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1. Introduction.

An interesting property of English is that multiple adjectival modifiers typically observe rather strict ordering restrictions. Some examples of this phenomenon are given in (1):

(1) a. small green Chinese vase (*green small Chinese vase, *green Chinese small vase, ??small Chinese green vase...)
b. nice round plate (*round nice plate)
c. small square table (*square small table)

That is, when no special emphasis is intended on any of the adjectives, and when no 'comma' intonation is used to break the adjectives up into separate intonational phrases, the orderings indicated are the ones which are required.

If we turn now to another language, Mandarin Chinese, we might be led to the conclusion that there is no evidence for such restrictions in that language. In the following examples, all of the indicated orderings are fine.

(2) a. **xiao-de lu-de hua-ping** (*small-DE green-DE vase*) 'small green vase'
a′. **lu-de xiao-de hua-ping** (*green-DE small-DE vase*) 'small green vase'
b. **hao-de yuan-de pan-zi** (*good-DE round-DE plate*) 'nice round plate'
b′. **yuan-de hao-de pan-zi** (*round-DE good-DE plate*) 'nice round plate'
c. **xiao-de fang-de zhuo-zi** (*small-DE square-DE table*) 'small square table'

c′. **fang-de xiao-de zhuo-zi** (*square-DE small-DE table*) 'small square table'

One property which all of the adjectives in (2) have is that they use the particle *de*, which is also used to mark relative clauses and possessives, among other things (see Huang, 1981; C. Huang, 1987).

Now, it is also possible to use monosyllabic adjectives in Chinese to modify noun phrases 'directly' — i.e., without the use of *de*, and in such cases ordering restrictions such as those found in English reappear. We note here that such 'direct' modification is limited to at most two *de*-less adjectives. We will provide an explanation for this restriction in the next section.

(3) a. **xiao lu hua-ping** (*small green vase*) 'small green vase'
a′. ***lu xiao hua-ping** (*green small vase*)
b. **hao yuan pan-zi** (*good round plate*) 'nice round plate'
b′. ***yuan hao pan-zi** (*round good plate*)
c. **xiao fang zhuo-zi** (*small square table*) 'small square table'
c′. ***fang xiao zhuo-zi** (*square small table*)

We will henceforth refer to the Mandarin *de* modification as 'indirect' modification, and the Mandarin *de*-less modification as 'direct', as above. We will argue in a subsequent section that the two types are distinct both in their syntactic and semantic behavior in addition to their behaving differently with respect to ordering restrictions. We will return to the structural differences between the two types of modification later on, but we note now that independent evidence from the behavior of Third Tone Sandhi lends suggests that direct modification in Mandarin is essentially compounding. The reader is referred to Shih (1986) for details. Thus, the structure of (3a) would be as in (4):

(4) $[_N$ **xiao** $[_N$ **lu hua-ping**$_N]]$

Our purpose in this paper is threefold. First of all we wish to investigate the cognitive and semantic basis for the adjectival ordering restrictions in English and Chinese. We will show that there is such a basis, and that the ordering restrictions in both English and Mandarin can be predicted on this basis. Secondly, we wish to answer the question as to why only direct modification in Mandarin, and all prenominal modification in English, is subject to such ordering restrictions as given above. In fact, we shall argue that prenominal modification in English is like direct modification in Mandarin, whereas indirect modification in Mandarin is a different construction; thus adjectival ordering restrictions are restricted to direct modification-like constructions. This leads us to our third aim, which is to show that the predictions of the theory which we develop for English and Mandarin extend correctly to other languages. In particular, we will show that one finds adjectival ordering restrictions cross-linguistically if and only if one is dealing with a direct modification construction. Also, as one would expect given that there is a cognitive basis for the ordering restrictions, the specifics of the restrictions are by and large the same across languages.[1]

1. Previous work on adjectival ordering restrictions, mostly for English, includes: Lance (1968), Goyvaerts (1968), Quirk, et. al. (1972), Dixon (1982), Nowicka-Schwartz (1980) (for Polish), Annear (1964), Vendler (1968), Whorf (1945), Ziff (1960), Martin (1969a,b), Danks and Glucksberg (1971). We also note that there are adjectival ordering facts, discussed in Levi (1975), with which we will not be dealing:

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2. *Prenominal adjectival ordering and the syntax and semantics of adjectival modification.*

In this section we present an analysis of English and Chinese adjectival modification with an eye to an account of the differing ordering behavior of direct (*de*-less) and indirect (*de*) modification in Chinese. In the first subsection we briefly discuss the cognitive basis of the ordering restrictions and some consequences of that cognitive basis; similar proposals have been made by Whorf (1945), Martin (1969a,b) and Danks and Glucksberg (1971). In the second subsection we present a formal treatment of English prenominal adjectival modification and the two kinds of modification in Chinese arguing in particular that direct modification involves the formation of nouns from other nouns, whereas indirect modification has the same syntax and semantics as relative clauses; we suggest that ordering restrictions are restricted to noun formation.

2.1 Cognitive basis of prenominal modification: 'apparentness' in English and Mandarin.

While it is not our purpose to give a detailed analysis of all aspects of the ordering phenomena, we would like to give some justification for assuming a cognitively-based scale and show that such a scale does make interesting predictions about the ordering one would expect to find. Consider the difference between the problem of establishing that an object is red and that of establishing that an object is large. The first involves computation of a physical attribute of the object, namely a property of the object's surface reflectance — its color. So, to establish that a car is red, one has to establish that a sufficiently large amount of its surface looks red. The second involves quite a bit more; one typically would have to establish the type of object that is involved and then compare that object with other objects of the type. To establish that a car is large — i.e., to determine that the phrase *large car* is appropriate for this item — one first has to establish that the item is a car and that it is large for such items. Since the second computation involves *comparisons* with other items, it apparently involves more *computations* than the computation of color. The number of comparisons involved is also deemed a relevant factor by Martin (1969a).[2] Let us refer to those adjectives whose ascription requires less comparison as more *apparent* than those adjectives whose ascription requires more comparison;[3] color terms, then, are more apparent than size terms. So, let us make the claim that the more apparent the adjective the further to the left in the adjective string the adjective goes. This accounts for size and

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(i) a. senatorial industrial investigations
b. industrial senatorial investigations

While both orderings in (i) are possible, they mean different things: (a) refers to the senate's investigations of industry whereas (b) refers to industry's investigations of the senate. These semantic differences follow, as Levi shows, from the differing assignment of the deverbal nominal head's thematic roles to the modifying adjectives in the two examples. Hence these ordering facts are tied to thematic structure in a way in which the kinds of ordering restrictions which we will be investigating are not.

