

WHY SURFACE SYNTACTIC STRUCTURE REFLECTS LOGICAL STRUCTURE AS MUCH AS IT DOES, BUT ONLY THAT MUCH

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The hypotheses that (1) with regard at least to scope, deep structure is identical to logical structure, e.g. a quantified expression is a sister of the S that is its scope, and (2) the rules relating deep structure to surface apply according to a strict principle of cyclicity, explain both why there are many systematic parallels between surface syntactic structure and logical structure (e.g. cases where surface c-command relations match logical scope relations) and why there are the derivations there are from these parallels (as where a tensed auxiliary verb in English can be in the scope of a following floated quantifier, contrary to an otherwise valid generalization).

The approach is put to work in accounting for distinctions (explored in Heycock 1995) between cases in which anaphora constraints seem to require ‘reconstruction’ of an underlying structure vs. those in which they do not. The resulting analysis, which exploits some hitherto overlooked details of the logical structures and an improved statement of the restrictions on anaphoric relations, has no need of reconstruction.*

INTRODUCTION. The expression LOGICAL STRUCTURE in my title throughout this article is to be understood literally, that is, as referring to structures that figure directly in logic as inputs to logical rules of inference and to truth conditions. Thus, when I refer below to 9 as the logical structure of 1a, I mean that, for example, truth conditions operate in terms of the constituents of that structure: for *Many students bought few books* to express a true proposition in a given state of affairs, there have to be a large number of students x for which the proposition ‘x bought few books’ is true in that state of affairs, and for any value of x, for that proposition to be true, there must be not many books y for which the proposition ‘x bought y’ is true. Logical structure, in this sense, differs both conceptually and formally from what is commonly called ‘LF’, a term whose interpretation reflects only tenuously its etymological relation to the expression LOGICAL FORM. As such authors as Chierchia (1995:194) make clear, LF is a putative syntactic level that cannot be identified with logical form, since it is expected to conform to restrictions (such as the projection principle) requiring homology between structures on different syntactic levels; accordingly, it cannot accommodate as many Ss as may be needed in a level of logical structure to serve as scopes in sentences having multiple quantifiers.¹ To reduce the likelihood of any confusion with LF, I will avoid the term logical form and say instead logical structure.

There are a large number of at least partially systematic parallelisms between surface syntactic structure and logical structure. A particularly celebrated such case (less famous

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¹ Chierchia provides rules relating LF to logical structure, thus treating LF as what Chomsky (1986:68) describes as an ‘interface’ between linguistic form and meaning. In this respect, Chierchia is unusual: very few works that invoke a level of LF treat it as any sort of interface; none, to my knowledge, use the adequacy of particular putative LFs as interfaces between form and meaning in arguing for or against those particular structures.

but actually clearer cases will be discussed later) is that of those dialects and idiolects of English in which certain combinations of quantified NPs, roughly those in which one of the two quantifiers is negative (*few*, *no*, *not many*, . . .), are required to stand in relative scope relations that match their surface c-command relations. Speakers of these varieties of English find sentences as in 1 unambiguous with regard to scope—they can interpret 1a as ‘There are many students who bought few books’ but not as ‘There are few books that many students bought’, and can interpret 1b as ‘There are few books that many students bought’ but not as ‘There are many students who bought few books’.

- (1) a. Many students bought few books.
- b. Few books were bought by many students.

Note that it is derived and not deep structural relations that directly reflect the scope relations here: the surface subject, irrespective of whether it is the deep subject, has the other NP in its scope, an observation that was widely interpreted ca. 1970 as grounds for not identifying deep structure with logical structure.

There are also many clear cases in which logical structure deviates from surface constituent structure. In all varieties of English, for example, raising predicates such as *seem* easily allow a quantified subject to be interpreted as within their scope, even though it is the quantified subject that is higher in the structure, i.e. 2 can be interpreted as ‘It seems as if [few professors have given hard exams]’.

- (2) Few professors seem to have given hard exams.

There will of course have to be at least SOME mismatches between surface structure and logical structure, since syntactic constituents often have multiple roles in logical structure. For example, a quantified expression has some S or other as its scope and also binds a variable having some syntactic role or other within that S; it cannot be simultaneously outside that S, directly representing the one role, and inside it, directly representing the other role. It turns out, though, that some syntactic phenomena involving quantifiers (for example, quantifier-float) allow both of these roles to be represented transparently in surface structure, even if not completely directly. I will show below both why this transparency exists and why it is less than complete. More generally, I will seek explanations both for what parallelisms there are between surface structure and logical structure and for why those parallelisms do not extend further than they do.

1. CHOOSING A MAXIMALLY EXPLOITABLE CYCLIC PRINCIPLE. The arguments that I give below will make extensive use of a version of a well-known principle whose importance has been greatly underappreciated, namely the CYCLIC PRINCIPLE.² The notion cyclic principle presupposes the notion of the DOMAIN of application of a linguistic rule, as

² The ubiquity of references by syntacticians to ‘successive cyclic’ application of rules should not be misinterpreted as implying correspondingly ubiquitous reliance on the cyclic principle. The idea that wh-movement and whatnot apply in ‘successive cyclic’ fashion is independent of the cyclic principle, i.e. one can accept either without accepting the other. Successive cyclic application of wh-movement is obviously consistent with a random sequential scheme of rule application, i.e. application of rules to any domain that meets their conditions of application, irrespective of what domains rules have applied to so far. The work of a cyclic principle is not to allow but to exclude derivations. Moreover, the proposal by Chomsky (1973) that the bounding nodes for his subjacency principle are precisely the nodes that define domains for the application of cyclic transformations rests on an uncritical acceptance of the then current belief that precisely S’s and NPs defined such domains; it does not presuppose the cyclic principle per se. References to the principle itself are in fact quite rare in syntactic literature of the eighties and nineties, other than in my own work (e.g. McCawley 1984, 1988/1998a), in which it is heavily exploited. The cyclic principle has not to my knowledge been explicitly rejected by any recent syntacticians—they’ve just stopped talking about it.

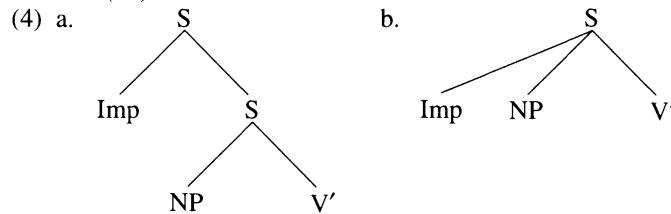
when one speaks of a passive transformation as having the complement S as its domain of application in 3a and as applying to three different domains (indicated by brackets) in 3b.

- (3) a. Alice thinks [her son has been kidnapped].
- b. [It was claimed by the woman [who was interrogated by Officer O'Riley] that [her son had been kidnapped]].

The notion of domain allows the question of how transformations can interact in a syntactic derivation to be divided into two questions: (i) What determines the interaction between transformations applying to the same domain? and (ii) What determines the interaction between transformations applying to different domains? The cyclic principle, which was the answer of 1960s generative grammarians to (ii), says:

If one domain to which transformations might apply is contained in another domain, applications of transformations with the smaller/lower domain precede any applications of transformations with the larger/higher domain.

