification

The simplest view on the syntax of prenominal adjectives, within government and binding theory, is that adjective phrases are sisters of N:

(9)



However, the simplest account is not completely satisfactory on a number of points. First, as noted by many grammarians (for example, Quirk et al. (1985)), and discussed in recent work by Pesetsky (1987), there is a distributional split in English between adjectives with complements and those without. "Simple" adjectives or adjectives with degree modifiers can appear prenominal-ly, but postnominally these are highly restricted in occurrence.

- (10) *red door*
wooden partition
very large window
navigable river
 **door red*
 **partition wooden*
 **window very large*
 ?*river navigable*
 (cf. Bolinger (1967) for semantic restrictions on
 postnominal simple adjectives)

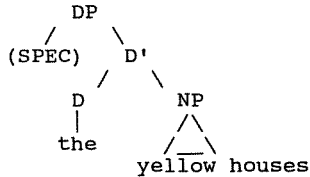
Yet complex APs containing complements to the adjective head can appear only postnominally, in most cases.

- (11) *a woman content with the world*
a coach proud of the team
 **a content with the world woman*
 **a proud of the team coach*
 (cf. *a content woman, a proud coach*)
a difficult book to read

It is not at all clear what should be said about this dichotomy: postposing complex APs and preposing simple APs have both been suggested (Pesetsky (1987), Quirk et al. (1985:420)). Di Sciullo and Williams (1987:51) have proposed the "Head-Final Filter" to explain what they see as obligatory post-posing of complex APs. In this view, APs remain in their base-generated pre-nominal position only if the adjective head is final within AP. Otherwise, the entire AP postposes. This is certainly descriptively adequate, though somewhat post hoc. Frazier (1980) provides motivation for post-posing on the basis of parsing constraints. For our purposes, we can restrict attention to prenominal simple adjectives at surface structure, so that all movements, if any, have already taken place.

Further problems with the simple structural analysis above include some raised by Abney (1987). In his presentation of the "DP-analysis", Abney discussed reasons why one might wish to view determiners as heading maximal projections of their own, within which NP is a sister of the determiner head, D:

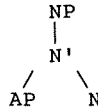
(12)



I shall assume this portion of his analysis without discussion: beyond the reasons given in his dissertation and supported in other work (Uriagereka 1988, Fukui and Speas 1986), it permits us to focus only on NP-internal modifications.² I do not pursue his suggestion that AP is the sister of D and that adjective heads select NP, however.

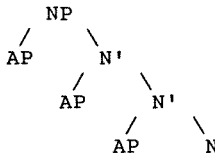
Thus far I am assuming a structure of the form

(13)

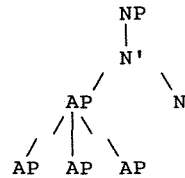


With multiple adjectives, it is necessary to decide among a number of alternative structures. (14) provides two examples:

(14) a.



b.



Problems arise with either construction. In the first, AP is dominated by and sister to a different pair of

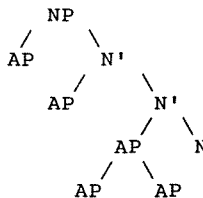
²It is also in keeping with work done in the Montague semantics framework, where determiners and quantifiers are functors which take common nouns (NPs) as arguments.

nodes in each of its occurrences. That is, the highest AP is daughter of NP and sister to N', the middle AP is daughter of N' and sister to N', and the lowest AP is daughter of N' and sister to N. If we wish to maintain a strong version of syntactic/semantic mapping, where bar-level attachment differences have semantic import, this structure implies that each AP has a different semantic interpretation with respect to the head N. Further, recursion should only be possible for the middle AP. The figure in (14b), however, avoids this problem by positing a sort of coordinate structure for AP modification. This structure implies that APs never participate in scopal relations with other AP modifiers of the same N head. Recursion of AP is, however, unlimited. Both of these approaches are wrong, at least in their strongest versions. We must be able to incorporate both scopal relations and recursion without scopal interactions, as shown by the examples in (15):

- (15) a. the big blue ball (context: two blue balls)
 b. the long thin box (context: only one box, or two boxes, where one is long and thin, the other is short and wide)

I propose, therefore, a compromise, as exemplified in (16), where both flat coordinate type iteration and different bar level attachments are available to the syntax. Coordination is available at all levels.

(16)



In the discussion below (Section 3.2), I present evidence that prenominal adjective strings may utilize both of these options and that the AOC is sensitive to level of attachment.

2.2 Semantics of AP Modification

Following Siegel (1976), I assume that adjectival modification of nouns can be treated within a compositional semantic framework. Siegel takes as her start the fragment of the semantics of English presented in Montague (1974). She extends the analysis to English and Russian adjectives and shows that there are two basic semantic types of adjectives: ad-Common Nouns (CN/CN) and predicate adjectives (t/e). In the syntactic model she assumes, these represent two different base-generated constructions:

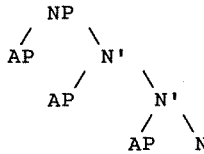
- (17) the ADJ_{CN/CN} N
 the N is ADJ_{t/e}

Both her semantic and syntactic analyses permit the derivation of one surface form from the other (though she does not treat instances of multiple adjective modifiers and does not offer any insights into the ordering of preposed predicate adjectives). While I am not entirely in agreement with some of Siegel's judgments, the major division she makes between basically intension-modifying ad-CNs and basically extension-modifying predicate adjectives seems essentially correct. She introduces a third class as well, the "measure" adjectives, which she claims are intermediate in function to the CN/CN and t/e types, but formally belong to the latter class.³ The distinction between measure adjectives and the other basic t/e adjectives is that the measure adjectives are nonintersective. This seems to correctly translate into a difference between Classes 3 and 4 as I described them in Section 1.3. Adjectives of Classes 1 and 2 correspond to her basic ad-CNs. (My Class 5 adjectives are treated as ad-CNs in Siegel's work, following Bolinger (1967), but I view them differently, as shown in the next section.)

