

OCCULT LINKING IN ENGLISH

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ABSTRACT

The paper explores the possibility that English syntax includes a particular sort of non-overt (*occult*) element, corresponding to the overt *links* that have been identified as very general elements in the languages of the world, serving the function of connecting elements to the head of the phrase in which they appear. Evidence is presented that occult links are ubiquitous, occurring in all the major phrase types of English, including at least NP, VP, AP, AdvP, PP, and QP, and exerting a strong influence on the form of these phrases. The effects consist of constraints on the types of phrases that can appear in pre-head positions, the frequent need for certain components of pre-head phrases to be extraposed, and the impossibility of extracting items from pre-head positions. These phenomena can be explained if one hypothesizes occult links in the types of positions in which overt links occur, with properties that overt links are known to have.

1. INTRODUCTION

A central part of the quest to understand human language is the effort to identify universal elements, common to all or nearly all languages. Inextricably tied up with this search is the issue of non-overt elements, i.e. elements that are present in some sense but have no phonetic form. The existence of such elements has become widely (and perhaps universally) accepted, the major examples being the empty categories of Chomskyan theory and the null affixes and phonetically vacuous applications of morphophonemic rules hypothesized in order to fill gaps found in inflectional paradigms. If one assumes their existence, the search for universals is necessarily altered—made more complex and at the same time more hopeful. Elements that appear overtly in only some of the world's languages may well be present in all languages, their universality hidden by the fact that they lack a phonetic matrix in many cases. Similarly, those

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which can be found overtly in some positions in a given language may well occur non-overtly in others. These two possibilities can of course be combined as well; for instance, an element which appears overtly in some phrase types of certain languages and in other phrase types of certain other languages might well be universal both cross-linguistically and cross-categorically, its universality hidden, again, by its non-overt status in many cases.

Thus, a natural research strategy is to identify elements which appear overtly in a variety of languages and/or a variety of positions in certain languages and then to look for them in those languages/positions in which they are not overtly present. This amounts to hypothesizing their existence and then seeing if one can find the kinds of effects that such elements should produce, if they are in fact present.

In this paper I will apply this strategy to the phenomenon of *linking* (Truscott 2000, 2003), the use of certain types of items (*links*) to connect peripheral elements to the head of the phrase they occur in. The conclusion will be that English, a language that is rather poor in overt links, shows clear and consistent evidence of non-overt (*occult*) linking. If one hypothesizes occult links, a range of otherwise puzzling phenomena are readily explained, indicating that occult linking does in fact occur in English.

The paper begins with a brief summary of links, establishing the background for a clearer statement of the question and the means of answering it. This is followed by discussion of occult linking effects on the structure of NP and VP and then a shorter look at such effects in AP, AdvP, PP, and QP. I then identify an additional occult linking effect—constraints on extraction from left branches—in each of these phrase types and conclude with some general discussion of directions for future research and the significance of the findings.

2. LINKS

The use of linking elements to connect constituents of a phrase to the head of the phrase is a very general characteristic of natural languages, and probably a genuine universal. The links appear in a number of superficially different forms, the major examples of which I will briefly describe in this section.

One type of link is the gender marker, shown in the following example from Spanish.

- (1) a. la pelota roj-a
the ball red-fs
“the red ball”
b. el libro roj-o
the book red-ms
“the red book”

In (1a) the head noun, *pelota* (‘ball’), is feminine and the article and adjective associated with it bear a feminine marking, connecting them to the head. In (1b) the head noun, *libro* (‘book’), is masculine, and so are its article and adjective.

Closely related to the gender link is the noun class marker (NCM), illustrated by the following Forrest River example, taken from Capell and Coate (1984):

- (2) amba a-njinga a-newur
kangaroo(s) NCM-this/these NCM-large
“this/these big kangaroo(s)”

The noun class marker, like the gender marker in Spanish, links the determiner and the adjective to the head noun. It also resembles the gender marker in that it divides the nouns of the language into categories, with loose semantic bases, leading many analysts (though by no means all) to treat the two as a single phenomenon.

A third type of linking, normally treated as an entirely distinct phenomenon, is the classifier, illustrated by the Chinese examples below.

- (3) a. nei-tiao lu
that-Cl road
“that road”
b. san-zhang zhuozi
three-Cl table
“three tables”
c. ji-ge ren
several-Cl person
“several people”

Like gender and noun class marking, it connects elements in the NP to the head noun and divides the language’s nouns into a number of quasi-

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semantic classes.

A fourth type of link can also be exemplified by Chinese. This is the linking particle (LP) that commonly appears in Chinese NP's.

- (4) *hen congming de xuesheng*
very intelligent LP student

The LP, like the other examples of links, connects elements in the NP to the head. It essentially represents a gender marker/noun-class marker/classifier system in which the number of classes reaches its logical minimum of one.

Linking also frequently takes the form of number agreement, as in the following Spanish example.

- (5) a. *la casa roja*
the house red
“the red house”
b. *las casas rojas*
the houses red
“the red houses”

The article and the adjective are marked singular in (5a) and plural in (5b), to agree with the number of the head noun. These markers are links.

Truscott (2000) argued that all these linking phenomena have an underlying unity, based on a single element that takes various surface forms. The essence of the argument was that (a) all these items serve the function of linking an element in an NP to the head noun; (b) their presence is contingent on the occurrence of such an element; (c) they are consistently attached to or adjacent to either that element or the head to which they are linking it; (d) they are in complementary distribution with one another (a single modifier is never accompanied by two links); and (e) the superficial differences among them can be straightforwardly explained by extraneous variables, mainly the morphological character of the languages in which they appear.

This conclusion was extended by Truscott (2003) to include linking outside of NP. The more general conclusion, then, is that linking is a very general characteristic of XP's. Languages of all varieties routinely use links to connect non-head elements to the head of the phrase. This generality of linking phenomena suggests that linking is an inherent part of human language, quite possibly attributable to Universal Grammar (UG).

The claim, then, is that whenever a peripheral (non-head) element appears within a given phrase a link is generated to connect it to the head of that phrase, as shown below.