As an illustration of the cyclic principle, consider English imperative sentences. I will assume that imperative sentences have deep structures containing a marker of imperative status (here written Imp), though for reasons that will soon become apparent, I will take it to be outside the S that it applies to (4a) and not (as in Katz & Postal 1964) within that S (4b).³

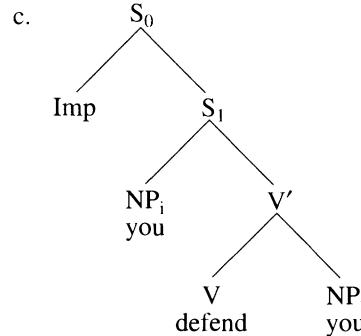


A transformation (ISD = IMPERATIVE SUBJECT DELETION) deletes a second person subject in the presence of Imp. With a deep structure as in 4a, the domain to which ISD applies will be the upper S, since that is the smallest constituent containing both Imp and the subject that is to be deleted. However, reflexivization (indeed, any transformation in which Imp is not involved) will apply with a lower constituent as its domain and thus, according to the cyclic principle, will get its chance to apply before ISD does. The cyclic principle thus explains why ISD cannot bleed the application of any 'ordinary' transformations when it deletes the pronoun that might serve as a conditioning factor, that is, why reflexivization, equi-NP-deletion, etc. in imperatives apply the same way as if the *you* remained in subject position. The domain for the application of those transformations (here, S₁) is contained in the domain for ISD (here, S₀), which thus does not get a chance to apply until after reflexivization, and so on, have had their chance to apply.

³ Throughout this article, I label syntactic constituents in accordance with the view of syntactic categories presented in McCawley 1988/1998a:ch. 7, in which the category label on a constituent is a summary of information relevant to its syntactic behavior. Two of the factors that influence how a constituent can behave syntactically are the part of speech of its head and the difference between phrasal and functor units; accordingly, V' means 'phrasal unit whose head is a V'. In this system, there are no multiple bars; the symbol NP refers to the syntactic counterpart of the logical category 'argument', not to a second-order projection of N. A more precise system of labels than is used here would distinguish semantic, internal syntactic, and external syntactic dimensions of categories such as NP and S that are syntactic counterparts of logical categories.

For an explanation of why Katz and Postal offered 4b without even considering the alternative of 4a, see McCawley 1985.

- (5) a. Defend yourself/*you!
 b. Stop (*your) wasting your time!



Of course, it is only because Imp is outside of S_1 that the cyclic principle implies anything about how ISD interacts with other transformations. If the deep structure were Katz & Postal's 4b, ISD would have the same domain as any other transformation that involved the NP and the V' , and accordingly the interactions between ISD and those transformations would come under the purview of question (i) rather than (ii). The usual answer of 1960s generative grammarians to (i) was that transformations applied to any domain according to a fixed ordering, and accordingly the interaction between ISD and reflexivization was commonly taken (e.g. in Perlmutter & Soames 1979) to show that reflexivization and the other transformations preceded ISD in that ordering; with deep structures as in 4a, the question of any ordering of these transformations never arises, since they can never apply on the same domain.

I have been saying THE cyclic principle, but there are several indeterminacies in the above definition of cyclic principle, and each way of resolving them yields a different cyclic principle. I will attempt to resolve these indeterminacies in such a way as to obtain a cyclic principle that does the maximum possible amount of work.

There are indeterminacies in what counts as the domain to which a rule applies. In the examples given so far, the domains have been S_s , but there is no a priori reason why ONLY S_s could be domains. If constituents of other categories can also be domains, so much the better, since the more domains there are, the greater the class of cases that come under the purview of question ii rather than i, and thus the more the cyclic principle implies about how rules interact. I accordingly resolve this indeterminacy by adopting the extreme position that ALL constituents, irrespective of category, are potentially domains of application for transformations.⁴ There is indeed no apparent reason why discourse constituents cannot also be domains for the application of rules that are required to interact in accordance with the cyclic principle, and until a reason to do otherwise emerges, I will assume that they can. Thus, the fact that zero V' 's can have their antecedents in a separate sentence is, from this point of view, no objection to positing a V' -deletion transformation that conforms to the cyclic principle, as in my argument relating to 6 below, and that assumption yields a correct interaction between

⁴ This is essentially what is done in Montague grammar: Montague grammar has syntactic rules for all syntactic categories that play a role in the given language, and (as I observed in McCawley 1977) one can interpret a Montague syntactic rule as a phrase structure rule possibly supplemented by transformations applying to that phrase structure configuration. The transformations in this reinterpretation of Montague would then interact according to the cyclic principle, with constituents of all categories as domains for the application of transformations.

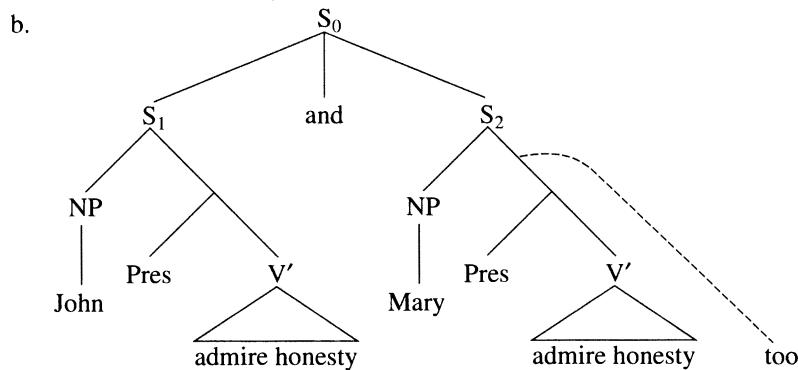
V' -deletion and postcyclic transformations such as the one combining tenses with main verbs.

Another indeterminacy about what can count as the domain for a particular application of a transformation emerges if one asks whether in 3a, for example, one could take passive as applying to the higher S but just ignoring all material that is outside the lower S. Since allowing that possibility would substantially reduce the implications of the cyclic principle and indeed subvert the idea that lower domains take precedence over higher ones, I will exclude it in the most straightforward possible way, namely by adopting the version of a principle of STRICT CYCLICITY that says that only the lowest constituent that contains everything relevant to the given application of the transformation can count as the domain to which it applies.⁵

There are also indeterminacies in what exactly is subject to the cyclic principle. Hitherto, I have spoken of it as constraining the application of transformations, but it is important to ask whether it applies to rules of other sorts also. Later, I will discuss something other than a transformation that appears to apply according to the cyclic principle and to respect strict cyclicity; of course, the more different kinds of linguistic rules whose application it constrains, the richer are its implications about how linguistic rules can interact.

Of comparable importance is the question of whether all or only some transformations are subject to it. That question receives a conclusive answer in Akmajian and Wasow's (1975) demonstration that some transformations have to be exempted from the cyclic principle and made POSTCYCLIC. They note that the application of the transformation that combines a tense with a MAIN V (tense-hopping, one of three transformations that Chomsky 1957 mistakenly conflated in a single rule of affix-hopping) has to be postponed until after such transformations as V' -deletion have applied with higher Ss as domains, since if it obeyed the cyclic principle, it would prevent V' -deletion from applying in sentences such as 6a.

- (6) a. John admires honesty, and Mary does \emptyset too.