³Siegel considers treating measure adjectives as basic CN/CN modifiers, subject to a meaning postulate which allows them to function as t/e modifiers in order to capture their nonintersective property, but rejects this approach as too powerful. More recent work in this framework (Partee 1987) proposes exactly this sort of operation, called "type-shifting", as a general principle of universal grammar. In light of this, it may be worth reconsidering the analysis which Siegel rejects, but that is beyond the scope of this paper.

The effect of Siegel's analysis is to provide a uniform syntactic behavior for prenominal adjectives, but to distinguish them semantically. I adopt the semantic portion of her conclusions, but I feel the syntax can and does reflect the semantic distinctions more directly. Recall that in (16) I proposed the structure repeated in (18) (without the coordination):

(18)



This syntactic structure can accommodate Siegel's semantic proposals if we recognize specific syntactic attachment sites for each of the distinct semantic classes she establishes. As shown in Table III, [AP,NP] is the syntactic attachment site for Siegel's

Table III. Syntactic-Semantic Correspondence

	nonintersective	intersective
CN/CN	[AP,NP] (sister to N') Class 2	none
t/e	[AP, N'] (sister to N') Class 3	[AP, N'] (sister to N) Class 4

basic ad-CN class (my Class 2), [AP,N'](sister to N') is the attachment site of the basic t/e measure adjectives (my Class 3) in prenominal position, and [AP,N'](sister to N) is the attachment site for the class of intersective basic t/e adjectives (my Class 4) in prenominal position. I am claiming a three-way distinction in the syntax which corresponds to the spirit, if not the letter, of Siegel's work. She

treats the measure adjectives as semantic doublets, able to pass as either attributive or predicative. In contrast, I explicitly embrace a distinct syntactic attachment site for them.⁴

The alternative to organizing AP attachment sites by means of the semantic classes of the adjectives would be to establish syntactic features on the APs which would have the same effect. These would be a sort of diacritic, and would serve no other purpose than to order adjectives in prenominal position. Presumably they would be part of the lexical entry for an adjective. They would be sensitive to whether the adjective was within an NP, had a complement, had a degree modifier of its own, and would only operate under the appropriate conditions. This is an unprecedented move: no other phenomenon in the language requires such specificity in the lexical entry. Having a diacritic feature (or features) which is active in the syntax is also very powerful, and has the potential to weaken traditional notions of the principled function of X-bar syntax and subcategorization.

In contrast, the classes distinguished here are needed in the grammar for reasons other than the ordering constraint. Siegel connects them to syntactic differences such as the ability to appear in predicate position and morphological differences such as those found between Russian long and short form adjectives. That they contribute to adjective order is no surprise when a direct semantic class-syntactic attachment site correspondence is recognized. The present analysis escapes the flaws of previous analyses in appealing not to post hoc ordering mechanisms or overly powerful lexical devices, but to independently motivated distinctions among classes of adjectives. In Section 3 I discuss in detail the motivation and function of the hierarchical organization of the semantic classes.

⁴Viewed in this way, the semantics may be inadequate in forcing us to devise some ad hoc means of isolating this class from the others such as Siegel's meaning postulate or a specification that they, and not others of their basic class, participate in type-shifting.

2.3 Thematic Adjectives

Finally, I wish to discuss one further piece of background theory which underpins my analysis. It is based on Levi's (1978) treatment of complex nominals. Her treatment is presented in a generative semantics framework, which I largely ignore, focussing instead on the existence of the relations she identifies rather than their formal expression.

Levi examines phrases such as "Martian expedition" or "electrical engineers" and concludes that these are ambiguously derived from noun predicate sequences. For instance, "Martian expedition" can mean "expedition to Mars", "expedition launched from Mars", or even "expedition launched by Martians". "Electrical engineers" are a proper subclass of the set of "engineers", those who work in electrical engineering, or (somewhat oddly), engineers who run on electricity. Under Levi's approach, the surface denominal adjective derives from an actual base-generated predicate. She isolates a restricted set of predicates, nine in all, and suggests that the derivation of some of these Adj-N (as well as some N-N) sequences contains, among others, the steps of predicate preposing and deletion:

```
(19) infection ## virus CAUSE infection ## >
      virus-caused infection >
      viral infection
```

Pragmatic factors determine the plausibility of each interpretation; Levi relies upon the context to disambiguate among the plausible interpretations. (For work documenting the ambiguity of compounds and Adj-N or N-N sequences such as these, see Gleitman & Gleitman 1970.)

A second source of complex nominals is what Levi calls "predicate nominalization". In these the head noun is deverbal and the prenominal modifier fills the role of either the object or the subject of the nominalized verb. "Parental refusal" is one example.

In the framework I am assuming, the function which Levi assigns to the predicate would be handled by thematic relations holding between the adjective (or non-head N) and the head noun. However, it is not always a simple matter to determine which element of

the complex nominal θ -binds the other.⁵ Nor is the exact nature of the thematic relation clear. Higginbotham (1985) suggests that adjectival modifiers may participate in diverse thematic relations, including (two forms of) θ -identification, θ -marking, and θ -binding. I do not wish to go into depth regarding NP-internal thematic roles, but will rather be content to rely on the characterization given by Quirk et al. (1985:1554), which is that sequences of this sort are "roughly paraphrasable as [N] 'having the properties of' or more generally 'having a relation to [the nominal underlying the adjective]'"'. They are equivalent to Class 5 above.