(6) [_{XP} YP Link_i X Link_j ZP]

Thus, the link is always within the XP. Because of its function, it consistently appears in close proximity to one of the elements it connects (both, if possible). Links are typically though not invariably bound, obligatorily attaching to one of these elements. Those which are marked with features of the head necessarily attach to the peripheral element, while those showing features of the latter attach to the head, and those lacking overt agreement features are not constrained in this respect.

Another sort of constraint is relevant, though. It is natural for morphophonemic processes to favor a particular direction of attachment. In English, for example, all available evidence indicates that attachment of links is an obligatorily leftward process (see below and Truscott 2000, 2003), perhaps related to the language's general preference for the use of inflectional suffixes rather than prefixes. The implication is that Link_i in (6) must attach to YP while Link_j must attach to X. This point will have important implications for the search for occult links below.

3. OCCULT LINKING

The generality of linking raises the question of whether links could be even more extensive—far more extensive in fact—than suggested by the discussion to this point. Perhaps they are covertly present in constructions that would appear to lack any linking. This is the topic of this section, and the remainder of the paper.

3.1 The Possibility of Occult Links

The idea that certain elements of a sentence are present in some sense but are not directly observable—have no phonetic matrix—is a common one in linguistic theory. Empty categories have played a central role in Chomsky's theory in each of its recent incarnations (e.g. Chomsky 1982, 1986, 1995). The more traditional zero-affixes produced by phonetically vacuous application of morphophonemic rules are another example (e.g. Corbett

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1991; Spencer 1991). Thus, there is fairly wide acceptance of the idea that a given element in a sentence need not be assigned a phonetic matrix, that it can in principle be non-overt.

In this context it is quite reasonable, a priori, to hypothesize the presence of non-overt links in cases in which satellites do not appear to be accompanied by a link. To some extent this hypothesis is already widely accepted, though in different terms. Null affixes for gender, noun-class, and number routinely appear in discussions of agreement (e.g. Corbett 1991). These are occult links, hypothesized because they make elegant rules possible and fill otherwise empty slots in paradigms. No one, to my knowledge, has hypothesized null classifiers or linking particles, but the logic in these cases should be essentially the same. And if classifiers and linking particles represent the same underlying element as gender markers, noun-class markers, and number agreement (Truscott 2000), it would be quite surprising if some instantiations of that element allowed non-overt items and others did not.

The strongest form of the occult linking hypothesis is that links are an absolutely universal feature of natural language, appearing with all satellites in all phrase types in all languages; when a given position does not show a link, this is because the link has no phonetic matrix. A weaker version is that links frequently but inconsistently appear non-overtly when they are not present overtly. In either case, if the hypothesis is valid one should expect to find identifiable effects of linking in cases in which no overt link appears. The hypothesis can therefore be tested by means of a search for such effects.

3.2 English as a Testing Ground

English provides a good testing ground for the occult linking hypothesis, as it is rather poor in terms of overt links. The main examples of overt linking in English are the number agreement that appears on demonstratives, shown in (7), and the genitive construction (8), which shows a fairly typical example of an LP. I will focus on the latter.

(7) this/these book/books

(8) the king's wife

The genitive marker *-s* has all the characteristics of an LP: its function is

to connect an element, *the king*) to the head of the phrase, *wife*; its appearance is contingent upon the presence of that element; it has no semantic content; and it does not co-occur with any other link. Such cases are nearly all that English has in the way of overt linking, though.

The issue, then, is whether this apparent lack indicates a genuine absence of links or simply their occult nature in English. The way to resolve this issue is to examine constructions in which an occult link is likely to occur, if such elements do in fact exist, and see if its effects can be found.

Useful clues in the search for occult links in English are provided by the characteristics of its overt linking, particularly from a historical perspective. An interesting characteristic of the English LP, shown in (9), is that it attaches to the rightmost element of the genitive phrase, even if that element is not the head of the phrase.

(9) the king of England's wife

But this type of construction, sometimes called the 'group genitive', is a fairly recent development in English. At earlier stages of the language the genitive marker could be attached only to the head of the NP, never to peripheral elements as it is in (9). A striking feature of this construction is that it was only allowed if the head was the rightmost element in its phrase. Thus it was not possible to say (10).

(10) *the king's of England wife

Instead, the PP had to be extraposed, as in (11),

(11) the king's wife of England

putting the head of the possessor phrase at the right boundary of the genitive phrase.

It is not difficult to explain this odd-looking construction, given the view that the genitive marker is a link. Morphophonemic processes typically require adjacency; thus if there is a link generated to the right of the possessor phrase and this link must be bound to *king*, it will only be possible for the attachment to occur if there is no intervening material. The presence of any material to the right of the head, *king*, and within the possessor phrase, will prevent the attachment and leave a bound morpheme free. Thus the existence of a construction like (11) is not at all surprising, given the

view of links presented in Section 2 and the fact that the genitive marker could only be attached to the head at that stage of the language.

The apparent explanation for the switch in genitive structures has to do with English morphophonemics. The development of the group genitive was associated with the historical simplification of English inflectional paradigms during the Middle English period. Before the shift, the genitive (i.e. the link) was tied to the head noun by the existence of morphophonemic rules existing specifically to specify the forms that nouns of particular noun classes took in various contexts. As the inflections faded, taking the morphophonemic processes with them, the genitive became less tied to a particular category and more clitic-like, allowing the simple generic attachment process seen in today's English.

On the linking account, the characteristics of the old genitive construction were dictated by the presence of the link and the need for it to attach to the head of the possessor phrase. In other words, overt syntactic phenomena reflected the occurrence of linking. Thus, if the hypothesized occult linking is more or less parallel to overt linking, the occurrence of these syntactic phenomena can serve as an indicator of its presence. The relevant structure, for the case of NP, is shown below.

(12) [_{NP}...[_{XP}...X⁰ Y] Link ... N ...]

If the position of Y is unoccupied, nothing will prevent the link from attaching to X⁰. If, however, something is there, the adjacency requirement is violated and attachment will not be possible, resulting in ungrammaticality. A crucial point is that the test cases are not simply phrases in which material is present between X⁰ and N, but specifically those in which such material occurs within the XP of which X⁰ is the head. Such a structure will guarantee that the Link, external to XP but most naturally located on its immediate periphery, is prevented from attaching to X⁰. Material to the left of the noun but to the right of the XP need not block the attachment, as the link would in all likelihood be located to the left of this material anyway.