⁵ The STRICT CYCLE CONDITION of Chomsky (1973:97: 'No rule can apply to a domain dominated by a cyclic node A in such a way as to affect solely a proper subdomain of A dominated by a node B which is also a cyclic node') has to do only with material affected by a transformation, rather than all material that figures in its application; it accordingly has very different implications from the condition adopted here. Chomsky's condition would exclude the formulation of *there*-insertion that I give in §3; it would also exclude the version of imperative subject deletion given in §1 and the concomitant explanation of why ISD cannot bleed transformations in which the imperative marker plays no role.

The domain on which V'-deletion applies here is S_0 (the smallest constituent that contains the two identical V's), but the domains for the two applications of tense-hopping are contained in S_1 and S_2 . If tense-hopping applied according to the cyclic principle, it would move the two tenses into the respective V's before V'-deletion got its chance to apply, and thus no derivation of 6a would be available, since S_0 would no longer contain identical tenseless V's. For V'-deletion to apply to the required input (6b) for a derivation of 6a, the two applications of tense-hopping have to be postponed until after V'-deletion gets its chance to apply with S_0 as domain.

The syntactically relevant levels that the distinction between cyclic and postcyclic transformations determines are indicated in Fig. 1, along with the components of a grammar that figure directly in syntax, as argued in McCawley 1988/1998a.⁶

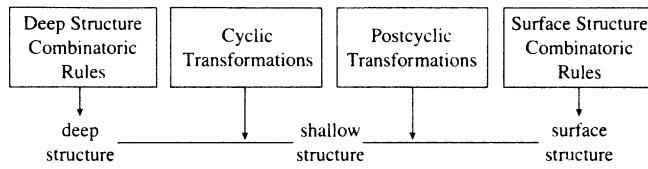


FIGURE 1.

The possibility of postcyclic transformations is severely limited. Pullum 1976 offers the appealing and well-supported conjecture that a transformation is postcyclic if and only if it is LOCAL in the sense of Emonds 1976. A local transformation is one for which, as with tense-hopping, at most two syntactic positions are involved in its application, and those positions are adjacent both in linear order and structurally (they are sisters or aunt and niece). Since most transformations are prima-facie nonlocal (in that they involve positions that are not structurally adjacent), the question of whether a transformation is cyclic or postcyclic would then usually allow a trivial resolution.⁷

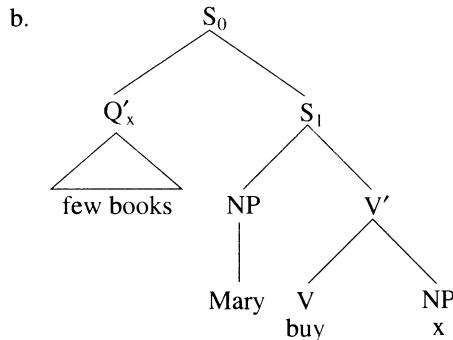
2. WHAT [Q' S] DEEP STRUCTURES COMMIT ONE TO. Let us return to the varieties of English in which sentences such as 1a–b are unambiguous with respect to quantifier scope. Many linguists writing in the later 1960s and early 1970s interpreted the fact that quantifier scope in these sentences reflected derived rather than deep grammatical relations as refuting the claim of generative semanticists (e.g. McCawley 1972, Lakoff 1972) that deep structure was identical to logical structure and as requiring instead that quantifier scope be determined directly from surface structure. That inference, however, is not justified. Suppose that scope relations are represented directly in deep structure, so that, for example, 7a would have a deep structure 7b in which the quantified expression is a sister of the S that is its scope.⁸

⁶ For further details, see McCawley 1998a. The arrows indicate what each component restricts, e.g. the cyclic transformations restrict the relationship between deep structures and corresponding shallow structures.

⁷ See McCawley 1988/1998a for arguments in support of Pullum's conjecture. Spurious arguments supposedly showing various nonlocal transformations to be postcyclic have sometimes been given; I disavow the arguments of that sort given in McCawley 1970.

⁸ Here and below, the deep structures will be simplified by omitting tenses and complementizers where they are not involved in the points at issue.

- (7) a. Mary bought few books.

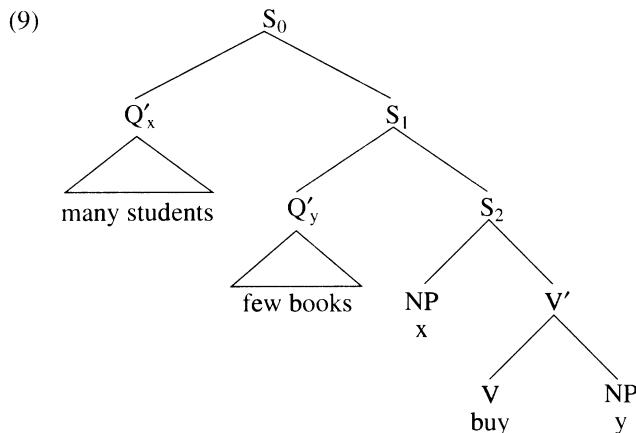


Acceptance of deep structures in which quantified expressions are outside their host Ss commits one to accepting a transformation (henceforth, Q' -LOWERING, abbreviated $Q'L$) that moves a Q' into a position occupied by an occurrence of the variables that it binds. Since the application of $Q'L$ to 7b yields an output in which all material is contained in S_1 , strict cyclicity implies that there can be no subsequent application of transformations with S_0 as domain: all material of S_0 that could be relevant to such a step would be contained in a lower domain (S_1) and thus that step would violate strict cyclicity. From this it follows that S_1 has to be the domain on which passive applies in a derivation of 8.

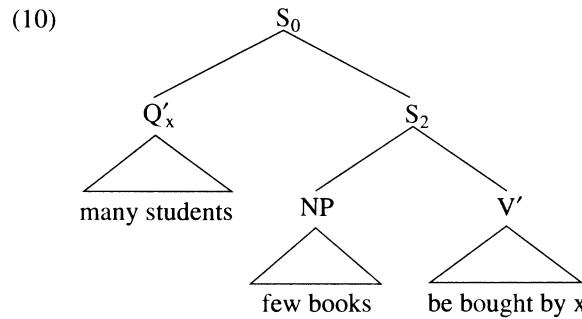
- (8) Few books were bought by Mary.

The domain to which $Q'L$ applies is S_0 , and thus in the input to $Q'L$ the S with which the Q' is combined is already in passive form.

Consider, then, what would be needed in order to reconcile such deep structures with the nonambiguity of sentences as in 1 in those varieties of English in which they are unambiguous, i.e. to allow a deep structure such as 9 to underlie 1a but not 1b in those dialects and idiolects.