Because they participate in a thematic relation which holds under government, they are predicted to occur in a position adjacent to the noun. As shown in Table II above, "origin" adjectives were preferred closest to the head. (This placement also contributes to the strength of the findings reported in Martin 1969a concerning the effect of "definiteness of denotation" in determining adjective order. Bever's (1970) observation that "nounlikeness" of modifiers increases closer to the head is also demystified here, as all of these adjectives are denominal.) It is my belief, though I do not have the space here to defend it, that these adjectives are indeed derived in some manner from underlying complements and adjoin (or equivalently, incorporate) to the head noun, creating structures as in (20):

(20)



⁵This was pointed out to me by F.R. Higgins. For instance, it is generally accepted that the *-en* of adjectives such as *wooden*, *golden*, etc. is a remnant of genitive case marking. These adjectives of "material" seem intersective to the extent that they denote an independent property, rather than a subsective one, yet there appears to be a thematic relation between the head and the adjective. I place them in Class 5 for this reason, thereby making the claim that they establish subclasses of the noun's extension rather than behaving as independent sets which intersect with it.

Semantically, the type of the resultant complex head noun is the same as that of the simple head. Frequency of usage may cause these combinations to become lexicalized compounds, simple nouns without internal phrasal structure, for example *french fries* or *solar system*.

Evidence for this analysis comes from the inability of thematic adjectives to participate in coordination with other adjectives, as discussed by Levi (1978:22-23) and Coulter (1983:54-58):

- (21) a. Martian and Venusian explorers
*tall and Martian explorer
- b. historical and comparative linguistics
*trendy and comparative linguistics

3. The Referent Identification Hypothesis.

The discussion so far has presented a number of distinctions among adjective modifiers. I turn now to the question of acquisition of these differences. What precisely must children figure out? First, children have to recognize that a modification relation holds between adjectives and nouns. Next they must distinguish the semantic classes of adjectives which are present in the adult grammar. At the same time, of course, they are increasing the number of items in their lexicon and categorizing new words. All of these processes operate simultaneously, with the result that lexical entries may be acquired which do not match those in the adult grammar completely, as different distinctions may become grammaticized at different times. Presumably when a distinction is acquired, the preexisting lexical entries are reanalyzed in terms of this new classification.

I propose a guiding principle for the acquisition of modifier-noun sequences, the Referent Identification Hypothesis (RIH). It clarifies the interaction of the various processes by underscoring their common goal, the acquisition of meaningful lexical items within a syntactically and semantically coherent grammar.

(22) Referent Identification Hypothesis (RIH)

Language learning is facilitated when adjacent items (within a phrasal constituent) contribute to the ease of identifying the referent of the head of the phrase.

Within NP, this in effect means that the modifiers preferred closest to the head are those which aid most in identifying the referent of N.

Among adjectives, those which are most useful in doing this are the Class 4 intersective basic t/e adjectives. Because the property denoted by a color or shape adjective identifies a set, the language learner may have access to it prior to knowing the meaning of the head noun. When told, for example, to look at "the red wug", the child can at least narrow the universe of reference to the red objects, even if s/he doesn't know what a "wug" is. Similarly, "a square doodad" is identifiable through both its squareness and its "doodadness". Children use the set-denoting property of Class 4 adjectives to aid in picking out the referent of the head noun. The RIH predicts that a Class 4 adjective will therefore be of greatest aid to language-learners if it is adjacent to the head noun which it modifies. This primary relation provides them with an initial syntactic hypothesis, that intersective adjectives are sisters of N.

Class 3 measure adjectives, on the other hand, cannot perform this function, because they are inherently subsective modifiers. In order to pick out "the big widget", one has to have a mental representation not only of the extension of "widget", but of a standard size for widgets against which the particular one referred to is compared. If the child has only been exposed to extra-large widgets, or if widgets are generally such small objects that even a big one does not stand out as *big* in the perceptual array, the reference may fail altogether! Thus, in contrast to intersective modifiers, subsective adjectives do not help to identify the referent of an unknown noun.

3.1 Evidence from acquisition

Research has shown that children have an initial preference for interpreting all attributive adjectives as intersective. Matthei (1978) designed a number of experiments to test the syntactic and semantic understanding of Adj-Adj-N sequences in children between 3;9 and 6;3 years old. He concluded that children initially interpret all adjectival modifiers as intersective and prefer flat syntactic structures, as in (23), regardless of the modifiers involved.



This is consistent with the RIH, which predicts that children will attempt to impose an intersective reading on all pre-head material in the absence of appropriate adjective class distinctions. They treat all intersective modifiers as sisters of N. Prior to any recognition of a difference between adjective classes, they try to use both adjectives as aids in identifying the referent. When they are confronted with the evidence, through exposure to adult input, which would lead them to differentiate Class 3 and Class 4 adjectives semantically, they appear to revise their syntactic analysis of Adj-Adj-N strings so as to create greater hierarchical depth. In this way, they arrive at the structure I have given in (18) for the adult grammar.

One might postulate a more general hypothesis regarding the role of adjectives in language acquisition, to the effect that all modifiers are used by the child to aid in identification of the referent of the noun. The initial preference for intersectivity of adjectives is transformed by the realization that only certain adjectives, those in Class 4, function well in this capacity. Their later maintenance in the noun-adjacent position reflects this facilitating effect by allowing semantic compositionality to be read directly off of syntactic structure.