The structure of interest here involves left branches, i.e. pre-head elements. The hypothesized occult links could equally well occur on right branches (with post-head elements), but the discussion in Section 2 indicates that in this position they would probably not produce the effects just described and would therefore be undetectable. Consider the right branch structure analogous to (12), shown in (13).

(13) [_{NP}... N ... Link ... [_{XP} Y X⁰ ...] ...]

As described above, the link must attach leftward in English. Thus, the internal structure of the XP is entirely irrelevant in this structure. What matters is the absence of overt material between the link and N. But there is no reason to think that any such material ever intervenes, as the position immediately adjacent to one of the linked elements is where a link would most naturally appear. Even when there are two or more post-head elements and therefore two or more links, the expected position for both is immediately after the head.

Saying that this positioning is natural and expected is not saying that it is a necessary consequence of the linking analysis; the links might appear elsewhere, with interesting consequences. The point is that such effects are unlikely and their absence would not constitute evidence regarding occult linking. For left branches, on the other hand, the analysis does make clear predictions: that in structures like (12) Y cannot be occupied by any phonologically realized material. The implication is that one should look for evidence of occult links in left-branching structures, specifically in those like (12).

In the following sections I will explore such structures, first in NP and VP and then in several additional phrase types, asking whether the tell-tale signs of occult linking are present. The conclusion will be that there is a great abundance of evidence that such effects do in fact occur, not only in NP but quite generally across English phrase types, indicating that occult links are pervasive in English.

4. OCCULT LINKS IN NP

In this section I will examine structures like (12) within NP, showing that the signs of occult linking are present. A number of interesting facts about the structure of English noun phrases can be readily explained if the presence of occult links is assumed.

4.1 Prenominal AP

Prenominal adjective phrases are strikingly similar to the old genitive construction in that they cannot contain any material to the right of the head adjective, as shown in (14).

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- (14) a. He is a proud man.
b. *He is a [proud of Mary] man.

Such facts contrast sharply with the characteristics of AP's when they appear in any other position.

- (15) a. He is proud of Mary.
b. a man so proud of Mary that he can't stop talking about her
c. Proud of Mary, he truly is.
d. Proud of Mary is what he is.

The problem with (14b) is not simply the presence of extra, non-head material in the prenominal AP, since one can freely place elements before the head A with no effect on acceptability.

- (16) a(n) very/truly/astonishingly proud man

This superficially bizarre set of facts can be readily explained if one assumes that (14) contains an occult link between the AP and the head noun. If this is the case, then phrases of this type are uniformly ungrammatical for exactly the same reason that group genitives were once ungrammatical—the link cannot be attached to the adjective, just as the overt link could not be attached to the head of the possessor phrase in the group genitive construction.

The ungrammaticality of (14b) cannot be accounted for by principles of Case assignment or theta-role assignment or by any constraints related to subcategorization. This is because the generalization involved is not one about arguments or any related concepts—it is simply that no lexical material, of any kind, can appear to the right of the adjective within the AP. In the above example, the material to the right of the A is a complement, but the sentence is equally bad when the A is followed by an adjunct instead.

- (17) a. *He is an [ugly beyond belief] man.
b. *He is a [diligent to a remarkable degree] man.
c. *He is a [happy during summertime] man.

Nor can the problem be explained in terms of a ban on the placement of heavy constituents in the middle of a sentence or phrase. The existence of such a constraint is not in doubt, but the troublesome constituents in these

cases are not particularly heavy (e.g. “proud of Mary”) and changes in their length do not seem to have any effect on acceptability, so the ungrammaticality of (14b) and related cases cannot be attributed to any heaviness constraint. Moreover, “astonishingly proud” is certainly no less heavy than “proud of Mary”, and yet placing it in the pre-head position is fully acceptable (16) while placing “proud of Mary” there is utterly impossible (14b). So, again, the problem clearly lies not in the length of the prenominal AP but rather in the presence of lexical material to the right of its head.

The structure that has been considered here is an instance of that presented in (12), specifically (18).

(18) [NP...[AP...A Y] Link ... N ...]

As predicted, when material occurs in the position of Y, ungrammaticality results. This problem is readily explained by the presence of an occult link, which must attach to A. This attachment requires adjacency, which is destroyed by the presence of Y, rendering the sentence ungrammatical. This is to say that the ungrammatical phrases considered above are bad for exactly the same reason that group genitives were once bad.

English has several ways of getting around this constraint on the use of AP modifiers. Often the post-head material can simply be omitted. When this is not appropriate, the AP can be shifted to postnominal position, as in (19a), or to predicative position, as in (19b).

- (19) a. He is a man (who is) ugly beyond description.
b. The man is ugly beyond description.

In these positions (and others), they are sometimes slightly awkward, but this occasional awkwardness contrasts sharply with their clear and consistent ungrammaticality in prenominal position.

The connection to the old genitive construction is shown more clearly by the existence of an additional way of getting around the constraint on prenominal modifiers. Compare the following cases to the old genitive (11), repeated below as (21):

- (20) a. a [hard__] sentence to translate (a sentence which is hard to translate)
b. a [pleasant__] person to talk to (a person who is pleasant to talk to)

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(21) [the king's] wife of England (the king of England's wife)

In each of the phrases of (20), the infinitive (*to translate, to talk to*) is a complement of the prenominal adjective. In each case it cannot appear in its natural position immediately following the adjective, since it would then prevent the link morpheme from attaching to the adjective. Thus it appears in the unnatural postnominal position, just as the complement of *king* does in (21).

The same sort of extraposition can be found with comparatives and superlatives:

(22) a. a [better_] man than he used to be (a man who is better than he used to be)

b. a [more intelligent_] man [than he used to be] (a man who is more intelligent than he used to be)

(23) a. the [best_] man for the job (the man who is best for the job)

b. the [most suitable_] man for the job (the man who is most suitable for the job)

Consider also the following example, taken from Quirk et al. (1985) (which also provided the inspiration for a number of other examples used in this section and elsewhere).

(24) A [good_] paper editorially can also be a [good_] paper commercially.