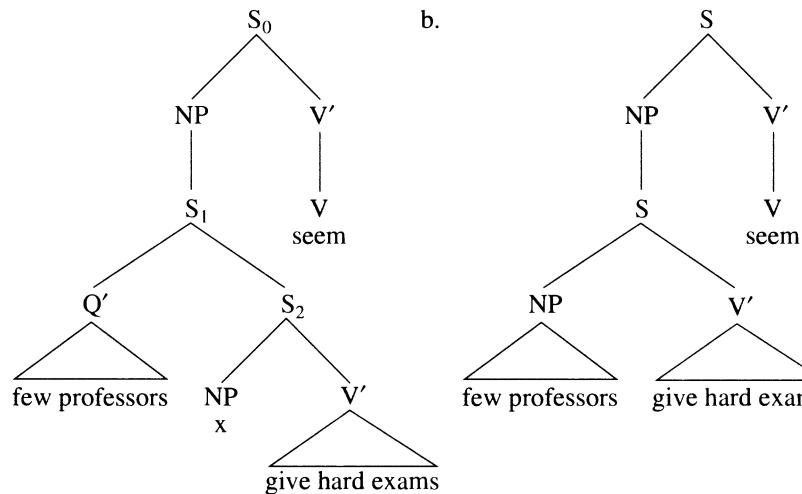
For the reason just noted, passive can apply in a derivation with the deep structure 9 only if its domain is S_2 . Suppose that S_2 undergoes passive; $Q'L$ on the domain S_1 will then yield 10. These two steps cannot be held responsible for the exclusion of 1b in an interpretation that corresponds to 9, since they are involved in derivations of acceptable sentences such as 8. Thus, to exclude a derivation linking the deep structure 9 to the surface form 1b, a grammar of these dialects will have to be supplemented with something that excludes the application of $Q'L$ to S_0 of 10.



The step that is to be excluded reverses the c-command relation between *many students* and *few books*: in 10, *many students* c-commands *few books*, and the application of Q'L would yield a structure in which *few books* c-commands *many students*. Suppose then that the varieties of English in which sentences as in 1 have no scope ambiguity have a restriction excluding steps in which the c-command relation of a negative Q' (such as *few books*) to any Q' is reversed.⁹ In virtue of the cyclic principle, the inputs to the applications of Q'L that that restriction excludes will not be deep structures but derived structures that reflect the application of any cyclic transformations whose domain is contained in the scope of the upper Q'. Thus, the assumption that deep structures are identical to logical structures yields a straightforward explanation of the fact that allegedly provided grounds for the rejection of such deep structures.

Note that the restriction suggested here does not exclude reversals of c-command relations in general. It thus does not rule out a reversal for combinations of nonnegative quantifiers, as in *Many students bought every book*, which is ambiguous for most speakers of English, even those for whom 1a is unambiguous, nor does it exclude a reversal of c-command between a quantified subject and a raising predicate, as in a derivation of 2 with 11a as deep structure, Q'L applying on S₁, and raising applying to the input 11b to yield 2.

(11) a.



⁹ Since Q'L is obligatory, a restriction excluding its application will have the effect of excluding any derivation in which Q'L has the given input: if Q'L is applied, that restriction will be violated, and if it is not applied, the obligatoriness of Q'L will be violated.

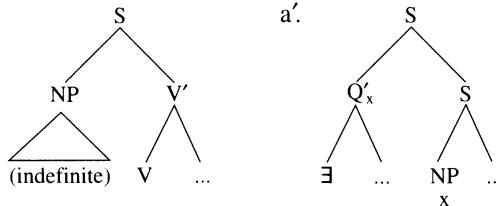
3. WHAT [Q' S] DEEP STRUCTURES BUY ONE. If Q's are outside their host Ss in deep structure, then any cyclic transformation in which quantifiers play a role will have to apply before Q'L so as to avoid violations of strict cyclicity.

The widely encountered claim that *there*-insertion requires an 'indefinite' underlying subject is incorrect, in that subjects that are indefinite in form but generic in interpretation exclude *there*-insertion, while subjects that are definite in form but existential in interpretation allow it.

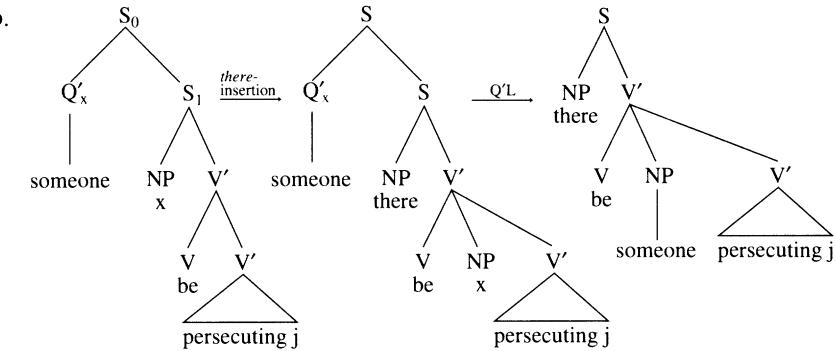
- (12) a. Dinosaurs are extinct. $\not\Rightarrow$ *There are dinosaurs extinct.
 b. There is the same kind of problem now that there was yesterday.

The restriction is rather that the subject must be an existentially quantified NP. This implies that the input to *there*-insertion cannot be a structure such as 13a, in which the existential NP is in subject position, since that is a structure derived by Q'L, and *there*-insertion with such an input would violate strict cyclicity by virtue of having a domain contained in a domain to which Q'L had already applied. Its input will thus have to be a structure as in 13a', with the Q' still outside its host S, and the derivation of a *there*-insertion sentence will involve steps as in 13b.

(13) a.



b.

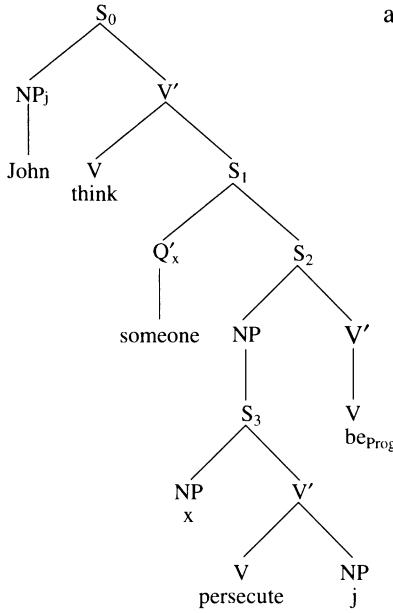


This observation explains why (as noted in McCawley 1970:293) *there*-insertion disambiguates scope, e.g. 14a is ambiguous with regard to the scope of *someone*, but 14b allows only narrow scope.

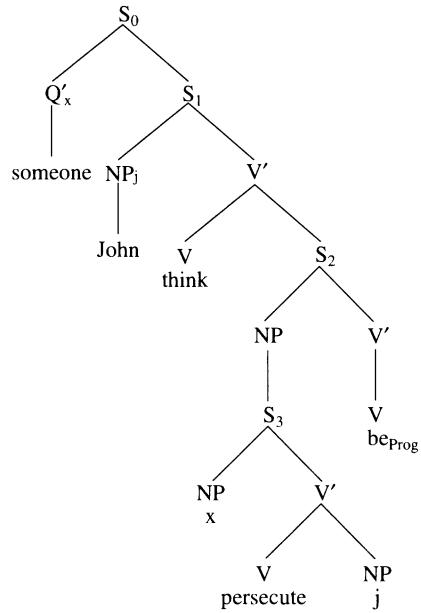
- (14) a. John thought someone was persecuting him.
 b. John thought there was someone persecuting him.