Matthei's data and conclusions are unimpeachable for most of his experiments. They support the claim that acquisition of semantic classes and syntactic structures operates in tandem and is tied to cognitive development. However, I must point out that in his

experiment #6 he runs afoul of the same problem I signalled above with Martin's methodology (1969a). Experiments (1-4), which elicited the intersective reading of, for example, the ordinal modifier "second" in phrases such as "the second green ball", presented the subjects with arrays of balls of different colors. In some there was a green ball in second position in the array, while in others the second ball was not green. The children who wanted to interpret "second green ball" with two intersective modifiers (i.e. a ball which was both second in the array and green) manipulated the experiment in various ways in the latter, unbiased, case: Matthei documents instances of children reversing the direction of counting in the array (when the next to last ball was green), or suggesting verbally other means of accommodating their interpretation (i.e. painting the second ball green).

The problem with experiment #6 is that there was no gradience in the materials. Subjects were shown four or five items, identical in every respect except size (in two of the arrays) or color (in the other two arrays), and asked to pick out their preferred ordering for a cuing phrase, e.g. "the big second bear" or "the second big bear".⁶ Notice, however, that in this context, size is not a gradient judgment based on the mental representation of the object and its standard size. It is rather an equipollent dimension which acts intersectively to pick out the referent. Thus it is impossible to tell from this experiment whether children categorize size adjectives as relative or intersective. To adequately test this, it would be necessary to establish a scale of size for the test objects themselves and have children pick out "the big purple elephant" from among a greater number of differently colored elephants varying over the size

⁶Matthei's intent was to replicate an experiment done by Schwenk and Danks (1974), which tested whether nonpreferred orders were used when the context was such that the first modifier was more effective in discriminating the referent. This hypothesis runs counter to the RIH, but there is another factor involved which I explicitly disclaimed above: focus intonation. Schwenk and Danks, as well as Matthei, stressed the first modifier in each pair. Matthei was not happy with the results of his experiment, as the children seemed to echo the order which was presented to them last. It is my contention that the AOC and RIH do not hold in focus constructions. See the discussion of focus and list intonation in Section 3.3.

dimension. If they are found not to distinguish "big" and "little" as relative points on a gradient scale, then the order eliciting experiment might be more informative.

Matthei's results indicate that as children mature linguistically they begin to use hierarchical structure, replacing their earlier preference for flat syntactic structures. It is difficult to know if this happens in tandem with the introduction of syntactic level distinctions or if one is acquired first and drives the other. Nelson (1976) studied the use of adjectival and possessive modifiers by somewhat younger children, aged 24 to 30 months. She found significant correlations between the mean length of utterance (MLU), the function of the adjectives used, and the syntactic form of the utterances. As children increase their MLU, they also change the focus of their object-identification from states of objects (*broken*, etc.) to perceptual differences among objects in an array and to class membership of objects.

What is most revealing in her study, for our purposes, is that as children begin to make contrastive judgments between objects and to subdivide reference classes, they rely more and more on attributive adjectives to identify the referent and to place a given object in a taxonomic subclass. Thus the function she proposes for adjectives in attributive position is that predicted by the RIH.

She also found that children of this age tend not to use gradient and antonymic adjectives to indicate contrastive properties. The use of attributive adjectives to designate subclasses is exemplified by *big*, which she notes is used almost exclusively for objects, and *little*, which is used almost exclusively for people. Initially these establish a bifurcation in the extension set of the noun classes, which gives way to finer distinctions of subclasses using the various relations available through Class 5 modification. This lends further support to the position that children readjust their initial syntactic hypotheses as their grammar becomes more sophisticated regarding the semantic classes of modifiers.

Martin and Molfese (1972) elicited preferred orders among adjectives in two groups of children, with average ages of 3;5 and 4;6, respectively. They showed

that in a production task, children ordered "size" before "color" 82% of the time (both groups), "size" before "cleanliness" (*clean* or *dirty*) 81% and 80% of the time, and "color" before "cleanliness" 64% of the time. Except for the last pair, this is the same as the preferred adult order. The unexpected order for "color/cleanliness" may arise from the design of the experiment, where again "cleanliness" was a binary opposition, establishing subclass relations between the materials which acted intersectively.

Thus their findings for children's productions support those of Matthei regarding comprehension. Nelson's work reinforces this by illustrating more clearly the nature of the distinctions among objects and the shifts in distinctions made by children even younger than Martin and Molfese's or Matthei's subjects. All of these experimental results support the RIH in demonstrating that the syntactically close relationship between an attributive modifier and the head noun is made use of by language learners even before they have made semantic class distinctions among adjectives. This research shows that the first hypothesis for the child is that the modifier denotes an independent property, which is relevant to identifying the referent of the head noun as an object in the world.

3.2 Cross-Linguistic Evidence

As mentioned above, Martin (1969a) studied preferred adjective order in Indonesian and found it to be the mirror image of that within English noun phrases. That is, where speakers of English would say *the big red ball*, speakers of Indonesian would say the equivalent of *ball red big the*. Sproat and Shih (1988) also examined cross-linguistic evidence for adjective ordering. They demonstrate that where such a constraint exists, adjectives manifest the same closeness ranking relative to the head noun as is found in English.

3.2.1 Direct vs. indirect modification

In their paper Sproat and Shih discuss Mandarin Chinese at some length, demonstrating that it contains at least one structure in which pronominal modifiers

observe the same ordering preferences as in English. However, in addition to this "direct modification" construction (24), Mandarin also makes use of "indirect modification" (25), where no constraint on the order of adjectives is evident.

(24) xiao lu hua-ping (S&S (3a,a'))
small green vase

*lu xiao hua-ping

(25) xiao-de lu-de hua-ping (S&S (2a,a'))
small green vase

lu-de xiao-de hua-ping

Indirect modification involves some mediating structural element in the adjective-noun relationship, which may or may not contain intervening lexical material. It has the effect not only of invalidating the ordering restrictions, but of changing the interpretation of the modification both semantically and syntactically. I interpret the characterization offered by Sproat and Shih of indirect modification to mean that in any construction involving indirect modification, the class of the adjective is simply not relevant.