The meaning is "A paper which is good editorially can also be a paper which is good commercially." Here *editorially* and *commercially* modify *good* from the postnominal position, just as the extraposed phrases and clauses in the previous examples modify prenominal adjectives.

The phenomenon can also be seen with degree clauses occurring in AP's within NP (these and subsequent examples involving degree clauses are based on Jackendoff 1977).

(25) a. a man [_{AP} so happy that he can't stop singing]

b. a man [_{AP} too happy to stop singing]

c. a man [_{AP} as happy as anyone I know]

d. a man [_{AP} more happy than you can imagine]

In the postnominal position (and other positions, as well), such phrases are perfectly natural. When moved to the prenominal position, though, they become utterly impossible.

- (26) a. *a [so happy that he can't stop singing] man
b. *a [too happy to stop singing] man
c. *an [as happy as anyone I know] man
d. *a [more happy than you can imagine] man

In each case, the presence of material between *happy* and *man* produces ungrammaticality.

AP's containing *too*, *so*, and *as*, when they appear in prenominal position, show some quirky behavior, which interacts with linking effects.

- (27) a. *He is a(n) [too/so/as intelligent] man...
b. He is [too/so/as intelligent] a man...

AP's that include these degree words must be moved to the front of the NP (perhaps to a topic position), for reasons that do not appear to be related to linking (at least I cannot find a connection). The interesting point is that from this novel position they still show linking effects.

- (28) a. *He is [too intelligent to say that] a man.
b. *He was [so happy that he started singing] a man.
c. *He is [as happy as I've ever seen] a man. (* with the appropriate reading)

- (29) a. He is [too intelligent_] a man to say that.
b. He was [so happy_] a man that he started to sing.
c. He is [as happy_] a man as I've ever seen.

The head of the prenominal degree phrase must still be the rightmost element of the phrase. The way that English gets around the constraint is, again, to extrapose the intervening material to a postnominal position.

Thus adjective phrases appearing in the prenominal position show precisely the characteristics of the old genitive construction: no material is allowed to follow the head, and when such material is necessary, it is extraposed to the postnominal position, where it cannot do any harm. Given

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the occult linking analysis, this is exactly as expected.

4.2 A Tangent: *enough*-Phrases

Before proceeding to other types of modifiers, it is necessary to consider an apparent—though not actual—problem with the generalization I have suggested. It involves the use of *enough* as a post-head modifier in AP, as in (30).

- (30) a. I've never yet found a [high enough] mountain.
b. He gave a [clever enough] explanation of his views.

These would seem to be counterexamples to the claim that the head of the AP must be adjacent to the noun. There are compelling reasons, though, to believe that A + *enough* combinations are actually compound adjectives; thus *high enough* and *clever enough* are the heads of the AP's in (30) and there is no problem for adjacency. (See Lyons 1968, for a good presentation of tests for identifying words.)

The compound status of A + *enough* can be seen, first, by a look at AP's which contain both *enough* and a complement.

- (31) a. We are [proud enough of Mary].
b. *We are [proud of Mary enough].

If *enough* is an independent modifier, it is difficult to understand why it must appear between the head and its complement, as in (31a), rather than outside the complement as in (31b). The latter, in fact, would seem to be the more natural position for such an element. The mystery disappears if *proud enough* is considered a single word; in this case the facts are exactly as expected.

Further evidence for compounding comes from the use of intensifiers. When *enough* is not accompanied by an adjective, it can be modified by *just*, as in (32).

- (32) a. There was just enough food.
b. He drank just enough.

However, it is not possible for *just* to intrude in an A + *enough* combination.

- (33) a. *The mountain was high just enough.
b. *His explanation was clever just enough.

Instead, the intensifier modifies the whole combination.

- (34) a. The mountain was just high enough.
b. His explanation was just clever enough.

These facts make sense if *high enough* and *clever enough* are compound words, but are difficult to explain if *enough* is an independent modifier of the adjectives.

Additional evidence is provided by the potential pause test. It is normally quite natural to pause between a specifier and an adjective, as in (35a), but it is quite unnatural to do so between an adjective and *enough*, as in (35b).

- (35) a. The mountain was very...ah...high.
b. *The mountain was high...ah...enough.

The awkwardness of (35b) suggests that no word boundary falls between *high* and *enough*.

Finally, Bloomfield's notion of the word as a minimal utterance can also be used to show the compound status of A + *enough*.

- (36) How high was the mountain?
a. Very
b. *Enough
c. High enough

The unacceptability of (36b) indicates that *enough* is not an independent word when it is used to modify an adjective. This can be contrasted with the situation in which *enough* is not modifying an adjective:

- (37) A. How much money do you have?
B. Enough.

The fact that *enough* cannot stand alone when it is used as an adjective modifier but can in other contexts strongly suggests that it is joining with the adjective to form a single word.

Thus there is a great deal of evidence pointing to the conclusion that A +

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enough is a single word. As a result, it can be concluded that sentences like (30), in which *enough* appears to intervene between the head A and the noun it modifies, are not problematic for the occult linking analysis. Since *enough* is a part of the adjective, it is not separating A from N.

4.3 Other Types of Prenominal Phrases

The analysis given here is not restricted to cases involving adjective phrases; it is, rather, a general principle about prenominal modifiers. The same pattern seen with adjectives holds when the modifier is a participle, for instance.

- (38) a. a problem [annoying beyond belief]
b. an [annoying] problem
c. *an [annoying beyond belief] problem
- (39) a. a man [frustrated beyond endurance]
b. a [frustrated] man
c. *a [frustrated beyond endurance] man

As with adjectives, the participle can have a post-head modifier when the participle phrase is postnominal, as shown by the (a) phrases, but cannot when the phrase is switched to prenominal position, as in the (c) phrases. The conclusion, again, is that no lexical material can follow the head of the modifier phrase when that phrase occurs prenominally.

Occult linking also provides an explanation for the fact that certain phrase types can only appear postnominally, never prenominally. One might ask, for instance, why postnominal PP's can freely appear in a noun phrase while prenominal PP's are impossible.

- (40) a. the book [_{PP} on the table]
b. *the [_{PP} on the table] book
- (41) a. a man [from London]
b. *a [from London] man
- (42) a. the shirt [with a yellow collar]
b. *the [with a yellow collar] shirt

The answer is precisely the same as in the case of AP's. In (40b), for example, a link with *book* must attach to the head of the PP, *on*. It cannot do so, due to the presence of intervening material; the phrase is therefore ungrammatical.