2. This is not to say that color perception is trivial. Certainly one cannot reliably derive the surface reflectance characteristics of an object from the spectral properties of the light reflected from it; comparison of the light's reflectance characteristics with the characteristics of the light reflected from surrounding objects is necessary (Marr, 1982, pp 259+; Land and McCann, 1971). However, it is not unreasonable to suppose that the computation of color is a lower level cognitive process than the computation of size, which apparently makes crucial use of higher cognitive entities such as notions of class membership.

3. Note that this notion of apparentness corresponds pretty well to the notion of *absoluteness* versus *relativeness* which have, since Aristotle (*Categories*, Ch. 6), been used to characterize classes of adjectives. In particular, people have long distinguished between non-absolute terms such as *large* and absolute terms such as *red*.

color in English (a) and Chinese (b):

(5) **SIZE/COLOR**
a. large red ball (*red large ball)
b. **da hong qiu (*hong da qiu)**

Now, there are modifiers which refer to size and which do not involve comparisons between the object in question and other objects of that kind. These are adjectives of absolute size such as *three-inch* or *five-gallon*. Because of the restrictions on the size of direct modifiers in Chinese, such adjectives must take *de* in that language and hence are unordered with respect to other adjectives. In English however, one would expect to find *some* ordering, and if our story concerning size and color is correct, one would expect that a noun phrase of the form COLOR-ADJECTIVE SIZE-ADJECTIVE NOUN would vastly improve if the SIZE-ADJECTIVE is an adjective of absolute size. This seems roughly correct, especially if one controls for phonological size of the adjectives, which is well-known to affect ordering phenomena; see Cooper and Ross (1975):

(6) **ABSOLUTE SIZE**
a. ?purple six-inch pen; six-inch purple pen
b. *purple humungous pen; humungous purple pen

Still, the (a) example is not stellar; one might argue that, after all, even adjectives of absolute size do involve *some* comparison not involved in color recognition, namely the comparison of the object in question with a measuring device of some kind.

Consider, now, adjectives of quality such as *good* or *ugly*. These would appear to involve substantial amounts of comparison. To establish that something is good clearly involves comparisons. Furthermore, it apparently involves a large measure of subjectivity, which is less clearly true of size terms; goodness or ugliness are, after all, largely matters of opinion. One would expect them to occur to the left of terms for size on this account; this seems to be partly correct:

(7) **QUALITY/SIZE**
a. a good large house; *a large good house
b. a nice small dog; *a small nice dog
c. an ugly great monster; a great ugly monster

So, certain of these adjectives pattern as predicted although others, such as *ugly*, seem freer. There seems little doubt of their ordering with respect to color, however:

(8) **QUALITY/COLOR**
a. a good red dog; *a red good dog
b. a nice green table; *a green nice table
c. an ugly blue sofa; *a blue ugly sofa
d. **hao hong qiu** (*good red ball*) 'good red ball'
e. ***hong hao qiu** (*red good ball*)

For reasons which we return to in section (2.2) it is not possible to combine quality and size adjectives where both are direct modifiers in Mandarin; therefore, it is not possible to test the equivalents of (7).

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Returning to visual properties, shape clearly involves less comparison than size; an object is round insofar as it has a certain shape, and not because of its relation to other objects of its class. What the ordering of shape modifiers with respect to color modifiers should be is less clear; the preferred ordering is as follows:

(9) **SIZE/SHAPE/COLOR**
a. large round red apple
b. *round large red apple
c. *large red round apple

In Chinese, again for reasons which we will return to later, one cannot combine two direct modifiers where one refers to a property of color and one refers to a property of shape. However, the judgments are clear in the case of size and shape:

(10) **SIZE/SHAPE**
a. **da yuan zhuo** (*large round table*) 'large round table'
b. ***yuan da zhuo** (*round large table*)

It is less clear where adjectives of material fit in, adjectives such as *wooden*. They tend to be ordered after color terms although this is a delicate issue:

(11) **MATERIAL**
vermillion wooden block (?wooden vermillion block)

As has been noted in previous work, adjectives of provenance are placed fairly far to the right, even to the right of color terms.

(12) **PROVENANCE**
a. *Chinese large red vase
b. ??large Chinese red vase
c. large red Chinese vase

It is not clear that this ordering can be derived from the comparison scale which we have been invoking. However, we can make sense of the facts by noting that adjectives of provenance typically serve as indicators of a taxonomy. So Chinese vases can quite reasonably be taken to be a particular type of vase (as opposed to Greek vases, Egyptian vases, French vases...) in a way that large vases, round vases, red vases and so forth would not typically be understood. Given this observation, then, one would not be surprised to find that these adjectives are more tightly bound to the head noun than other adjectives; in English, this amounts to the observation that they are to the right of other adjectives. It is impossible to test these cases in Chinese since Chinese lacks adjectives of provenance.

Still, under appropriate conditions, it is possible to interpret, say, size adjectives as setting up a taxonomy. So, if someone wishes to distinguish between the small dogs and the large dogs that he owns, *small* and *large* can be used to set up a taxonomy of dogs. Under these conditions, one might expect color adjectives to be able to felicitously occur to the left of the size adjectives, which seems to be correct:

(13) I've shown you my *black* small dogs; now, these are my two *brown* small dogs.

Note that this utterance is only felicitous under the interpretation that *small dogs* constitute a taxon in the context of the utterance of (13); note also that some contrastive stress, as indicated in italics in (13), is necessary. Assigning the normal prominences for prenominal adjectival sequences to this sequence results in an infelicitous utterance. This reordering phenomenon has been noted before, for instance by Quirk, et. al. (1972).

To summarize, following previous work by other authors, we have argued that adjective ordering has a basis in cognitive processing. We have suggested that the left-to-right ordering for English and Chinese, correlates with the amount of comparison necessary to establish whether the various types of description are appropriate to the particular object being described. In particular, the more comparison necessary, the further to the left the corresponding adjective is placed. Other issues, such as whether or not the adjective and the head noun taken together refer to a sensible taxonomic type, were also shown to be relevant.