The two scopes correspond to logical structures as in 15, 15a being narrow scope (the interpretation in which John need not have identified a specific persecutor, as when it reports his saying, 'I'm being persecuted') and 15a' wide scope (the interpretation in which John does have a particular persecutor in mind, as when it reports his saying, 'Harry Schwartz is persecuting me'). *There*-insertion requires that the S to which it applies have an existentially quantified subject. *Someone* is the only existentially quanti-

(15) a.



a'.



fied expression in 15a and a'; accordingly, an application of *there*-insertion would have to have S_1 as its domain if the deep structure is 15a and S_0 if it is 15a'. *There*-insertion on S_1 in 15a yields 14b. With the deep structure 15a', S_1 is the scope of the existential quantifier but its subject is not the bound variable; *there*-insertion thus could apply only if that variable were made the derived subject of S_1 (by raising and passive), which would yield not 14b but *There was someone thought by John to be persecuting him*. *There*-insertion disambiguates quantifier scope because it applies in such a way that the S whose subject is displaced by *there* has to be scope of the existential quantifier.

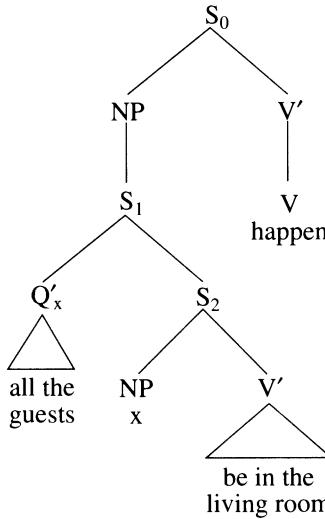
More generally, any cyclic transformation in which quantifiers play a role and whose effect is near the top of its domain will disambiguate scope: the higher the scope, the higher will be the effect of the transformation. Quantifier-float is a case in point; for example, while 16a is ambiguous with regard to whether *happen* is inside or outside the scope of *all*, 16b forces *all* to have narrow scope with regard to *happen* and 16b' forces it to have wide scope.

- (16) a. All the guests happened to be in the living room. (ambiguous with regard to scope)
 b. The guests happened to all be in the living room. (narrow scope)
 b'. The guests all happened to be in the living room. (wide scope)

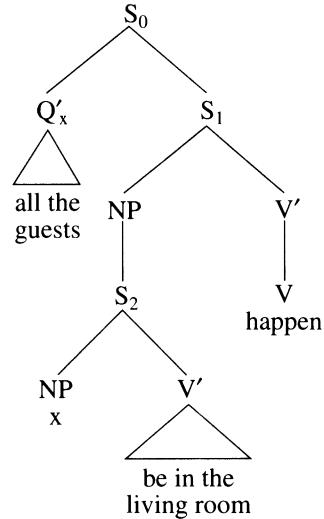
Narrow scope and wide scope correspond respectively to logical structures 17a and 17a'.

If these are taken as deep structures, 17a will allow Q-float only with S_1 as domain, while 17a' will allow it only with S_0 as domain, and *all* will be respectively adjoined to *be in the living room* and *happen to be in the living room* (the V' of S_1 , after raising has applied); thus, only 17a allows a derivation of 16b and only 17a' a derivation of 16b'. The way in which the effect of Q-float depends on the scope of the quantifier gives rise to a parallelism between surface constituent structure and logical structure: the V' to which the floated quantifier is adjoined is the (derived) predicate phrase of

(17) a.



a'.



the S that is the scope of the quantifier, and thus higher surface positions of the floated quantifier correspond to higher scopes.¹⁰

This treatment of quantifiers explains why passive cannot apply to the output of Q-float, as in a derivation of 18a' or 18a'' from a deep structure that also underlies 18a.

- (18) a. The workers all criticized the manager.
- a'. *The manager all was criticized by the workers.
- a''. *The manager was all criticized by the workers.

The inapplicability of passive cannot be blamed on the presence of *all* in a V'-adjunct position, since passives of clauses with adverbs in that position, as in the interpretation of 19 in which the inadvertence is John's, are not systematically excluded.

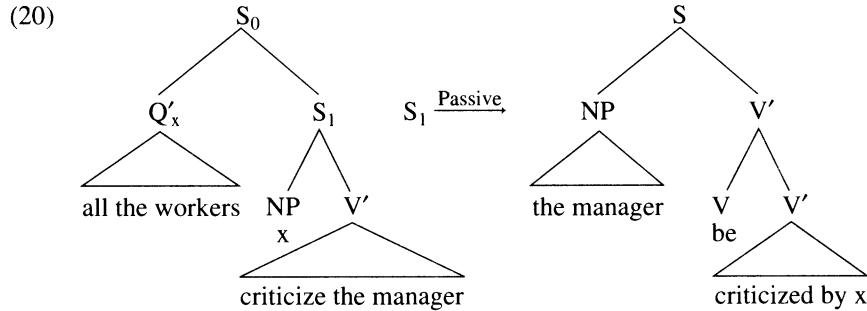
- (19) Mary was inadvertently offended by John.

Like *there*-insertion and any other cyclic transformations in which quantifiers play a role, Q-float will have to be taken as applying to a structure in which the Q' has not yet been moved into its host S by Q'L. With the sort of deep structures posited here, passive and Q-float in a derivation of 18a' or 18a'' would have different domains of application—S₀ would be the only possible domain for Q-float, since it is the smallest constituent that contains both the quantifier and the position to which it is to move, while passive would have to have S₁ as domain (20), for the reason given in connection with 8. Strict cyclicity prevents passive from applying after Q'L, since after Q'L on S₀, everything is in S₁, and Q-float cannot apply on S₀ after passive has applied on S₁,

¹⁰ One other cyclic transformation in which quantifiers play a role is *only*-float, which also disambiguates scope. With *beer* as the focus, (i) has only an interpretation with wide scope of *only beer* (= he won't let her drink anything else) and (i') has only an interpretation with narrow scope (= it's OK with him that she doesn't drink anything else), whereas (ii) allows both interpretations:

- (i) John only lets Mary drink beer.
- (i') John lets Mary only drink beer.
- (ii) John lets Mary drink only beer.

To my knowledge, the only postcyclic transformation in which quantifiers play any role is quantifier-pronoun flip, as in *We got replies from [them all]*.



because Q-float in English requires that the quantifier bind a subject variable, and in the output of passive (*the manager be criticized by x*), the variable bound by *all the workers* is no longer the subject. This shows that no extrinsic ordering of passive and Q-float is required to make them interact correctly, and thus defuses one of the few at all solid arguments (Williams 1974) for ordering of transformations.