For Mandarin, Sproat and Shih argue that the overt adjective suffix *-de* is a specifier, indicating that the suffixed adjective takes NP as its sister and subsequently behaves syntactically like a relative clause. They postulate that this sister NP is empty and that this empty position is bound to the head of the relative clause through coindexation.

Mandarin has an extra restriction superimposed upon the structure of adjective-noun sequences. In direct (*-de*-less) constructions, only two pronominal adjectives are permitted, and these must differ in "apparentness". An alternative analysis is that Chinese has only two attachment sites available, [AP,NP](sister of N') and [AP,N'](sister of N). Specification of which classes may attach to which site restricts co-occurrence of adjective classes. Class 2 and Class 3 adjectives share the higher attachment

site, sister of N', as shown by the fact that adjectives of these two classes never modify the same noun without the mediation of *-de*. Either may occur with Class 1 adjectives, which are attached as sisters of N. N' cannot be a recursive node, nor can nonbinary branching be possible at either level, a claim which is supported by the non-occurrence of two adjectives of the same class (without *-de*).

The "double *-de*" construction of (25) is most probably a coordination structure, such as shown in (14b). I suggest that adjective class is irrelevant in these constructions because the adjectives are dominated by the common AP node and do not take any projection of N as a sister. This explanation saves us from having to postulate an empty NP, if we assume that *-de* is a marker of coordination. (This position does not provide any explanation for the fact that the same form, *-de*, is used as a marker in true relative clauses, which is the motivation for Sproat & Shih's analysis.) However, it is possible that only one of the adjectives has the *-de* suffix. In this case the internal Adj-N pair participates in direct modification, while the external adjective modifies the N only indirectly. As predicted, there is no ordering preference reported in these sequences. Further, adjectives of Classes 2 and 3 or of the same class may co-occur:

- (26) a. hao-de xiao pan-zi (S&S (20e'))
 good small plate
 b. xiao-de hao pan-zi
- (27) a. yuan-de hong pan-zi (S&S (20f'))
 round red plate
 b. hong-de yuan pan-zi

Sproat and Shih do not signal any meaning difference between the pairs of sentences in (26-27). If they are truly equivalent, it appears to be irrelevant whether both adjectives are marked with *-de* or whether *-de* alone behaves like a conjunction. It seems possible, though I have not had the chance to test this prediction, that the (a) and (b) sentences require different scopal

interpretations. (26a), for example, may mean "good as small plates go", whereas (26b) means "small as good plates go", a difference of comparison class. The two readings have distinct truth values.

In the absence of scope interactions, indirect modification reduces to what Sproat and Shih characterize as a third type, parallel modification. They give no arguments for their claim that parallel modification is direct, and therefore I would argue that it is a particular case of an indirect modification construction. While I have shown that there is no need to postulate relative clause structure in this case, it is not ruled out as another instantiation of indirect modification.

3.2.2 Direct modification and adjective order

Cross-linguistically, adjective ordering effects are therefore predicted to be limited to instances of direct modification, where the syntactic structure is sensitive to the semantic class of the adjective. Sproat and Shih provide evidence for this claim from their examination of multiple adjective modification in other languages. In Greek and Kannada, the facts of adjective-noun surface order are identical to those of English. Mokilese demonstrates the exact mirror image of English noun phrases, with the head noun preceding all adjectives and specifiers. This is what Martin claimed for Indonesian, discussed at the beginning of Section 3.2. Thai, according to Sproat and Shih, is the mirror image of Mandarin, in that it has both morphologically simple adjectives and a second set of morphologically complex ones which correspond to *-de* suffixed adjectives.

The "mirror image" languages provide evidence that adjectives are ordered with respect to their syntactic closeness to the head noun. This is predicted by my claim that ordering is based on different syntactic attachment sites for semantically different adjective classes. While languages may differ in whether or not intermediate levels of N are recursive or in having left- or right-branching modification structures, any construction which restricts attachment sites on the basis of semantic class will necessarily impose an order on the adjective modifiers. The assumption that semantic compositionality can be directly read off of

syntactic configuration is not an arbitrary one. Without this generalization, it would be necessary to stipulate the direction of adjective order relative to the head, and nothing would prevent a language from demonstrating order preferences identical to those documented in English, Chinese, Greek, and Kannada, with the syntactic difference of having postnominal modification.

Irish appears, on the surface, to be an example of this. Adjectival modification of a noun in Irish is almost always postnominal. Sproat and Shih provide these data:

(28) a. cupan mór uaine (S&S (72a))
cup large green

*cupan uaine mór

b. cupan mór cruinn (S&S (72b))
cup large round

*cupan cruinn mór

The asterisk must be seen as indicating a nonpreferred order here, rather than ungrammaticality, although they do not state this. M. Ni Chiosáin (p.c.) points out that the starred phrases differ in interpretation from the preferred phrases. The reading which they impose is scopal, forcing the external adjective (*mór* 'large') to take the intersection of the internal N+Adj sequence as its comparison class, i.e. *large* for either *green cups* or *round cups*.

The preferred order of the adjectives, by semantic class, is the reverse of that found in English and Mandarin. Building on Guilfoyle's (1988) proposal that in Irish nouns follow specifiers at D-structure and undergo fronting when the specifier is a possessive noun, reversing the surface order of the noun and the possessive, Sproat and Shih widen the approach to predict movement both of the NP constituent (with all its modifiers), and of N itself within NP. They do not argue for this account, other than to state that it is plausible and accounts for the ordering facts. In essence, they claim the same underlying structure for

Irish DPs as I assume for English, but require movement which results in a head-initial NP which precedes its adjective modifiers, still in their base-generated order.