2.2 The semantic reflexes of the cognitive bases.

In the next section we turn to the formal syntax and semantics of adjectival modification with an eye to giving a linguistic account of the distribution of the adjective ordering restrictions. Before we do that, however, we would like to bring up one other issue which bridges the gap between the issues discussed in the last section, and the more formal semantic aspects of adjectival modification to be discussed in the next section. The difference between more apparent adjectives, and less apparent adjectives shows up in syllogisms of the following form:

(14) Predicativeness (Kamp, 1975)

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

Those adjectives for which the conclusion of this syllogism is true have been termed 'predicative' by Kamp (1975); those for which it is false are non-predicative. By and large, the more apparent adjectives such as shape and color, and the more taxonomic adjectives, such as adjectives of provenance, are predicative, whereas less apparent adjectives, such as measure adjectives or adjectives of quality tend to be non-predicative:

(15) a. All mice are mammals.
Freddy is a white mouse.
Therefore, Freddy is a white mammal. (apparently TRUE)
b. All tables are pieces of furniture.
This is a square table.
Therefore, this is a square piece of furniture. (apparently TRUE)
c. All vases are ornaments.
That is a Chinese vase.
Therefore that is a Chinese ornament. (apparently TRUE)
d. All mice are mammals.
Freddy is a large mouse.
Therefore Freddy is a large mammal. (apparently FALSE)

e. Agatha Christie novels are literature.
The Murder of Roger Ackroyd is a good Agatha Christie novel.
Therefore *The Murder of Roger Ackroyd* is good literature. (possibly FALSE)

This dichotomy seems to account for the most unequivocal ordering restrictions. Reordering adjectives which differ in predicativeness seems to be much worse than reordering adjectives which do not differ in predicativeness. In particular, phonological considerations, such as the relative size of the adjective, seem to have more of a reordering effect between adjectives which are of the same predicativeness than between adjectives which are of differing predicativeness. Cooper and Ross (1975) note that, other things being equal, the longer member of a collocation tends to occur after the shorter member. Some examples are:

(16) spit and polish, salt and pepper, dog and pony (show)...

Now, while quality and size adjectives, which are both non-predicative, and shape and color adjectives which are both predicative tend to occur in the order given, the ordering preference seems significantly less clear when the quality or shape adjectives are made heavier:

(17) a. ?large beautiful house, beautiful large house
b. serpentine green shape, green serpentine shape

This reordering seems much less available when adjectives of differing predicativeness are involved:

(18) a. humungous red peach (*red humungous peach)
b. gigantic round table (*round gigantic table)
c. wonderful red ball (*red wonderful ball)

Some of these judgments seem delicate. Still it does seem as though the predicativeness dichotomy accounts for the strongest preferences on adjective ordering.

In Chinese the effects of predicativeness manifest themselves in a way different from the effects in English. Chinese adjectives can typically occur with *de*, whether or not they can occur without *de*. Now, it turns out that while adjectives of quality, size, shape and color can usually all occur without *de* before a noun, only certain interclass combinations are possible:

(19) a. **hao hong pan-zi** 'good red plate' **QUALITY/COLOR**
(*hong hao pan-zi)
b. **hao yuan pan-zi** 'good round plate' **QUALITY/SHAPE**
(*yuan hao pan-zi)
c. **xiao hong pan-zi** 'small red plate' **SIZE/COLOR**
(*hong xiao pan-zi)
d. **xiao yuan pan-zi** 'small round plate' **SIZE/SHAPE**
(*yuan xiao pan-zi)
e. ***hao xiao pan-zi** (*good small plate*) **QUALITY/SIZE**
***xiao hao pan-zi**

f. ***yuan hong pan-zi** (*round red plate*) **SHAPE/COLOR**
***hong yuan pan-zi**

Examples (a-d) show that QUALITY/COLOR, QUALITY/SHAPE, SIZE/COLOR and SIZE/SHAPE combinations are possible with the appropriate ordering. Examples (e-f) show that for some reason QUALITY/SIZE or SHAPE/COLOR combinations are not possible. The generalization is clear: two adjectives of the same predicativeness may not both directly modify a noun in Mandarin. That this is the right generalization is supported by the following data which show that (e-f) are possible if at least one of the adjectives is a *de* modifier:

(20) e'. **hao-de xiao pan-zi** (*good-DE small plate*) 'good small plate' **QUALITY/SIZE**
xiao-de hao pan-zi

f'. **yuan-de hong pan-zi** (*round-DE red plate*) 'round red plate' **SHAPE/COLOR**
hong-de yuan pan-zi

We suggest that these facts follow from an avoidance strategy in Chinese. Given our claim that decisions on ordering among adjectives of the same degree of predicativeness are more delicate than decisions on ordering between the two classes, it might be expected that speakers would tend to avoid using constructions which would necessitate some ordering decision. Since Chinese adjectives can quite generally occur as *de* modifiers, making one of the two adjectives into a *de* modifier would effectively avoid a decision on ordering them. We suggest that this avoidance strategy has become grammaticalized in Mandarin and explains the data we have just seen. English, which only has direct adjectival modification, cannot adopt such an avoidance strategy. Note that this account also explains the fact, noted in the introduction, that Mandarin allows at most two direct modifiers; clearly, in any combination of three direct modifiers, at least two of them would have to be of the same degree of predicativeness, and thus any more than two such modifiers would be ruled out by the avoidance strategy. So far as we know, this fact about Mandarin has not been otherwise explained.

To summarize: we have argued that the ordering restrictions on adjectives in English and Mandarin can be related to cognitive issues such as the amount of comparison involved in deciding whether the ascription of a certain property is appropriate or not. We have further shown that the most unequivocal ordering facts for English can be understood in terms of the predicativeness dichotomy, which is itself related apparently to the cognitive issues we have raised. The property of predicativeness turns out to help explain some cooccurrence restrictions on direct adjectival modifiers in Chinese. We now turn to the formal semantics and syntax of direct and indirect modification. We show that the restriction to direct modification constructions of the ordering restrictions in Chinese is related to the different syntactic properties of the two kinds of modification.

2.3 Syntax and Semantics of prenominal modification.

2.3.1 Formal Semantics. It has often been assumed that ordinary adjectival modification in English involves the formation of nouns from other nouns, and that adjectives are therefore of type CN/CN; see Kamp (1975). For intensional, non-intersective adjectives, such as *fake*, the semantic structure would be:

(21) **fake'(^gun')**

Now, while this analysis is clear enough for intensional adjectives, this type assignment for

extensional adjectives has been questioned. One *could* take them to also be CN/CN. However, since they are extensional, one would need a meaning postulate such as that in (22) to account for their extensionality resulting in a translation such as (23) for *red dog*:[4]

(22) $\exists P\, \forall Q\, [\hat{}\alpha'(Q) = \hat{}\lambda x[P\{x\} \,\&\, Q\{x\}]]$ (there is a property P such that for any property Q, the property $\hat{}\alpha'(Q)$ is the intersection of P and Q)[5]

(23) $\lambda x[\mathbf{dog}'(x) \,\&\, \mathbf{red}'(x)]$ (c.f., Siegel, 1980)

Siegel argues for a different analysis where non-intensional adjectives are just one place predicates like intransitive verbs. While considerations of space do not allow us to elaborate upon this point, we do not feel that her arguments for collapsing adjectives with intransitive verbs are compelling. We will assume — with the first of the theories discussed in Kamp (1975), but contra Siegel (1980) — that all adjectives are functions from noun meanings to noun meanings. It seems a reasonable assumption that Chinese direct modifiers are also such functions.