I turn now to an example which shows how the cyclic principle both yields such parallelisms and also provides for deviations from them when transformations that apply to higher domains disrupt the parallelism. What I said about scope carries over to combinations of auxiliary verbs and floated quantifiers, provided that one adopts an analysis of auxiliaries and tenses as deep-structure predicate elements with sentential complements, as in McCawley 1988/1998a, ch. 8. Specifically, I assume the following about tenses and auxiliary verbs in English:

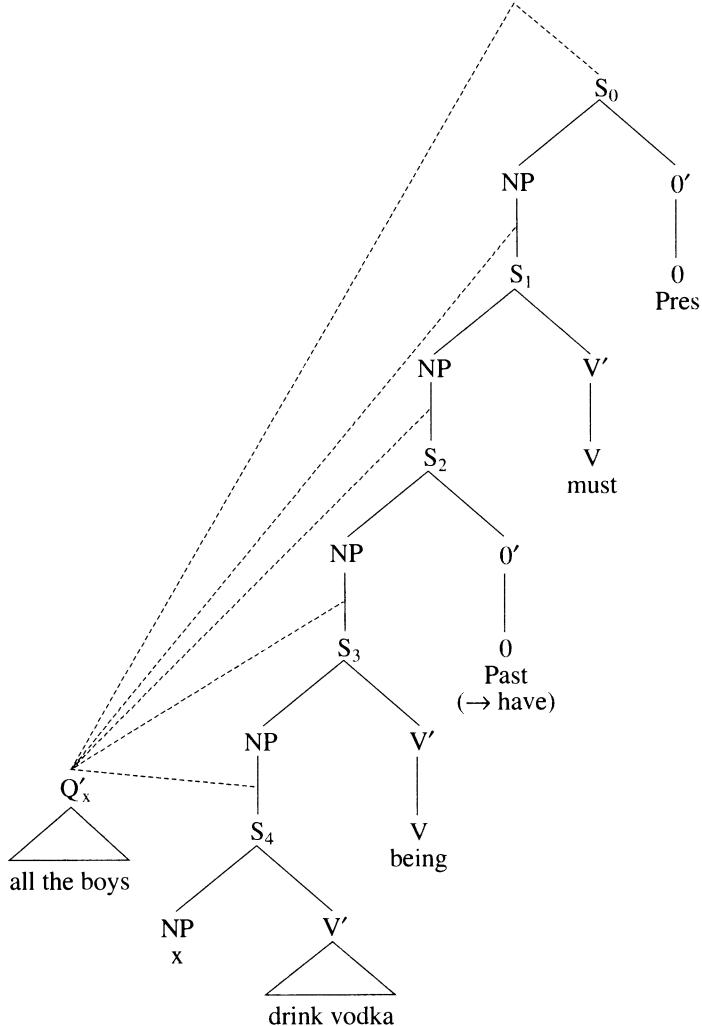
- (i) Syntactically, most auxiliary Vs are raising predicates: they have a deep-structure sentential subject and have obligatory raising to subject, like *SEEM* or *HAPPEN*. (The exceptions to this statement are passive *BE*, which is inserted as part of the passive transformation, and a couple of uses of modal auxiliary verbs that are equi predicates, e.g. *DARE* and the ‘be able’ sense of *CAN*.)
- (ii) Tenses share the syntax of auxiliary Vs, but in addition
 - a. in nonfinite Ss they undergo tense-replacement (Pres → Ø, Past → *have*), and
 - b. they get attached to Vs, by attraction-to-tense (cyclic, moves auxiliary V up to a tense), tense-hopping (postcyclic, moves tense down to a main V), or *do-support*. By virtue of being a cyclic transformation, attraction-to-tense skips over intervening modifiers.¹¹

Corresponding to 21a, there are four possibilities for the surface position of a floated quantifier, indicated in 21b with subscripts corresponding to the S in 21c that is the scope of a quantifier in that position.

Broken lines in 21c indicate the different positions where *all the boys* can be adjoined to a S, i.e. the possible scopes of *all the boys*. Each scope corresponds to a different domain to which Q-float can apply, adjoining *all* to the predicate phrase of that domain: if the scope of *all the boys* is S₄, *all* will be adjoined to *drink vodka*, if the scope is S₃, it will be adjoined to *be drinking vodka* (i.e. the V' that raising on S₃ has yielded), if the scope is S₂, it will be adjoined to *have been drinking vodka*, etc. There are five possible scopes for the Q', but only four positions where a floated quantifier can go, since one of the predicate elements is realized as an inflectional morpheme. Thus, one

¹¹ I argue in McCawley 1998a:33 that all cyclic transformations skip over modifiers.

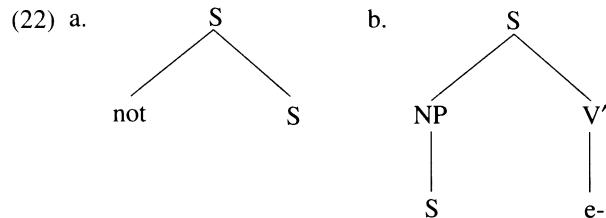
- (21) a. All the boys must have been drinking vodka.
 b. The boys ₀ must _{1,2} have ₃ been ₄ drinking * vodka.
 c.



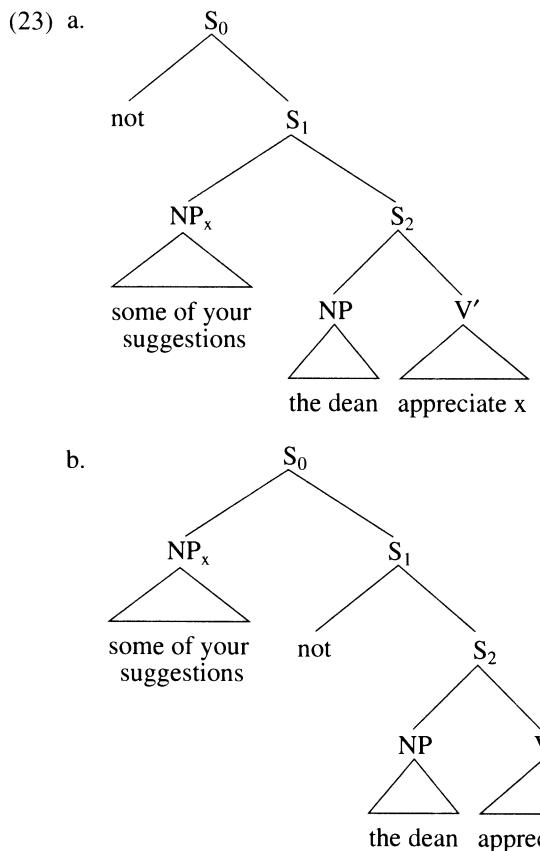
of the four word orders must be ambiguous with regard to scope. The word order *... must all have been ...* is in fact ambiguous with regard to whether *must* is in the scope of *all*. When *all the boys* has S_1 as its scope, Q-float will adjoin *all* to (tenseless) *must have been drinking vodka*, and attraction-to-tense will raise *must* to where *Pres* is, skipping over the intervening *all* (see n. 11), yielding the same word order as when *all the boys* has S_2 as its scope. The assumptions in force here thus account for why it is precisely tensed auxiliary verbs that can deviate from the usual parallelism between the scope of floated quantifiers and their position in surface syntactic structure.¹²

¹² An example has already been given in which a cyclic transformation that moves material to a higher position disrupts a parallelism between logical and syntactic constituent structure that had held in its input: raising, as in 2. Another case in point is the transformation that extracts a NP from an N' and moves it into Det position with a genitive marker, as in *John's former wife* or *Your pervert of a brother*: semantically, *former* is combined with *John's wife* and *pervert* with *your brother*.

I turn now to negation. Leaving aside contrastive negation, as in *John drinks not wine but beer*, for which see McCawley 1991, 1998a:§17f, I will assume that negative elements have Ss for their scopes. Languages differ with regard to whether their negative elements are S-modifiers, as in English (22a), or predicates of Ss, as in Finnish (22b).¹³



The replacement of *some* by *any* in the presence of a negation illustrates a different way in which strict cyclicity can eliminate scope ambiguities, though here without surface structures showing a direct structural reflection of scope. Consider whether the deep structures in 23 would allow *some*—*any* to apply:



¹³ Korean has negative elements of both kinds.