An alternative is to regard the nonpreferred order as basic. If we assume the hierarchical structure of (18) in mirror-image form, the order of adjectives would then support the predictions of the RIH by observing strictly the differences between semantic class and hierarchic proximity to the head noun. Irish may differ from English in reserving this structure for scopal interpretations, allowing ambiguity only in an indirect modification structure, similar to the parallel structure proposed for English list intonation constructions (see Section 3.3 below). This would entail the further restriction that order is not free in the indirect modification structure, but this may be merely another language-specific constraint. The order of adjectives in a parallel structure may be pragmatically constrained to be distinct from that of the hierarchical direct modification structure in order to reinforce their difference in meaning.

I do not have evidence to decide between these alternatives. Note that my account requires no movement of the head relative to its modifiers, unlike Sproat and Shih's, and that in either case the same issues arise with regard to the relationship between the NP and its specifiers. It is difficult to see how the derivation Sproat and Shih propose results in a direct modification structure, as the adjectives are ordered relative to the trace of the head. This sort of syntactic complexity is precisely what Sproat and Shih argue would constitute evidence for indirect modification. My account fares better in this regard, as the ordering effect is indeed present only in the structure which I argue represents syntactically hierarchical direct modification, sensitive to semantic class distinctions among modifiers.

Other languages do not seem to observe any ordering restrictions whatsoever within multiple modifier-noun sequences. Sproat and Shih conclude that these languages (they discuss Japanese, Arabic, and French) have access only to indirect modification. The adult grammars do not then have overt realizations of an instance of the relevance of semantic classes to syntactic hierarchical structure which would provide further evidence for the RIH. This does not, however,

provide evidence against it. Despite the fact that adults do not report preferences or meaning differences among the possible orders, the child may have greater success at identifying the referent of an unknown noun with some orders than with others. The prediction of the RIH is that if such is the case, the orders which will be of greatest use to the learner will place those modifiers amenable to an intersective reading closer to the head, at least at surface structure.

In order to be a true counter-example to the predictions of the RIH and the account suggested here for the AOC, a language would have to have only one direct modification structure, which exhibited a grammatical order for adjectives different from that found in the languages discussed above. (Potentially, other orders would be possible, but there would have to be independently motivated reasons for assuming that they were derived from the unpredicted order.) I know of no such counter-example.

3.3 Focus, Contrast, and Parallel Modification in English

I made the claim above (see examples (2-4) and the discussion in Section 1.1) that focus and list intonations were surface indicators that the syntactic structure of the noun phrase was different from that of the noun phrase with normal intonation. It is my contention that intonational focus is collapsible with contrast, both of them representing an unexpected emphasis on a given modifier. This may be signalled by an intonation contrast in either pitch or volume, a reversal of adjective order, or both. Another type of intonational pattern is the "comma" or "list" reading, where no single adjective receives greater emphasis, and each occupies a single intonational phrase. (See Beckman and Pierrehumbert (1986) and Sproat and Shih (1988:478).)

Focus and contrast have the effect of demoting the other adjectival modifiers to subclassifiers of the noun, establishing a temporary taxonomy among the possible referents. The focussed adjective highlights the property which is most relevant to identifying the referent, providing an alternative to syntactic proximity to the head as an aid. Intuitively, this should place the adjective in a structural position where it dominates the rest of the noun phrase. However, in

situ contrast intonation shows that this domination may be an LF phenomenon and need not be present in the syntax. (23), part of directions for how to rewire a lamp, illustrates focus/contrast both in situ and with adjective order reversal (capital letters indicate intonationally emphasized element):

- (29) a. Put the two NEW wires in...
 b. Put the NEW two wires in...

The attachment site of the focussed adjective (due to syntactic movement in the order reversal cases, at LF in all cases) must be higher than that of any other adjectival modifiers. I propose that it is a sister to NP, within the structure given in (18), with NP as the parent, essentially a Chomsky-adjunction to NP, co-indexed to a trace in the underlying position. An alternative would be to assume a SPEC position which is utilized only in focus constructions.⁷ This is incompatible with the current approach, as it forces us to give up the distinction between Class 3, daughter of NP, and Class 4, daughter of N', attachment sites. The other alternative would be to move the focussed element outside of NP into the DP. Since I have chosen to ignore any potential modifier positions outside of NP, I will not pursue this idea here.

This construction is another case of indirect modification. One might argue as well that a movement analysis of this sort supports a claim of greater processing complexity because of the need to interpret the coindexation relationship. Its purpose is similar to the RIH, showing that the grammar may provide alterna-

⁷In (19) I have assumed, following Fukui and Speas (1986), Uriagereka (1988), and others, that NP has no SPEC position. Those who make this assumption generally extend it to all lexical categories (N, A, V), restricting specifiers to functional categories such as P, Infl, or Comp. One result of this, pursued briefly by Abney (1987), is that degree modifiers of adjectives (*very*, etc.) cannot be viewed as specifiers, but as sisters of A'. I do not have the space to pursue this here, but it is interesting to note that APs with degree modifiers participate in parallel and focus constructions only, and are therefore never subject to the ordering effect.

tive means of reaching the goal of identifying the referent.

List intonation, in which each adjective represents a separate intonational phrase, is another instance of parallel modification.

- (30) Harold prefers blue, soft, roomy, expensive sweaters.

Harold prefers soft, expensive, roomy, blue sweaters.