2.3.2 Syntax. Given this semantic analysis of direct modification, what would be the expected syntactic structure associated with direct modification? It seems fair to assume that, if the adjective is semantically taking a common noun meaning, and forming a common noun meaning, then syntactically it ought to select for some projection of N which can function syntactically as a (noun)word in the language in question, and that the output should also be something which can function as a word syntactically. Let us call this projection of N, N^x for the time being; we will see that Chinese and English differ on the value of x. Iteration of the process of direct modification as in *large red apple* should involve iterative adjunction of adjectives to N^x. Furthermore, specifier material such as quantifiers, determiners, possessives, and so forth, should not be able to intervene between a direct modifier and its modifiee. Loosely speaking, the reason for this is that the function of specifiers is to determine reference of a nominal expression, and common nouns do not themselves have reference. The syntactic reflex of this would be that constructions of the form in (24) could not be instances of direct modification between A and N:

(24) [A ... [Spec ... N]] (linear order irrelevant)

In many languages, such as English, one can give a somewhat tighter semantic characterization than what we have just said: direct modification assumes some form of identification of the thematic structure of the adjective with the thematic structure of the noun. Since specifiers 'close off' the thematic structure of nouns, subsequent identification of the noun's thematic structure is impossible since it is no longer available (see, for example, Higginbotham, 1985). So, to summarize, we would expect the output of direct modification to function like a noun and, as a corollary of that one would not expect to

4. Higginbotham's (1985) treatment, while claiming to involve a non-intensional semantics, nevertheless representationally distinguishes intersective extensional adjectives, such as *black*, from non-intersective intensional adjectives such as *fake*. With respect to extensional adjectives, Higginbotham suggests that the adjective and the noun *identify* their thematic roles, which leads ultimately to an interpretation like (23).

5. Thanks to M. Rooth for help with this formula.

find specifier material between a direct modifier and the head. Let us see how these considerations are borne out in English and Chinese.

Considering Chinese first, we have already noted that there is clear evidence from Mandarin that instances of direct modification are treated phonologically as single words; see, again, Shih (1986). While this does not unequivocally argue for direct modification forming words as far as the syntax is concerned, it is at least consistent with the claim that they do. The syntactic structure for *xiao hong ping-guo* (= 'small red apple') would then be, assuming without evidence to the contrary, that syntactic word projections of N are N^0 in Chinese:

(25) $[_N$ xiao $[_N$ hong ping-guo$_N]]$

Additional considerations lead one to suppose that such direct modification structures are like compounds, hence like syntactic words in Mandarin; see also Zhu (1956). One property of lexicalized expressions in Mandarin is that modifiers contained in them must lack *de* even if those modifiers would normally have *de* when contained in a non-lexicalized expression. For example, heavy adjectives such as *fen-hong* 'pink' typically require *de*, yet drop it when they occur in a lexicalized compound:

(26) a. **fen-hong-de bao** (*pink-DE panther*) 'a pink panther'
b. **fen-hong bao** (*pink panther*) 'The Pink Panther'

Furthermore, while a direct modification such as (27a) is ambiguous, an indirect modification such as (27b) is not, indicating that the indirect modifier cannot occur inside the compound:

(27) a. **hong ping-guo shu** (*red apple tree*) 'red [apple tree]', '[red apple] tree'
b. **hong-de ping-guo shu** (*red-DE apple tree*) 'red [apple tree]', *'[red apple] tree'

So, absence of *de* appears to correlate with wordhood.

Chinese also fits our expectations about direct modification structures in that specifiers are clearly forbidden between a *de*-less direct modifier and the head. Placing direct modifiers before specifiers, or even other *de* adjectives is completely unacceptable:[6]

(28) a. ***xiao jei-ben hei-de shu** (*small this-CL black-DE book*)
b. ***jei-ben xiao hei-de shu** (*this-CL small black-DE book*)
c. **jei-ben hei-de xiao shu** (*this-CL black-DE small book*) 'this small black book'

Chinese direct modifiers behave as expected then; they apparently form words as far as the syntax is concerned and they, as a corollary, do not allow intervening specifier material.

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6. Note that polysyllabic adjectives such as *pyanyi* 'cheap' do apparently allow *de*-less forms to behave like *de* forms:

pyanyi hao-kan-de jei-ben shu (*cheap good-read-DE this-CL book*) 'this interesting cheap book'

However, it seems clear that this is due to a fairly late rule which deletes *de* at PF; the rule in question is apparently sensitive to the size of the adjectives, and so must be a surface phenomenon.

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In English, the situation is somewhat more complex, but the conclusion is the same. We note that adjectives can clearly modify N′ in English, as in *rapid Russian invasion of Afghanistan*, where *Russian* is assigned the external argument of *invasion*, hence ought to c-command *Afghanistan*; *rapid* must a fortiori c-command *Afghanistan*. One would therefore assume that the structure is as below:[7]

(29) $[_{N'}$ rapid $[_{N'}$ Russian $[_{N'}$ invasion of Afghanistan]]]

It seems fair to assume that this is generally the structure for adjectival modification in English. Possible further evidence for the output of adjectival modification being N′ and not N^0 comes from the well-known fact that A-N sequences in English typically take nuclear stress, whereas N-N sequences typically take compound stress; phonologically, then, N-N sequences are stressed like words, whereas A-N sequences are not. We end up with the following for *small red apple*:

(30) $[_{N'}$ small $[_{N'}$ red apple$_{N'}$]]

Still, despite the syntactic difference between English and Chinese, it turns out that English adjectival modification behaves syntactically as direct modification should. Clearly, specifiers cannot intervene between adjectives and nouns:

(31) a. *small red the apple
b. *small the red apple
c. the small red apple

Furthermore, there is also no question that N′ does function as a *syntactic* word to the extent that it can occur inside compounds in English. So, *one-eyed, one-horned, flying purple people eater* is many ways ambiguous where all but one of the ambiguities involves a compound containing an N′:[8]

(32) a. $[_N$ $[_{N'}$ one-eyed, one-horned, flying purple people] eater]
b. one-eyed, $[_N$ $[_{N'}$ one-horned, flying purple people] eater]
c. one-eyed, one-horned, $[_N$ $[_{N'}$ flying purple people] eater]
d. one-eyed, one-horned, flying $[_N$ $[_{N'}$ purple people] eater]
e. one-eyed, one-horned, flying purple $[_N$ people eater]

It seems clear, then, that both in English and Chinese, direct modification behaves syntactically as expected. Now, since direct modification constructions are the domain of adjectival ordering restrictions in both languages, we wish to claim that these restrictions occur only in structures which involve common noun formation semantically, and function as words syntactically.[9] So as not to give the wrong impression, we note that we are not

7. Recent literature such as Abney (1987) describe adjectives in English as selecting for NPs, where NP is what used to be called N′ (the old NP being classed as a D(eterminer)P. Though we will occasionally make reference to DPs, nothing in our analysis depends upon this theoretical device.

8. One does not typically find N′ of the form *history of California* within compounds though one can easily construct compounds containing expressions such as *California history*. This restriction may be due to a head-adjacency requirement for compounds; see Sproat (1985b).