Further evidence is provided by intransitive prepositions, cases in which prepositions appear without any complement. In such cases there is nothing to the right of the preposition and therefore nothing to prevent it from appearing in prenominal position, so if the analysis is right we should expect to find intransitive prepositions in that position. This prediction is correct.

- (43) a. a near catastrophe
b. an inside account
c. the above problem
d. the outside linebacker
e. the up/down escalator
f. the in/out door

The acceptability of these phrases indicates that the problem with prenominal PP is the presence of lexical material following the preposition, as predicted.

It is important to note that the treatment of these words as intransitive prepositions is by no means an ad hoc analysis invented to support occult linking. Radford (1997), for example, took it for granted that prepositions can be transitive or intransitive, based on the consistent parallels between the syntactic behavior of such words and that of words that are universally called prepositions (including those in (41)). Pullum (1998) compared the rejection of intransitive prepositions to a claim that *eat* is a verb in *I've already eaten dinner* and is not a verb in *I've already eaten*. Interestingly, the parallel behavior of transitive and intransitive prepositions has one striking exception: the impossibility of full prepositional phrases appearing in pre-head positions. The occult linking analysis provides an explanation for this anomaly—the only explanation there is, to the best of my knowledge.

The clause is another type of element that can freely appear in postnominal position, but is never possible prenominally.

- (44) a. the fact [that it is raining]
b. *the [that it is raining] fact

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- (45) a. the man [that I told you about]
b. *the [that I told you about] man

Given the standard view that Comp is the head of the clause, the link in the (b) phrases must attach to the complementizer. This is not possible, due to the presence of intervening material within the clause. Thus the ungrammaticality of these phrases is explained in exactly the same way that the previous cases of prenominal modifiers were explained.

5. OCCULT LINKS IN VP

The discussion of prenominal modifiers can be straightforwardly generalized to preverbal modifiers. Interestingly, there is also a modification structure in verb phrases which closely parallels the old genitive construction, involving extraposition of the intervening material:

- (46) a. Herb explained his reasoning [so cleverly that I couldn't help being convinced].
b. *Herb [so cleverly that I couldn't help being convinced] explained his reasoning.
c. Herb [so cleverly_] explained his reasoning that I couldn't help being convinced.

The adverb phrase *so cleverly that I couldn't help being convinced* can appear as a single unit in the postverbal position, as shown in (46a). Not surprisingly, it cannot do so in preverbal position, as shown in (46b), since the occult link would then be unable to attach to the head, *cleverly*. The interesting point is that it is possible for the AdvP to appear preverbally, but only if all the material to the right of the adverb is extraposed, as in (46c). This is precisely the situation that obtained in the old genitive construction (and in all the analogous cases shown in Section 4), and it deserves the same explanation: the extraposition shown in (46c) leaves the head of the phrase, *cleverly*, at the right boundary of its phrase, allowing a link (occult in this case) to attach to it and thereby saving the construction. The existence of such constructions provides strong evidence both for the generalization that the head of a preverbal modifier must be adjacent to the verb and for the treatment of occult linking as a cross-categorical phenomenon.

This phenomenon is quite general. An adverb phrase in which the adverb comes last can appear either preverbally or postverbally.

- (47) a. Herb very quickly left the room.
b. Herb left the room very quickly.

But when the AdvP contains additional material to the right of the adverb, there is no possibility of the phrase appearing in preverbal position.¹

- (48) a. *Herb [so quickly that I couldn't follow him] left the room.
b. Herb left the room [so quickly that I couldn't follow him].
- (49) a. *Herb [too quickly to follow] left the room.
b. Herb left the room [too quickly to follow].
- (50) a. *Herb [as quickly as he could] left the room.
b. Herb left the room [as quickly as he could].
- (51) a. *Herb [more quickly than I thought possible] left the room.
b. Herb left the room [more quickly than I thought possible].

Extrapolation is available, to varying degrees, as a means of getting around the problem, as it is in NP.

- (52) Herb [so quickly_] left the room that I couldn't follow him.
- (53) Herb [too quickly_] left the room for me to follow him.
- (54) Herb [as quickly_] left the room as he was capable of leaving it.
- (55) Herb [more quickly_] left the room than I thought possible.

The acceptability of these cases seems to vary from very nearly (perhaps fully) grammatical to rather marginal. The essential point, however, is that they are clearly and consistently better than their unextrapolated counterparts

¹ In these and other cases, I assume that the parenthetical reading, with strong pauses surrounding the AdvP, is not relevant, as it indicates a separation of the material from the overall sentence structure.

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in (48)-(51), showing again the effects of occult linking. Extraposition is sometimes a marginal process, but even at its most marginal it significantly improves the sentences.

This constraint on preverbal modification is not limited to adverb phrases. Prepositional phrases, whether subcategorized or not, can never appear in the preverbal position, despite the fact that they are quite free postverbally.

- (56) a. *Herb before dinner runs five miles.
b. Herb runs five miles before dinner.

- (57) a. *Herb will under the tree read a novel.
b. Herb will read a novel under the tree.

Given the assumption that occult links appear in these sentences, the facts are exactly as expected—the (a) sentences are ungrammatical because the link cannot be attached to the non-adjacent head P.

The same can be said of clauses appearing in VP.

- (58) a. *Herb [while he talked to Mary] looked out the window.
b. Herb looked out the window [while he talked to Mary].

Again, the head of the clause is presumably C, which is not at the right boundary of the clause, so linking is blocked in such cases, making the sentence ungrammatical.

Thus the preverbal position is subject to the same constraints that apply to the prenominal position. This is as expected, given the occult linking analysis.

6. OCCULT LINKS IN OTHER PHRASE TYPES

So far I have considered evidence of occult links in NP and VP. The same sort of evidence can be found in other phrase types as well. I will consider AP, AdvP, PP, and QP.²

6.1 Occult Links in AP

² I set aside the very theory-internal question of how this account might apply to constituents of clauses.

The same phenomena that were found in NP and VP can be found in AP. First, consider degree clauses.