The logic of negation can be done in equivalent ways irrespective of whether the negative element is treated as a 1-place operator or as a 1-place predicate with a proposition argument. The difference between English and Finnish is strictly speaking not a difference in what logical structures the languages allow but in what logical structures their lexicons provide means of expressing.

With the deep structure 23a, Q'L will apply with S_1 as domain, and both *some-any* and the rules relating to the placement of *not* will apply with S_0 as domain, yielding 24a, whose meaning is in fact 23a.

- (24) a. The dean didn't appreciate any of your suggestions.
- b. The dean didn't appreciate some of your suggestions.

With 23b as deep structure, the rules for the placement of *not* will apply with S_1 as domain, and Q'L will apply with S_0 as domain. For *some-any* to apply, it is necessary at the very least that the negative element be higher in the structure than the affected *some*, and that condition will not be met until Q'L has moved *some of your suggestions* into the position of the *x*; but strict cyclicity will then prevent *some-any* from applying, since its domain would be S_1 or S_2 , but Q'L has already applied with S_0 as domain. We thus obtain 24b, whose meaning corresponds to 23b.

Unlike *there*-insertion and Q-float, which insert material at the top of the structure and whose effects iconically match the scope of the quantifiers, *some-any* can affect quantifiers virtually anywhere in the structure, and thus scopes cannot directly be read off of the location of its effect. But since strict cyclicity prevents *some-any* from affecting quantifiers that are outside the scope of the negation, its application or nonapplication correlates with whether the affected quantifier is inside or outside the scope of the negative.

4. INTERROGATIVE STRUCTURES AND ANAPHORA. Before discussing the observations of Heycock (1994, 1995) about differences between cases where WH-movement opens up possibilities for anaphoric relations and cases where it does not, I first need to sketch my view of the syntax of WH-interrogatives and of the restrictions on anaphoric relations.

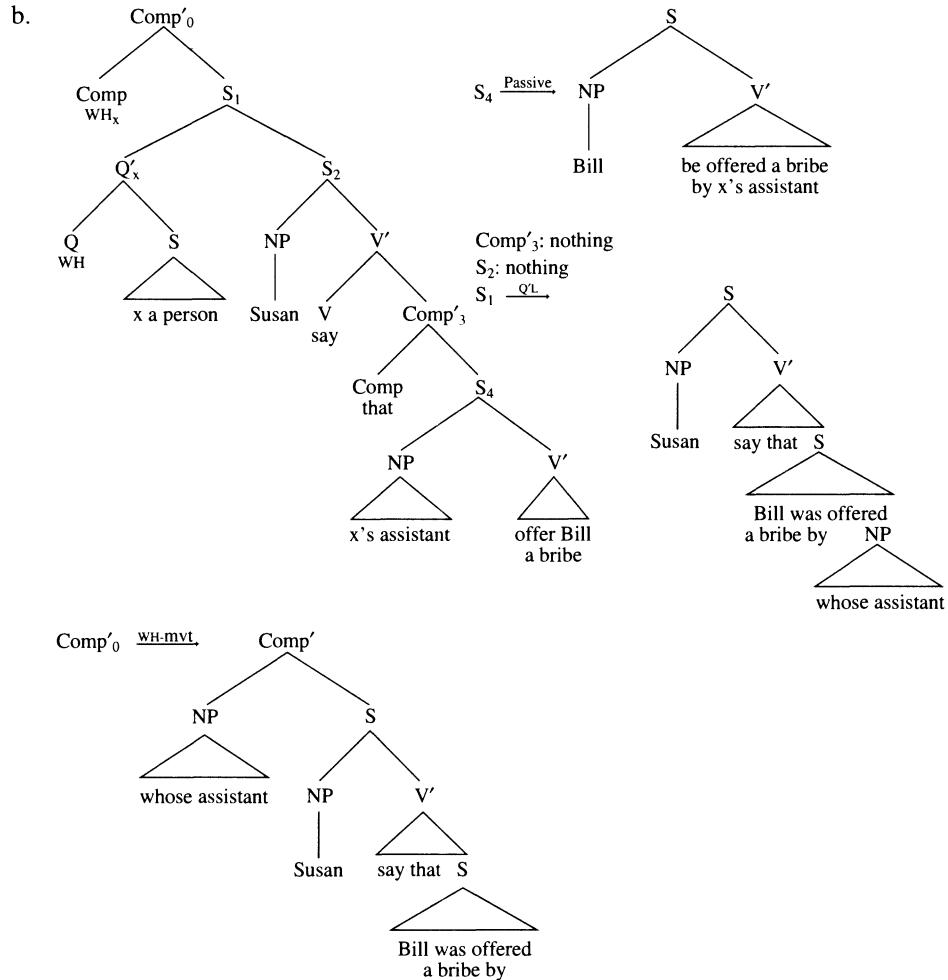
I make the following assumptions about WH-interrogatives:

- (i) Both yes-no and WH-interrogative clauses have an interrogative complementizer, as proposed in Bresnan 1970.
- (ii) The deep structure of a WH-interrogative clause (not NB that of a yes-no interrogative clause) has in addition a WH-interrogative operator binding one or more variables in that clause (in a multiple-WH question, the operator is polyadic, i.e. it binds multiple variables). The interrogative Comp is coindexed with the variable(s) that the interrogative operator binds.
- (iii) Since WH-interrogative operators bind variables, they undergo Q'L; in a multiple-WH question, Q'L moves each of the WH-expressions to where an occurrence of the corresponding variable is.¹⁴
- (iv) In languages such as English, in which the Comp position of a WH-interrogative clause is required to be filled in surface structure by an interrogative expression, a transformation (interrogative WH-movement) obligatorily moves into that Comp position one of the operators with which the Comp is coindexed.
- (v) In view of the pied-piping principle, the movement of the operator can result in a surface structure in which the Comp position is filled not by the interrogative operator but by a larger expression containing it. For example, the deep structure of 25a involves an interrogative operator corresponding to *who*, but due to pied-piping, the Comp position in surface structure is filled not by *who* but by *whose assistant*.
- (vi) By virtue of the conditioning factor (coindexation of Comp and operator), the WH-movement described in (iv) must be a 'Newtonian' movement, in which the interrogative expression moves in one step into the coindexed Comp position, and not the 'Cartesian' WH-movement proposed in Chomsky 1973, in which it moves one S at a

¹⁴ This is true of polyadic operators in general; see McCawley 1993:§7.6.

time, via intervening Comp positions.¹⁵ The derivation of 25a will thus involve steps as sketched in 25b, from which steps involving tenses and auxiliary verbs have been omitted to simplify exposition.

- (25) a. By whose assistant did Susan say that Bill was offered a bribe?



¹⁵ What is said here about interrogative wh-movement will also apply, mutatis mutandis, to restrictive relative and nonrestrictive relative wh-movement.

I am not claiming that no language has Cartesian wh-movement, only that the conditioning factor in English requires Newtonian movement. Both Newtonian wh-movement (as in i) and Cartesian wh-movement, in which interrogative expressions replace Comps with which their operator is not coindexed (as in ii-iii), are found in wh-interrogatives in many varieties of German (examples from McDaniel 1989).