9. Stowell (1981) suggested that English adjective ordering restrictions should be accounted for by having adjectival modification be a lexical process. While we would not want to say that, it is clear that his idea is

claiming that direct modification constructions in all languages will participate in compounding since compounding in many languages often has stringent phonological restrictions, which seems not to be so true for English and Chinese. Still, direct modification should observe the restriction on specifier placement.

What about indirect modification in Chinese? Does the lack of ordering among *de* modifiers correspond to a difference in structure between *de* modifiers and direct modification? There is reason to believe that this is the case, and that *de* adjectives are furthermore syntactically and semantically just like relative clauses. We note that the arguments that we will present were also used independently by C. Huang (1987) and our conclusion concerning the difference between direct and indirect modification in Mandarin is largely in accord with his.

It is clear that *de* modifiers are syntactically different in their behavior from *de*-less modifiers. Not only are there no ordering restrictions among *de* adjectives but it is possible to freely order the adjectives with respect to specifier or quantifier-like material:

(33) a. **hei-de jei-ben shu** (*black-DE this-CL book*) 'this black book'
a′. **jei-ben hei-de shu** (*this-CL black-DE book*)
b. **hei-de Zhang-san-de shu** (*black-DE Z.-DE book*) 'Zhangsan's black book'
b′. **Zhang-san-de hei-de shu** (*Z.-DE black-DE book*)
c. ?**hei-de yi-ben shu** (*black-DE a-CL book*) 'a black book'
c′. **yi-ben hei-de shu** (*a-CL black-DE book*)

Turning to evidence that *de* adjectives phrases are relative clauses, consider, first of all, that they involve the same particle as relative clauses, namely *de*.

(34) a. **[wo xi-huan]-de shu** (*[I like]-de book*) 'the book which I like'
b. **hei-de shu** (*black-DE book*) 'black book'

This is not an absolutely conclusive argument since possessives, whose structure and semantics are presumably different from relative clauses, also use *de* (as noted in the introduction). More positive evidence is the following: Chinese, like English, has certain adjectives which cannot occur in predicate position. One of these is *qian* 'former', which is just like English *former* in this respect:

(35) a. *This president is former.
b. ***jei-ge zongtong qian.** (*this-CL president former*)

Now, *qian*, like English *former* may occur prenominally:

(36) a. the former president
b. **qian zongtong** (*former president*) 'former president'

If, as we have claimed, *de* modifiers are relative clauses, then the adjectives in them must

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related to ours.

be in predicate position. This would predict that *qian* should not be able to occur as a *de* modifier. This is apparently correct (see also C. Huang, 1987):

(37) ***qian-de zongtong*** *(former-DE president)*

Note that the equivalent English construction, **the president who is former* is also out, as expected.

So, we have some good evidence that *de* adjectives in Chinese are relative clauses. We arrive at the following structure for *de* modifiers in Chinese:

(38) $[[[e_{NP,i}$ hei] $O_i]$-de $shu_{N,i}]_{NP}$ *(black-DE book)*

Under this analysis, the thematic role of *hei* will be assigned ultimately to the subject position of the *de* clause, and this will in turn be identified with the head noun of the main NP.

So, *de*-modifiers fail to be direct in two senses. First of all, insofar as they modify specified nominals, they do not apparently share the property with direct modifiers of forming words from words. Secondly, the adjective's thematic structure is not assigned directly to the head noun as in direct modification; rather the assignment is mediated by binding and coindexation, hence the identification of the thematic structure of the adjective and the noun is quite indirect.

The clusters of properties associated with direct modification in English and Mandarin, and indirect modification in Mandarin should not be restricted to those two languages. So, the kind of common noun forming semantics associated with direct modification necessitates the syntactic restrictions we have previously noted, and these properties should correlate in other languages as well. Conversely, if such semantics are not involved, as in indirect modification in Mandarin, the syntactic restrictions need not hold. Let us summarize these points by giving some straightforward diagnostics for identifying cases of direct or indirect modification, all of which will be easily seen to follow from what we have said.

(39) A. Direct Modification:
Adjective noun combinations behave like syntactic words. In particular, specifiers may not intervene between the direct modifier and the noun.

B. Indirect Modification:
Specifiers may intervene between the adjective and the noun. Furthermore, there may be evidence, as in Chinese *de*-modifiers, that the adjective phrase has the structure of a relative clause.

Now, we have identified direct modification constructions as the locus of adjective ordering restrictions in Chinese and of course, English. We need to be a little more precise, however, and note the effect of parallel structures on ordering restrictions. As has also been noted by Nowicka-Schwartz (1980) for Polish, treating the prenominal modifiers as separate intonational phrases frees up the modifier order to some extent. So, for example, the following seems felicitous with appropriate intonation, here indicated by commas:

(40) She loves all those Oriental, orange, wonderful ivories.

Following Beckman and Pierrehumbert (1986), we will assume that in such cases the adjectives each constitute a separate intermediate phrase. Furthermore, as Beckman and Pierrehumbert note, such an intermediate phrase intonation is consistent with the analysis that such modifiers are interpreted in parallel. This is because clearly parallel structures such as conjunctions are implemented intonationally as intermediate phrases:

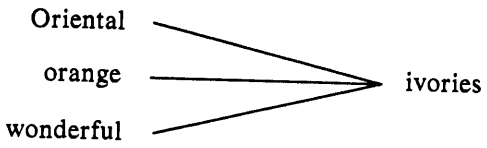
(41) They gave watermelons, oranges, and berries.

The intonation of (40) is more similar to the intonation of (41) than it is to that of (42):

(42) She loves all those wonderful orange Oriental ivories.

If the structure of (40) is one of coordination, then, we may fairly assume that the adjectives involved are each modifying the head noun in parallel, rather than in sequence. Hence, we would expect that the ordering restrictions should not apply here since the adjectives are not each modifying the output of the next. Following Goodall (1987), we will assume the following structure for such parallel constructions:[10]

(44)



Further evidence for the coordinative analysis of such intermediate phrase constructions is that the following seems odd (even when spoken in 1989, when Reagan will be a former president):

(45) ??Reagan is an unwise, ignorant, former, president.
(compare: Reagan is an unwise ignorant former president)

This makes sense on the assumption that the construction in question is actually coordinative, with the adjectives modifying the head in parallel: thus, (45) would be equivalent to (46), which seems facetious:

(46) ??Reagan is an unwise president, an ignorant president and a former president.

Taking parallel structures into consideration, then, we would like to make the following universal claim:

10. Note that we are therefore assuming that the structure of examples like (40) is different from the emphatic reorderings such (13), which we take to be hierarchical.

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(47) Adjectival ordering restrictions are limited, cross-linguistically, to instances of non-parallel direct modification.