- (59) a. Herb is [so _] intelligent that he has never lost an argument.
b. Herb is [too _] intelligent to believe that story.
c. Herb is [as _] intelligent as people say he is.
d. Herb is [more _] intelligent than you think he is.

Here again we see the effects of occult linking on pre-head elements, in AP in this case. The phrase that modifies the adjective *intelligent* can appear in the pre-adjectival position, but only if all the material to the right of its head, *so/too/as/more*, is extraposed, leaving the head at the right boundary. Without the extraposition, such sentences are consistently awful.

- (60) a. *Herb is [so that he has never lost an argument] intelligent.
b. *Herb is [too to believe that story] intelligent.
c. *Herb is [as as people say he is] intelligent.
d. *Herb is [more than you think he is] intelligent.

This is the same phenomenon found in VP and in the old genitive construction, and it can be explained in exactly the same way.

It is interesting to note that the extraposed clauses in (60) are complements of the degree words, just as the extraposed elements in the old genitive construction were complements of the genitive head, and therefore logically belong with it, in the preverbal position. Their complement status is shown by the fact that the complementizer in each case is selected by the degree word (*so...that*, *too...for-to*, *as...as*, *more...than*) and also by the fact that the clauses cannot appear unless the degree word is also present (deletion of the degree word alone results in ungrammaticality in each of the sentences of (59)). Their status as complements makes their obligatory separation from the degree word all the more striking and again shows the similarity to the old genitive construction.

In his discussion of degree clauses, on which the present discussion is based, Jackendoff (1977) included a fifth case, involving *enough*.

- (61) a. He's afraid enough of Bill to freak out.
b. He's afraid enough that he'll lose to freak out.

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But cases like these are not parallel to those in (59) and (60) because, as I argued in the previous section, *enough* is not an independent modifier in such cases, but rather part of a compound adjective. The arguments given above apply equally well here. If *enough* is an independent word in (61), then it is intervening between the adjective and its complement at the A level, where such elements do not belong. If it is part of a compound adjective, on the other hand, it is in exactly the appropriate position. Furthermore, it is not possible to insert *just* before *enough* in (61)—a puzzling fact if *enough* is an independent word, but expected if *afraid enough* is a compound. Note that when *enough* appears outside the complement—and therefore is clearly an independent word—it can be modified by *just*, as in (62),

- (62) a. He's afraid of Bill just enough to freak out.
b. He's afraid that he'll lose just enough to freak out.

and that the appearance of *just* actually improves such sentences. In addition, the potential pause and minimal utterance tests used in the preceding section give the same results when applied to *afraid enough* in (61)—there is no word boundary between the two elements. Finally, *enough* is unlike the genuine degree words in that each of them requires one specific complementizer to appear in its degree clause while *enough* clauses can take either *that* or *for-to*. The latter are simply the default values for Comp; they occur whenever there is no need for any specific complementizer. For all these reasons, it can be concluded that *enough* does not belong to the same class as *so*, *too*, *as*, and *more*, and that it should therefore have no role in this discussion.

6.2 Occult Links in AdvP

There is not a great deal to say regarding the AdvP, since it has relatively little internal structure. It does, however, display the property that was perhaps the most interesting of those considered in the discussion of VP and AP—the extraposition of degree clauses. The example sentences above included several examples of a VP containing an AdvP showing this phenomenon. Consider the adverb phrases used in (63):

- (63) a. so quickly that I couldn't follow him
b. too quickly to follow him

- c. as quickly as he could
- d. more quickly than I thought possible

It was pointed out above that the clauses in these examples are complements of the degree words *so*, *too*, *as*, and *more*, based on the fact that the clauses cannot be present unless these degree words are also present and that the degree words select the appropriate complementizer for each clause. Thus the natural place for such a clause is the pre-adverbial position, immediately following the degree word, as in (64).

- (64) a. *so [that I couldn't follow him] quickly
b. *too [to follow him] quickly
c. *as [as he could] quickly
d. *more [than I thought possible] quickly

The fact that they cannot appear in this, their natural position, calls for an explanation, which is straightforwardly provided by the occult linking analysis: the presence of the clause in (64) blocks the attachment of a link to the degree word, which is the head of the phrase modifying *quickly*. Thus adverb phrases show the same effects found in NP, VP, and AP.

6.3 Occult Links in PP

PP is comparable to AdvP in complexity, so again there is relatively little to be said. It is not difficult to find instances of degree clause extraposition in PP, but they are almost always cases in which the degree phrase (i.e., degree word + clause) is modifying a modifier of the preposition rather than the preposition itself. Examples like the following are fairly common.

- (65) We were [so far from the city that we still couldn't see its lights].

This is certainly an instance of degree clause extraposition, but the degree phrase is not modifying the preposition *from*, but rather the modifier *far*; the fact that this is taking place in a pre-head position of PP is largely accidental. More interesting (and more difficult to find) are examples like the following.

- (66) a. He was [so_] against the proposal that he wouldn't listen to arguments in its favor.
b. He was [too_] against the proposal to listen to any arguments in its

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favor.

- c. He was [more_] against the proposal than I had realized.
- d. He was [as_] against the proposal as he had ever been.

As in analogous examples given in previous sections, the natural position for the *that* clause is between the degree word and the preposition *against*. As in the previous examples, it cannot appear in that position, because by doing so it would prevent attachment of a link to the degree word. Thus prepositional phrases show the same effects as other phrase types, for the same reason.

6.4 Occult Links in Quantifier Phrases

Degree clause extraposition can also be found in QP, as shown below.

- (67) a. She loves him [so_] much that she left him.
- b. She loves him [too_] much to leave him now.
- c. She loves him [as_] much as his mother does.

Once again, each clause is a complement of the degree word but cannot appear in its natural position between degree word and quantifier. Once again, this can be explained by the existence of a non-overt linking process.

Consider now the more complex situation shown below.

- (68) a. He explained his reasoning so __ much more __ cleverly than he had before that everyone was now convinced.
- b. He is so __ much more __ intelligent than she is that no one can believe she is his mother.
- c. He was so __ much more __ against the idea than he had been before that no one could believe it was the same man.