Harold prefers expensive, roomy, blue, soft sweaters.

The ordering constraint does not obtain in these noun phrases. Each of the adjectives modifies the head noun, without any interaction among the adjectives. Their interpretation is similar to one of overt coordination:

- (31) Harold prefers blue, soft, roomy, and expensive sweaters.

For this reason, the structure which underlies parallel constructions can be assumed to be like that of coordinate structures, except for the absence of an overt coordinating element. The dominating AP intervenes for purposes of semantic composition, and since adjectives of different classes may participate in the same modifier list, I assume that the class differences are irrelevant in this construction. These constructions are similar in nature to the *-de* suffixed adjectives of Mandarin, and like them constitute an indirect modification structure.

For the child learning English, we can assume that the initial hypothesis of flat syntactic structures gives way not only to the hierarchically organized direct modification structures which are sensitive to semantic adjective class distinctions, but also to the two indirect modification structures which accompany focus and list intonation. Use of one structure rather than another may be a case of pragmatics, as indirect

modification, where direct modification is available, may be a marked phenomenon emphasizing that the properties denoted by the adjectives apply to the head noun alone. Direct modification, on the other hand, permits both this interpretation and the one which reads the hierarchical organization as indicative of scope relationships. By this I mean that *the big round ball* can be interpreted either as a ball which is both *round* and *big* or as one which is *big* for a *round ball*. In indirect modification structures, only the first interpretation is available. Since *round* aids in picking out the referent of *ball* in both cases, the RIH predicts the unmarked case to be the direct modification structure, supporting the claim that adjective ordering effects are examples of this heuristic principle. The universality of this principle is confirmed by the prevalence of its application in direct adjective modification structures cross-linguistically.

4. Summary and Discussion

As Nelson (1976) puts it, the role of modifiers is to

enable the child to make distinctions among referent objects and classes of objects on the basis of both general and specific properties. That is, they provide him with a linguistic means to generate new reference classes. They are thus basic to lexical productivity. In addition, the adjectives used by the child specify the properties of objects, people and other referent entities...." (14).

I have shown that adjectives fall into distinct semantic classes, depending on the formal nature of the property they specify. Using distinctions among semantic classes of adjectives which are independently motivated by the syntactic behavior of single adjective modifiers, I have proposed that the Adjective Ordering Constraint be viewed not as a syntactically active mechanism in the grammar, but as an effect of the interaction of semantic class distinctions and hierarchical syntactic configuration. In those structures which exhibit this type of syntactic sensitivity to the semantic class of the adjective, the obtained orderings

are predicted to follow from the grammar's attempt to conform to the Reference Identification Hypothesis.

The RIH provides an initial strategy to direct the language learner in successful comprehension of an utterance, focussing attention on those elements which are most closely associated with the head. It therefore guides acquisition and is an aid to "bootstrapping" the nominal system of the lexicon.

It is maintained in the adult grammar both as a tool for succeeding generations of language learners and for clarity of communicative intent among adult speakers. In this latter function, it has an effect similar to conversational maxims, and may even be a specific case of a more general principle which states that the grammar serves to reinforce the existence of a relationship between context and utterance. There may be pragmatic implications of a speaker's choice of direct modification over indirect, or vice versa, when both are available to the language in question.

The advantages of my proposal over previous analyses are many. First, unlike most of the work reviewed in Section 1.2, the primitives of the analysis are independently motivated semantic classes and a standard version of X-bar syntax. No appeal is made to adjective labels such as "size", "shape" or "color". Nor is there any need to explicitly order adjective classes among themselves. Rather, their order is a consequence of the sensitivity of the syntactic structure to the semantic class of the adjective. As predicted, where the syntax does not make use of these distinctions, no ordering effect is found.⁸

Secondly, my account has been shown to be compatible with evidence from acquisition that children interpret adjective order in accordance with the predictions of the RIH. Comprehension of hierarchic syntactic structure is achieved in tandem with drawing the correct distinctions among adjective classes.

Miller and Johnson-Laird (1976) arrive at similar conclusions about the distinctions among classes of adjectives which must be incorporated into the grammar.

⁸Except as noted above for Irish, which I suggested may be explained by a strict pragmatic constraint reinforcing the distinctness of direct and indirect modification structures.

Indeed, they propose a referent identification procedure which is similar in character to the RIH. Their discussion highlights the usefulness in a referent "search" of intersective adjectives. They come close to capturing the intuition which is behind my analysis of the AOC, as for example when they state that

Color adjectives are sometimes categorized as "absolute" by comparison with "relative" adjectives like "tall," which always depends for its value on its head noun, or "good," which seems to take a different sense for every noun it modifies.... To classify all adjectives as either absolute or relative, however, dichotomizes what is essentially a continuum. Color and shape adjectives are near one end, evaluative adjectives are near the other end, and the majority of predicate adjectives are somewhere in between. The differences are of degree, not of kind. For example, "black chair" allows a direct interpretation of "black," unaffected by the meaning of the head noun; "good chair" places strong restrictions on "good," since what is good about a chair is unrelated to what is good about, say, a knife; and "tall chair" is intermediate, since it depends on one's conception of chairs and their expected heights, but in all cases it is the vertical extent of the referent that is specified by "tall".
(356)

Where we disagree is that in the framework I am assuming, sensitivity of the syntax to the semantic class of the adjective is essential. They explicitly disclaim this approach, preferring to look at adjectives as placed on a continuum in terms of procedural complexity. What is most striking is that their continuum corresponds so exactly to the ordering scales given in Section 1.1.