We substantiate this claim for a number of other languages in the next section.

So, we have argued for two claims in this section. The first is that adjectival ordering restrictions are cognitively based and seem to relate, in part, to the amount of comparison necessary to establish the appropriateness of a particular attribute. We also noted that the most unequivocal restrictions relate to the semantic notion of predicativeness, due to Kamp (1975), which is in turn related to the more cognitive issues we have been discussing. The second claim is embodied in (47).

Given that the ordering restrictions have a cognitive basis, we would expect other languages which have ordering restrictions to observe the same restrictions as English and Chinese. What is not clear, however, is whether the same left-to-right ordering would be expected, or whether closeness to the head is the relevant consideration. Evidence bearing on this issue comes from Thai, Mokilese and Irish, as we shall see.

3. Excursus into other languages.

We now turn to data from other languages to substantiate the predictions of the last section.

3.1 Japanese

Japanese prenominal modification has been argued to be quite similar to Chinese prenominal modification in many respects (see, among others, Kitagawa and Ross, 1982). It is clear that the ordering of adjectives with respect to specifier-like material is quite free in Japanese. So, Fukui (1986) gives data such as the following:[11]

(48) a. **ookina John-no a-no kuruma** (*big John-NO that-NO car*) 'that big car of John's'
b. **akai John-no ko-no hon** (*red John-NO this-NO book*) 'this red book of John's'

So, in at least one respect, Japanese adjectives behave like Chinese *de* adjectives, suggesting that they are indirect modifiers. Therefore, we would expect fairly free ordering among the adjectives, which is indeed what we find:

(49) a. **SIZE/COLOR**
ookina akai inu (*large red dog*) 'large red dog'
akai ookina inu (*red large dog*)
chiisana midori-iro-no booru (*small green ball*) 'small green ball'
midori-iro-no chiisana booru (*green small ball*)
b. **SIZE/SHAPE**
ookina marui o-sara (*large round plate*) 'large round plate'
marui ookina o-sara (*round large plate*)

11. Fukui argues that Japanese does not have true specifiers and that Japanese noun phrases are projections of N rather than of D, the latter being the analysis which he, and Abney (1987) gives for English NPs. This point, while worth noting, is largely orthogonal to our concerns since Japanese clearly does have words and phrases which function semantically like specifiers.

chiisana shikakui ie (*small square house*) 'small square house'
shikakui chiisana ie (*square small house*)

c. **SHAPE/COLOR**
marui akai e (*round red picture*) 'round red picture'
akai marui e (*red round picture*)

3.2 Greek

Greek apparently has direct adjectival modification; adjectives are prenominal and come after the article. Ordering effects are the same as English, as shown by the following preferred orderings:[12]

(50) a. **SIZE/COLOR**
i meɣali kokkini balla (*the big red ball*) 'the big red ball'

b. **SIZE/SHAPE**
to meɣalo strongilo antikimeno (*the large round object*) 'the large round object'

c. **QUALITY/SHAPE**
to kalo strongilo antikimeno (*the good round object*) 'the good round object'

d. **SIZE/COLOR/PROVENANCE**
to mikro kokkino kineziko vazo (*the small red Chinese vase*) 'the small red Chinese vase'

e. **SIZE/COLOR/MATERIAL**
o mikros prasinos ksilinos kivos (*the small green wooden block*) 'the small green wooden block'

3.3 Kannada

Turning away from Indoeuropean, we consider the Dravidian language Kannada. Kannada clearly has direct modification, by our criteria; both specifiers and adjectival modifiers are prenominal and modifiers must come after the specifier and before the noun:

(51) a. a dhɔɖɖʌ nai (*that large dog*) 'that large dog'
b. *dhɔɖɖʌ a nai (*large that dog*)

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12. Interestingly, published literature on Modern Greek suggests that the ordering facts may not be as clean as the above examples suggest. Mackridge (1987) claims that 'there does not appear to be any set of rules according to which, for instance, an adjective denoting some inherent quality precedes or follows one which conveys a subjective attitude' (p. 195). His examples, transliterated, are given below (thanks to Paul Kiparsky for providing us with these examples.)

(i) a. **θriskeftikes akatanoites frasis** (*religious incomprehensible phrases*) 'incomprehensible religious phrases'
b. **yipsines apokrustikes kariatiδes** (*plaster repulsive Caryatids*) 'repulsive plaster Caryatids'
c. **laikes terasties afises** (*popular huge posters*) 'huge popular posters'
d. **isaɣomena analoɣa aɣaθa** (*imported analogous goods*) 'analogous imported goods'

These examples were checked with six native speakers of Greek, all of whom agreed that the forms which Mackridge cites are odd and that the English order would be preferred. We can only assume that the modifiers in Mackridge's examples are intended to be interpreted in parallel, and that this is simply not indicated in the orthography.

c. ʌvʌrʌ dhɔɖɖʌ nai (*their large dog*) 'their large dog'
d. *dhɔɖɖʌ ʌvʌrʌ nai (*large their dog*)
e. raju dhɔɖɖʌ nai (*R. large dog*) 'Raju's large dog'
f. *dhɔɖɖʌ raju nai (*large R. dog*)

There is a preferred order for the adjectives and it is the same as in English:

(52) a. **SIZE/COLOR**
dhɔɖɖʌ kɛmpu pʊsthʌka (*large red block*) 'large red block'
b. **QUALITY/COLOR**
sʊndhʌra kɛmpu dhoɳi (*beautiful red boat*) 'beautiful red boat'
c. **SIZE/SHAPE**
dhɔɖɖʌ gʊndʌ goli (*large round marble*) 'large round marble'
d. **SIZE/SHAPE/COLOR**
dhɔɖɖʌ gʊndʌ nili goli (*large round blue marble*) 'large round blue marble'

3.4 Arabic

Adjectives in Arabic are placed after the nouns that they modify. Furthermore, they must agree in definiteness with their nouns:

(53) a. kalbu-n aħmaru-n (*dog-indef. red-indef.*) 'a red dog'
b. al-kalbu l-aħmaru (*the-dog the-red*) 'the red dog'
c. *kalbu-n al-aħmaru (*dog-indef. the-red*)
d. *al-kalbu aħmarun (*the-dog red-indef.*) (where *aħmarun* is interpreted as modifying *al-kalbu*)

Since definiteness is a property of NPs rather than of nouns, one suspects that adjectives in Arabic do not modify the head noun directly, but rather modify the entire NP. Further evidence for this idea is provided by the behavior of adjectives modifying nouns which have possessive modifiers. Specifiers and possessives are in complementary distribution in Arabic. In particular, one cannot mark an NP with the definite article *al* and a possessive at the same time:

(54) a. *al-kitaabu l-waziiri (*the-book the-minister-GEN*)
b. kitaabu l-waziiri (*book the-minister-GEN*) 'the minister's book'

However, despite the lack of a definiteness marker on the head noun, the interpretation of the entire NP is definite due to the possessive. It is noteworthy, then, that adjectives which modify such NPs must occur to the right of the possessive, and agree in definiteness with the entire NP, not with the head noun, which does not have a definiteness marker of its own.