These are examples of multiple extrapositions, occurring in AdvP, AP, and PP. In each case, the clause beginning with *than* is a complement of *more* and so logically belongs in the position immediately after it. In each case, it cannot occupy that position because by doing so it would prevent a link from attaching to *more*. In addition, each *that* clause is a complement of *so*, but must be extraposed in order to allow attachment of a link to *so*. This second extraposition cannot place the *that* clause after *more*, since this would then block the first linking, so the clause must be placed at the right

end of the entire phrase. Again, the results are exactly as expected given the occult linking analysis.

7. THE EFFECTS OF OCCULT LINKS ON EXTRACTION

Ross (1967) observed that extraction from the left branch of an NP yields ungrammatical results, as in the following example (Ross' 2.15):

(69) *Whose did you find book?

Based on such facts, he proposed the Left Branch Condition (LBC), shown below (Ross' 4.181).

(70) No NP which is the leftmost constituent of a larger NP can be reordered out of this NP by a transformational rule.

This formulation of the LBC is actually somewhat broader than it would appear to be, since Ross treated as NP's certain elements which are not normally considered NP's; I will discuss such cases (though not Ross' analysis of them) below.

Occult linking provides a straightforward explanation for the LBC. A link must be attached to each left branch constituent. This process, being a morphophonemic matter, should apply after movement has occurred.³ Thus, if a left branch constituent is moved away from the associated link, it will not be possible for the attachment to occur. The resulting situation is shown below:

(71) *Who did you find -s book?

Movement of the possessor has stranded the link morpheme, forcing it either to remain free or to attach to an inappropriate element (the verb *find* in this example). In either case, the result is ungrammaticality.

Given this analysis, extraction of a left branch element produces exactly the same problem discussed in Sections 4, 5, and 6: a link is unable to attach to the element to which it must attach. Thus the two constraints on left

³ In passive sentences, for example, the NP that has been moved to the subject position receives nominative Case: *He was kissed by her*, not **Him was kissed by she*.

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branches (i.e. on pre-head elements)—one on their occupants and one on extraction of these occupants—can be unified under the occult linking analysis.

One implication of this analysis is that the phenomenon captured by the Left Branch Constraint is a very general one, exactly as general as the constraint on occupants of left branches. Within NP, it should apply not simply to possessors, but rather to anything which appears on a left branch. Beyond NP, it should apply to all the other phrase types in which other left branch effects occur—VP, AP, AdvP, PP, and QP. In this section it will be shown that all these predictions are correct.

7.1 Noun Phrases

As expected, the LBC applies to all occupants of left branches in NP. An example was given above of possessor extraction. Extraction of an adjective is equally bad.

- (72) a. What color lipstick do you like e?
b. Yellow lipstick, I like e.
c. *Yellow, I like e lipstick.
d. *What color do you like e lipstick?
e. *Yellow is the color that I like e lipstick.

The entire NP, *what color lipstick* or *yellow lipstick*, can be moved, as shown by (72a) and (72b), but its left-branch occupants cannot be extracted, as shown in the remaining sentences.⁴

The same effect occurs with quantifiers, as in (73).

- (73) a. How many books did you buy e?
b. *How many did you buy e books?
c. *Many, I bought e books.

Again, movement of left branch occupants produces ungrammatical sentences.

⁴ These cases must be separated from those in which *yellow* or *what color* appears after the NP: *I like lipstick (to be) yellow*. The latter are not relevant to the LBC. Fortunately, the meaning contrast between the two types of cases is sharp enough to allow clear judgments that the sentences of (72) are quite bad when they have the meaning associated with a left-branch position for the modifier.

Extraction of determiners is similar.

(74) *These, I don't like e books.

This case is like that of possessors in that it involves overt linking; the demonstrative is marked for the number of the noun *books*. The effect of this overt linking is no different, however, from that of the non-overt kind seen in (73)—in each case the extraction is impossible. If the determiner is replaced by the *wh*-element *which* (presumably occupying the same position), the results are the same.

(75) *Which don't you like e books?

Thus nothing can be extracted from the determiner position of NP.

Such examples show that the LBC is a general phenomenon within NP, applying to all types of left branch constituents. In the two following sections it will be shown that the constraint is also a general phenomenon outside of NP.

7.2 Verb Phrases

In identifying left branch effects, VP is the most difficult phrase to deal with. This is because verb modifiers can appear either preverbally or postverbally, making it difficult to determine the source of an extracted constituent. Thus the AdvP of (76a) can be fronted, but its initial position could, in principle, be either preverbal, as in (76b), or postverbal, as in (76c).

- (76) a. How quickly was he running down the street?
b. He was quickly running down the street.
c. He was running quickly down the street.

Finding adverbs that cannot appear postverbally is extremely difficult. Perhaps the best test cases involve *truly*, which is fine preverbally but somewhat marginal postverbally.

- (77) a. He might truly like cricket.
b. ?He might like cricket truly.

So any cases in which extraction of *truly* is acceptable are likely to be using

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the preverbal position. The fact that there do not seem to be any acceptable cases thus provides evidence that *truly* cannot be extracted from this position.

- (78) a. **Truly*_i is how he might e_i like cricket.
b. *[How truly]_i might he e_i like cricket?

Thus, there is some reason to think that the Left Branch Constraint applies within VP. The explanation, again, is straightforward if we assume the occult linking analysis.

7.3 Other Phrase Types

It is also possible to find Left Branch effects in extraction from the other phrase types that have been considered here. One example is AP.

- (79) a. How happy was he e?
b. *How was he e happy?

- (80) a. Extremely happy, he was e.
b. *Extremely, he was e happy.

It is possible to front the entire AP, but the left branch element cannot be extracted from the phrase. It is also interesting to compare (79) and (80) to cases in which a right branch adjunct is extracted.

- (81) a. He was happy to a remarkable degree.
b. ?To what degree was he happy?

While this right branch extraction is perhaps somewhat stilted, it contrasts sharply with the extreme unacceptability of the left branch extraction (79b) and (80b), indicating that the LBC is operating in AP.

Consider also cases in which AP contains both a left branch element and a right branch complement.

- (82) Herb left the room [extremely happy about his luck].

While no movement from this position is fully acceptable, there is a striking contrast between movement of the left branch occupant on the one hand,

and either the right branch constituent or the entire AP on the other.