A third area in which the predictions of my analysis may find corroboration regards those constructions in which the ordering effects do not appear. Since these constructions involve greater syntactic complexity, they are unlikely to be loci for the application of the RIH. I have suggested that they represent structures in which the semantic classes of

the adjectives are irrelevant. Attempting to interpret them under the RIH, particularly where this fails, may aid in constructing the correct syntactic configurations.

Two specific predictions are made regarding these cases. The first is that languages may differ on the range of interpretations available to direct modification structures. As exemplified by Irish, it may be read as strictly encoding scope relations among modifiers, or it may be ambiguous as to whether adjectives interact in this manner, as in English. As a result, pragmatic considerations may come into play regarding the choice of indirect vs. direct modification, resulting in preferred surface orderings which reflect either a marked or an unmarked structure.

The second prediction is that even in indirect modification structures, the RIH may operate in the comprehension of some surface orders and not others. In order to test this prediction, one would need to study whether children are able to identify an unknown referent through its membership in an intersective set when the adjective denoting the independent property is not syntactically close to the head noun. Under the RIH, the expected result is that when linear word order places the intersective adjective closer to the head, the language learner can still make use of adjacency at this level. Parallel structures with and without overt coordination would be a first set of data by which to test this hypothesis.

In previous accounts, nonpreferred orders were viewed as arising from some intent of the speaker to emphasize a given property or as a side effect of different intonation patterns in the same syntactic structure as was held to be the domain of the AOC. Most of the treatments implied that nonpreferred orders were un- or extragrammatical. The analysis presented here provides a clearer explanation for why adjectives may be ordered relative to the head in some cases and not in others by claiming different syntactic configurations to be underlying the various surface orders. Rather than being ungrammatical in any way, these alternative orders provide information about the pragmatic intent of the speaker or the context of the utterance by utilizing a different means of encoding semantic and syntactic relationships between the modifiers and the noun. Thus they are shown by this perspective to be an aid to the language learner because

they give direct input regarding the availability of diverse syntactic configurations.

4.1 Residuum

Although I have provided evidence for dividing adjectives conceptually, semantically, and syntactically into classes, as well as for ordering these classes relative to the head noun, the current proposal leaves open a number of questions.

The most important of these is intraclass ordering. Why is "big" preferentially ordered before "tall" or "long"? By the criteria established here, all these should be members of the subjective basic t/e class (Class 3). Similarly, adjectives which denote "shape" seem to be preferred before "color" adjectives, though both are intersective properties. In fact, some of the research done by Martin (1969a,b) shows that intraclass ordering is more variable than among the distinct semantic classes of adjectives. Still, there is a significant preference correlation across speakers and this is not attributable solely to factors of phonological weight. I do not have an explanation, but my intuition is that adjectives which describe a measurement along a single dimension are ordered closer to the head than adjectives which involve evaluating more than one vector. General mass and shape are less specific than judgments of height, length, and surface reflectance. This seems to be a retreat to a descriptive "perceptual complexity" metric, but it is in keeping with the suggestions of Miller and Johnson-Laird, which are otherwise quite adequately expressed in my analysis. It may be the case that our semantic classes are not sufficiently narrow, or that we have need of a means of encoding some portions of the continuum which Miller and Johnson-Laird envision.

Another loose end concerns the exact nature of the thematic relations which hold between head nouns and their modifiers, whether the Class 5 group isolated by Levi, or other modifiers, which are generally assumed to participate in some sort of θ -identification, though not under strict adjacency.

I have sidestepped the issues concerning Class 1 and 2 adjectives such as *fake* or *genuine*, as well as those which are related to adverbs, such as *mere*, *former*,

utter, or *slight*. I have also not discussed participial -ing or -ed adjectives. Clearly, no account of the syntax and semantics of adjectives would be complete without incorporating these into the analysis.

Finally, the question of metaphoric interpretation of adjectives has not been addressed here. Miller and Johnson-Laird propose a sort of property matching between adjectives and nouns.⁹ Mismatch of features may result in metaphorical modification, or in the extreme case, gibberish. Aarts and Calbert (1979) propose an explicit theory of adjective-noun feature matching mechanisms responsible for normal and metaphorical interpretations of modifier-noun sequences. Presumably, the sensitivity of the syntax to the semantic class of the adjective would be at issue here, as well as the sort of modification (direct or indirect) strategy underlying metaphoric readings. As far as the predictions of the present study, I note only that adjectives which are closer to the head in a sequence of modifiers do not seem to be open to metaphorical readings. While *poor little boy* is ambiguous between meaning a small boy who is deserving of sympathy and a small boy who has no money, *little poor boy* can only mean the latter. *Rich* does not have any metaphoric interpretation relative to humans, so that while *poor little rich boy*, with the sympathy-related meaning of *poor* is acceptable, *rich little poor boy* is simply contradictory.

This suggests that metaphoric interpretation of a given adjective may arise from its being attached in a different syntactic site than is usual for its basic meaning. This might be analyzed in two ways, either as

⁹Intuitively, there is a link here with work on prototype theory (Rosch 1978, Carey 1987, et al.). Properties of objects (or kinds) may be characteristic, defining, or merely coincidental: compare "red apple", "round ball", and "flowered shirt", respectively. It is interesting that shape is often a defining property, while color is often a characteristic one. Specifying color would be predicted on this basis to be useful in helping to identify the referent; specifying shape would presumably be most helpful when the object differs in some way from the stereotypical norm. Evaluative adjectives are related only to the comparison of an exemplar to the prototype, while relative adjectives seem most often to evaluate a given property of the exemplar to that same property in the prototype. I thank Cynthia Welsh for bringing this to my attention.

a movement from the basic site of attachment, or as the implementation of some lexical operation which gives rise to a different semantic class (and therefore attachment site) for the adjective. I leave this question open for further research.

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