(55) a. kitaabu l-waziiri l-aħmaru (*book the-minister-GEN the-red*) 'the minister's red book'
b. *kitaabu {l-aħmaru, aħmarun} l-waziiri (*book {the-red, red-indef.} the-minister-GEN*)
c. *kitaabu l-waziiri aħmarun (*book the-minister-GEN red-indef.*)

This suggests that the structure of the Arabic NP with an adjectival modifier is as follows:

(56) [[kitaabu [l-waziiri]$_{DP}$]$_{DP}$ l-aħmaru]$_{DP}$

Furthermore, since, as we have noted, definiteness is a property of noun phrases, we suggest that the postnominal adjective is in fact an NP (= DP) with an empty head, with the following structure:

(57) [$_{DP}$ SPEC [$_{NP}$ A e]]

The adjective then assigns its thematic structure to this empty head, which in turn becomes identified with the head of the NP which the adjective modifies. A rough translation of the structure in (56) would be:

(58) the book of the minister, the red one

All of these considerations would lead one to suppose that Arabic has indirect adjectival modification. Given this, we clearly predict that no ordering should obtain among post-nominal adjectives in Arabic. Indeed this is correct; we present COLOR/SIZE modification in (59):

(59) **COLOR/SIZE**
kalbun aħmarun kabiirun (*dog red big*) 'a big red dog'
kalbun kabiirun aħmarun (*dog big red*)

According to our informant, which ordering one chooses depends upon which property is deemed more important; the more important of the two properties occurs first. He did not feel that either of the two orders was more basic.

3.5 French

In French, as in other Romance languages, adjectives may be placed either before or after the noun. However, the constraints on prenominal placement are quite strong; see Waugh (1977). Since prenominal adjectival modification is generally restricted to a single adjective, adjectival ordering in French can only be tested for postnominal constructions. Looking at these we find that there is no preferred ordering:

(60) a. **SIZE/COLOR**
chien moyen blanc (*dog medium white*) 'medium-sized white dog'
chien blanc moyen (*dog white medium*)
b. **SHAPE/COLOR**
maison blanche carée (*house white square*) 'square white house'
maison carée blanche (*house square white*)
c. **AGE/COLOR**
bijou vermeil ancien (*jewel vermillion old*) 'old vermillion jewel'
bijou ancien vermeil (*jewel old vermillion*)
d. **COLOR/PROVENANCE**
tapis blanc chinois (*rug white Chinese*) 'white Chinese rug'
tapis chinois blanc (*rug Chinese white*)

There are a couple of reasons why one would expect not to find ordering restrictions in French. First of all, there is some evidence that multiple postnominal adjectives in French modify the head noun in parallel rather than forming a hierarchical structure. Our

informants often preferred to insert *et* 'and' between more than one postnominal adjective, giving examples like (61):

(61) a. **une table grande et ronde** (*a table big and round*)
'a large round table'
b. **une machine noire et anglaise** (*a machine black British*)
'a black British machine'

The other option which our informants suggested involved the use of 'comma' intonation with multiple post-nominal adjectives. All of this suggests that these constructions in French are equivalent to parallel prenominal modification in English.

There is a further consideration which would lead one to the expectation that there should be no ordering restrictions in French: there seems to be some evidence that postnominal adjectives are indirect modifiers. In particular, intensional adjectives such as 'former', which may not occur as indirect modifiers in Chinese, also may not occur as postnominal adjectives in French. So, *ancien* is ambiguous between 'old' and 'former'. With the latter reading it may only occur prenominally (Waugh, 1977 and p.c.):

(62) a. **ancien président** 'former president'
b. **président ancien** 'old president'

In general, the more intensional adjectives are placed prenominally (Waugh, 1977).

The evidence for French, while not wholly conclusive, suggests that postnominal modification in that language is consistent with our expectations.

3.6 Thai

Thai has postnominal modification. As in Chinese, there is a difference in behavior between simple and complex modifiers. Complex modifiers are polymorphemic; in our data, they are either composed of a classifier and a stem, or, in the case of color terms, are composed of a morpheme meaning 'color' followed by a stem. These modifiers are freely ordered with respect to specifier material:

(63) a. maa khɔɔŋ-chan tua-niŋ tua-yai (*dog of-I CL-one CL-big*) 'my large dog'
b. maa sii-dam tua-yai tua-nii (*dog color-black CL-big CL-this*) 'this big black dog'
c. maa tua-nii sii-dam tua-yai (*dog CL-this color-black CL-big*) 'this big black dog'

Thus, we would have to consider these complex modifiers to be indirect, and, as expected there appear to be no ordering restrictions on them:

(64) a. maa tua-yai sii-dam (*dog CL-big color-black*)
b. maa sii-dam tua-yai (*dog color black CL big*)

In (65a,b) are examples of simple modifiers; examples (c-f) show that such modifiers must occur within any specifiers or complex modifiers:

(65) a. maa dam (*dog black*) 'black dog'
b. maa yai (*dog big*) 'big dog'
c. maa dam tua-yai (*dog black CL(assifier)-big*) 'big black dog'

d. maa yai sii-dam (*dog big color-black*) 'big black dog'
e. *maa tua-nii dam (*dog CL-this black*) 'this black dog'
(This expression is OK with the reading 'this dog is black', where **dam** is a verb)
f. *maa khɔɔŋ-chan tua-nɨŋ yai (*dog of-I CL-one big*) 'my large dog'

This evidence suggests that simple modifiers are direct modifiers in Thai. Nominal structures with two direct/monosyllabic modifiers are rare. However, when they do occur, we find that there is an ordering restriction, which turns out to be COLOR before SIZE, the mirror image of English and Chinese.

(66) a. maa dam yai (*dog black big*) 'big black dog'
b. *maa yai dam (*dog big black*)

In many respects, then, Thai looks like a mirror-image of Chinese. First of all, both languages have both direct and indirect modification, and secondly, direct modification in both languages exhibits ordering restrictions. The most salient difference is that Thai nominals are left-headed.

3.7 Mokilese

Mokilese is a Ponapeic language of Micronesia. It has postnominal direct modification, where the ordering is also the mirror image of English and Chinese.[13] According to Harrison (1976), Mokilese NP has the structure of (67a) and post-nominal adjectives in NP conform with the ordering stated in (67b).

(67) a. NOUN ADJ DEFINITE/INDEFINITE DETERMINER
b. MATERIAL COLOR SHAPE SIZE

Some examples are given below.