- (83) a. *How did Herb leave the room e happy about his luck?
b. ?(About) what did Herb leave the room extremely happy (about) e?
c. ??How happy about his luck did Herb leave the room?

The fact that (83a) is substantially worse than the other two sentences again points strongly to the conclusion that the LBC is operating in AP, as predicted by the occult linking analysis.

The constraint also appears to affect extraction from AdvP.

- (84) a. How quickly did he run e?
b. *How did he run e quickly?
- (85) a. Extremely quickly, he ran e.
b. *Extremely, he ran e quickly.

As expected, extraction of the left-branch constituent is impossible, as shown by the (b) sentences, despite the fact that movement of the entire AdvP is acceptable, as in the (a) sentences.

The same phenomenon occurs with extraction from PP.

- (86) a. How near the city are they e?
b. Which city are they near e?
c. *How are they e near the city?

The entire PP can be moved, as in (86a), and its right branch occupant can be extracted, as in (86b), but movement of the left branch element is impossible, as shown by (86c).

Finally, consider extraction from the left branch of QP.

- (87) a. How few are his problems e?
b. *How are his problems e few?
- (88) a. Extremely few, his problems are e.
b. *Extremely, his problems are e few.

Again, extraction of the left branch element is impossible, despite the fact that the entire QP can be moved.

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7.4 Conclusion

This discussion shows that the Left Branch Constraint applies very generally. This generality, moreover, corresponds to that of the constraint on the character of left branch occupants found in Sections 4-6. Each phrase type shows both of the constraints, as predicted by the occult linking hypothesis.

8. DIRECTIONS FOR FUTURE RESEARCH

I have focused on English because it provides a good testing ground for occult links, as described above, and because the phenomena are sufficiently rich that a lengthy treatment is required for the analysis of even a single language. But the occult linking analysis clearly has implications that go well beyond English. The search for occult links could, in principle, be undertaken in any of the world's languages, with varying degrees of promise and of difficulty. In this section I will briefly consider how the search might be extended beyond English, and the potential limits of such an extension, taking Chinese as the example.

In Section 3.2, I identified the following configuration as the place to look for signs of occult links.

(89) [NP...[XP...X⁰ Y] Link ... N ...]

If the link is required to attach to the head of XP then no material should be allowed in the Y position, because it would block the obligatory attachment. An observed prohibition against such material would thus constitute evidence that an occult link is present.

A key piece of this logic is the requirement that attachment must be to the head. If the link can simply attach to whatever element appears at the right end of XP, attachment will never be blocked, regardless of the character of Y, and so the presence of a link would not produce any discernible effects. But this requirement is clearly not a universal characteristic of links, as shown by the current form of the English genitive construction. In other words, the test I have used for occult links can be used only where head attachment is a requirement. Until additional tests can be found, this situation imposes an important limit on the search for occult links. In a great many cases (perhaps most) they could be present but undetectable simply because the proper testing conditions do not arise in the language in

question.

Consider Chinese. Noun phrases in general tend to be the most fertile ground for studies of linking, so I will focus on the Chinese NP. Two types of overt links can be identified, both briefly described above: a set of classifiers and the linking particle *de*. The former attach to numerals, determiners, and certain quantifiers, linking them to the head noun. The linking particle's behavior is similar to that of the English genitive marker *-s*, though its uses are considerably broader, linking essentially anything except those items that appear with classifiers. One interesting and potentially useful characteristic of the Chinese NP is that it is absolutely head final. In other words, every non-head item in the phrase is on a left branch, making configurations like (89) the norm.

For linking, the first issue is whether the overt links show any signs of a head-attachment requirement. If they do not, it would not follow that an occult link could not have this requirement (as shown by the current state of the English genitive construction), but the situation would not be encouraging. Thus, it is quite possible that the presence of occult links in Chinese, at least in noun phrases, simply cannot be tested.

It is difficult to judge whether classifiers have a head-attachment requirement, as numerals, determiners, and quantifiers—which presumably head their phrases—are not normally accompanied by any other material within the phrase. The evidence is potentially much richer for the linking particle. It appears to consistently attach to the rightmost element of the phrase, so the issue is whether or not this element is consistently the head of its phrase. More importantly, when such a phrase is not accompanied by an overt link, can that phrase contain material after its head? Such questions are inevitably complicated by issues of the proper analysis of Chinese phrase structure. And of course similar questions must be asked for other phrase types, which in some respects are considerably more complex, as they do not have the consistent head-final order found in NPs.

I leave these issues as topics for future research. An interesting related issue is the possibility that occult links have other visible but more subtle effects, which I have not recognized in the treatment of English. This in itself could constitute an interesting line of research.

9. CONCLUSION

I have argued at length that occult links are pervasive in English, as shown

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by the presence of clear and consistent effects of the linking process. The evidence consists of (a) a wide assortment of cases in which certain types of phrases cannot appear in pre-head positions though they are unconstrained in all other positions; (b) the need for extraposition to save constructions in which otherwise unacceptable phrases would appear in the pre-head position; and (c) the impossibility of extracting pre-head elements.

This discussion has an important implication for X-bar theory, the major appeal of which is that it captures cross-category generalizations, providing one general framework in place of the large number of category-specific rules which characterized earlier versions of phrase structure theory. Ideally, this means that no phrase structure rule will ever again mention a specific category; any differences among categories will follow from independent principles of the grammar (see Stowell 1981). One very large problem for this program is that pre-head positions allow certain phrase types while disallowing others. The occult linking analysis can remove this problem. On this view, the impossibility of certain categories appearing in the prenominal position has nothing to do with phrase structure theory; the proper generalization is that, in accordance with the requirements of occult linking, pre-head positions disallow exactly those modifiers which contain post-head material, because such material would block the linking process. Thus there is no problem in saying that the phrase structure rules are category-neutral in regard to pre-head positions; the constraints on what categories appear there are straightforwardly explained by independent principles of the grammar—those involving linking.

Returning to the central point, this discussion suggests that linking is universal to a far greater degree than can be seen on the surface: Occult links play a very substantial role in English syntax. It also provides further support for the general strategy of hypothesizing occult elements based on the properties of overt elements and then testing the hypotheses by looking for the effects of such occult elements.

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