(68) a. did sakai koro:ro:y (*wall stone white-DET*)
'this white stone wall'
b. mwɔk sɔl pwu:wu:sso (*cup black round-DET*)
'that round black cup'
c. pwo:la wa:ssa siksikko (*ball red small-DET*)
'that small red ball'
d. se:pil su:kɔ paspasso (*table wooden flat-DET*)
'that flat wooden table'

So far, Mokilese presents the most complete data that we have on postnominal direct modifiers. The ordering is the exact mirror image of English, down to the last detail.

3.8 Irish

Irish usually places its adjectives postnominally. While specifiers such as *an* 'the' are prenominal, possessive NPs are postnominal and are in complementary distribution with the prenominal specifiers:

13. Thanks to J. Levin for bringing this to our attention.

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(69) a. **an leabhar** (*the book*) 'the book'
b. **leabhar an fhir** (*book the man-gen.*) 'the man's book'
c. ***an leabhar an fhir** (*the book the man-gen.*)

Apparently, then, there is evidence that postnominal possessives behave as specifiers insofar as they are in complementary distribution with the prenominal specifiers. Indeed, Guilfoyle (1987) suggests that the postnominal possessives are derived by fronting of the head noun; the structure of (69b) would be:

(70) $[_{D'}$ **leabhar**$_i$ $[_{N'}$ **an fhir** $e_i]]$

Now, postnominal adjectives intervene between the head noun and the genitive or other postnominal specifier material, such as the clitic *sin* 'this':[14]

(71) a. **leabhar uaine Sheáin** (*book green Sean-gen.*) 'Sean's green book'
b. ***leabhar Sheáin uaine** (*book Sean-gen. green*)
c. **leabhar uaine sin** (*book green this*) 'this green book'

So, Irish postnominal adjectives seem likely candidates for being direct modifiers, which would of course predict that ordering restrictions should apply. Indeed, there do appear to be ordering preferences:

(72) a. **SIZE/COLOR**
cupán mór uaine (*cup large green*) 'large green cup'
***cupán uaine mór** (*cup green large*)
b. **SIZE/SHAPE**
cupán mór cruinn (*cup large round*) 'large round cup'
***cupán cruinn mór**

So Irish appears to have the ordering restrictions, as expected, at least for the adjectives that we have tested, but what is strange is that the adjectives have the same *left-to-right* order as English rather than the same degree of closeness to the head noun. This goes counter to the evidence that we have obtained on Mokilese and Thai. However, these languages differ from Irish in one important respect: specifier material is always to the right, suggesting that the larger scale construction of the noun phrase in those languages may simply be a mirror-image of English. In Irish, as we have noted, things are more complicated in that there is some reason to believe that the head of the noun phrase moves to the left of possessive specifiers. In fact it is possible to extend this movement analysis and suggest that the nominal head moves within the N′ containing the adjectives. This would result in a structure such as the following:

(73) $[_{D'}$ $[_{N'}$ **cupán**$_i$ $[_{N'}$ **mór** $[_{N'}$ **cruinn** e_i $]]]_j$ $[_{N'}$ **Sheáin** e_j $]]$ (*cup big round Sean's*)

'John's big round cup'

14. Apparently, then, Guilfoyle's rule must move the adjectives along with the noun. She does not discuss this point.

If the approach is correct, then the ordering facts should be as in English since the head of the modified N′ is to the right of the modifiers at S-structure. This analysis of Irish is consistent with the analysis that in Celtic languages, surface head initial effects are derived via head movement (see Sproat, 1985a).

3.9 Summary of Pre and Post nominal cases

We have found, then, that our predictions are largely borne out by data from languages other than English and Chinese. First of all, we have shown that the predicted correlation between direct modification and the occurrence of ordering restrictions is well-motivated. And secondly, we have shown that the specifics of the ordering restrictions, when they do occur, would appear to be the same as in English and Chinese. Furthermore, while evidence from Irish is less clear, evidence from Mokilese and Thai suggests that the ordering restrictions should be stated in terms of closeness to the head, rather than in terms of linear ordering.

4. Summary

In this paper we have laid out some of the issues surrounding the hoary problem of ordering restrictions on adjectives. We have argued that there is a cognitive basis for these restrictions, and we have shown that, across languages, adjectival modification is of two types, direct, and indirect, and that ordering restrictions are found only with direct modification. Direct modification, we have suggested, involves the formation of common nouns from common nouns, a view which is fairly familiar in the semantics literature.

We have not as yet, however, described the link between the cognitive basis of the ordering restrictions and their linguistic manifestation; why should more 'apparent' adjectives be ordered closer to the head than less 'apparent' adjectives, and why should the presence of ordering be sensitive to the kind of modification involved? Unfortunately, we can give no answers to these questions at the present time. Previous workers such as Martin (1969a) and Danks and Glucksberg (1971) attempt a psycholinguistic explanation for the orderings. Martin obtains the orderings found in English by assuming that more *absolute* adjectives are chosen first in the production of NPs, and then less absolute adjectives: this will result in having more absolute adjectives closer to the head (assuming that we construct phrases starting with the head and work outwards). Thus we predict mirror-image cases like Mokilese. Danks and Glucksberg argue, rather, that for pragmatic reasons one tends to place the more *discriminating* adjective *first* in a string of adjectives by which they mean the adjective which is more likely to distinguish the referent of the NP for the listener. Assuming that this is intended to account for the default orderings in English, one might think that if the same pragmatic principle is operative in other languages, then one would expect to find the same linear ordering being observed across languages. So far, only Irish (against Mokilese and Thai) might support that prediction yet it seems clear that the Irish noun phrase differs structurally from that of these other languages in crucial respects.

Whatever the predictive success of these two approaches, and others like them, they both suffer from a more basic flaw: as stated, neither of them would appear to predict that the ordering restrictions should be themselves restricted to direct modification. As far as one can tell, in a Chinese example such as (74a) one is not predicating different kinds of properties of the table than in (74b), yet in the first case the opposite ordering of the adjectives is possible, whereas in the second case it is not.

(74) a. **xiao-de fang-de zhuo-zi** (*small-DE square-DE table*) 'small square table'
b. **xiao fang zhuo-zi** (*small square table*) 'small square table'

While we do not rule out the possibility that a well-articulated theory of language production or comprehension could be developed in which approaches such as Martin's or Danks and Glucksberg's could be stated precisely enough so as to make these predictions in a non ad hoc way, it seems clear that this goal has not yet been achieved.

So, we cannot offer an explanation for the relationship between the cognitive basis of the ordering, and the effect it has upon the grammar. Still, there is no dearth of such explanatory lacunae. Adjectival ordering would appear to fall into the same boat as other cognitively-based grammatical phenomena such as animacy hierarchies, and classifier systems (such as the one exhibited in Chinese), which are both rampant in natural language and similarly lacking in any explanation for their occurrence. We can do no better at this point, then, than to assume that the statement in (47) is simply a fact of universal grammar.

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