- (i) Mit wem glaubst du, [dass Hans meint, [dass Jakob gesprochen hat]]?
'With whom do you believe that Hans thinks that Jakob talked?'
- (ii) Was glaubst du, [mit wem Hans meint, [dass Jakob gesprochen hat]]?
- (iii) Was glaubst du, [was Hans meint, [mit wem Jakob gesprochen hat]]?

When the interrogative expression moves into a noninterrogative complementizer position, an interrogative marker *was* is required to fill the interrogative Comp position and any Comp positions intervening between it and the surface position of the interrogative expression. Wh-movement of relative pronouns in German is strictly bounded (there are no acceptable relative clause counterparts of i-iii) and thus relative wh-movement is neither determinately Newtonian nor determinately Cartesian.

Since an operator position is not a Comp position (for starters, operators can be stacked arbitrarily high above a S, irrespective of what context the S is embedded in, whereas the possibility of even one Comp depends on the context in which the Comp' occurs), WH-movement does not simply undo the effect of Q'L even when the WH-moved expression consists just of the WH-operator.

In McCawley 1988, as corrected in McCawley 1998a, I argue for the following system of restrictions on anaphoric relations:

- (26) Conditions on anaphoric relations:
 - i. (on surface structures) an anaphoric element may not c-command its antecedent if it
 - a. is a clausemate of the antecedent, or
 - b. precedes the antecedent.
 - ii. (on cyclic outputs) if X is coreferential with Y, X occupies an argument position in the given nexus, and X outranks Y, then Y must be a pronoun with X as antecedent.

The well-known constraint (Reinhart 1976) against anaphoric elements c-commanding their antecedents in surface structure is not absolute but is sensitive to whether the pronoun and its antecedent are clausemates. If they are (27a), the anaphoric element is not allowed to c-command the antecedent, irrespective of whether it precedes it (26ia), but otherwise (27b–b') it is only if the anaphoric element precedes the antecedent that it may not c-command it (26ib).

- (27) a. *Near John, he saw a snake.
- b. Near the car that John was washing, he saw a snake.
- b'. *He saw a snake near the car that John was washing.

Accordingly, the two-part restriction on surface anaphoric relations in 26i is required.

However, as Carden (1986) has observed, pronouns are restricted on the basis not only of their surface structural relations to their antecedents but also of underlying configurations that may be broken up in the course of the derivation.

- (28) a. *It was near John that he saw a snake.
- a'. It occurred to John that he had seen a snake.

The surface structural relation between *John* and *he* in 28a is not one that otherwise lowers acceptability (28a'), and so some other factor must come into the picture; the only plausible one to invoke here is the underlying structure, which contains the same configuration as is found in 27a. The restriction, however, must apply not to deep structures but rather to CYCLIC OUTPUTS, that is, structures at the end of the application of cyclic transformations to each domain, since it is derived and not deep structural relations that violate or satisfy the restrictions.

- (29) a. *It was to John that he seemed to be a victim of injustice.
- a'. It seemed to John that he was a victim of injustice.
- a''. *He seemed to John to be a victim of injustice.

The unacceptability of 29a is not because of any disallowed configuration in surface structure (since *John* and *he* are in the same surface configuration as in 28a') or in deep structure (since the sentence embedded in the cleft construction in 29a has the same deep structure, except for the Comp, as the acceptable 29a'),¹⁶ but because of the cyclic output 29a'', in which *he* outranks *John*.

¹⁶ In McCawley 1998a:232, I argue that the complement of such verbs as SEEM, APPEAR, and HAPPEN (more generally, complements which denote a proposition, rather than a situation type or an event) is tensed, irrespective of what the complementizer is, and concomitantly, irrespective of whether the complement is finite or nonfinite. Finite vs. nonfinite is a distinction in whether a tense is required in surface structure, a distinction which crosscuts the semantic requirement for presence or absence of a tense in deep structure.

I have stated 26ii not in terms of c-command but in terms of a much stricter relation that Bresnan (1994) calls OUTRANKING. Outranking is a relation not of constituent structure, like c-command, but of argument structure: a subject outranks everything in the predicate phrase with which it is combined, and an object of a given predicate outranks everything contained in its other objects and complements. A subject NP c-commands material in a S-modifier (at least, according to my conclusion (1998a:§11c) that modifiers are transparent with regard to command relations)¹⁷ but does not outrank it, and antecedents in a S-modifier do not yield the unacceptability of 29a.

- (30) a. It was because John was tired that he went home early.
- b. It was because of John's headache that he went home early.
- b'. *Because of John's headache, he went home early.

If 26ii were stated in terms of c-command rather than outranking, it would wrongly exclude 30a, b. Note that 30b', the noncleft counterpart of 30b, violates the constraint on surface anaphoric relations, since here *he* is a clausemate of and c-commands *John*.

The condition 26ii on cyclic output creates a distinction between what I will call HARD pronouns, whose status as pronouns is obligatory, and SOFT pronouns, which are optional, in the sense that they can be replaced by nonpronominal material (as where Q'L replaces them with a nominal expression). Another difference between hard and soft pronouns that is implicit in 26 is that only personal pronouns (in the broad sense that includes reflexives and reciprocals) can be hard, whereas anaphoric elements of any sort can be soft. A further difference is brought out by examples such as 31 (taken from Barss 1988), in which an anaphoric element is acceptable despite preceding and apparently c-commanding its antecedent in surface structure, thus violating 26i.

- (31) a. Himself_i, John_i likes. (Barss's 1)
- b. Him_i, John_i thinks Mary loves with all her heart. (Barss's 43b)

However, topicalized pronouns are not always exempt from 26i, as can be seen from 32a–b, whose unacceptability is of a degree comparable to the violations of 26i discussed above.

- (32) a. *Him_i, John_i's sister can't stand.
- b. *Her_i, rumors about have made Mary_i a laughing stock.

The one clear difference between 31 and 32 is that the pronouns in 31 are hard (by virtue of cyclic outputs of the S prior to topicalization, in which *John* outranks the pronoun in both sentences), while those in 32 are soft (neither antecedent outranks the pronoun). A third difference between hard and soft pronouns thus appears to be that the constraint 26i on surface structures applies only to soft anaphoric elements.

5. SOME SYNTACTIC AND SEMANTIC CONSEQUENCES OF THE ANAPHORA CONSTRAINTS. Heycock (1994, 1995) operates in a framework that recognizes a level of LF, a term that (as I noted at the beginning of this paper) should not be confused with its etymon 'logical form'. The particular LFs that Heycock proposes, however, suggest specific logical structures, often ones that differ in only minor details from her LFs, and it is on those logical structures that I will concentrate here.

The framework adopted by Heycock relates LF to surface structure rather than to

In nonfinite complements an underlying Pres is deleted and an underlying Past is converted into *have*; there are also finite complements (as in Japanese *V' koto ga dekiru* 'can V') that, for semantic reasons, have no tense in deep structure and undergo insertion of a semantically empty present tense.

¹⁷ In McCawley 1988/1998a, I argue for a version of c-command in which modifiers are transparent with regard to command relations and thus the subject of a S c-commands material in a S-modifier even though the constituent structure is [s P' S]. By virtue of the status of the P' as a modifier, the relevant bounding node is not the lower but the higher S-node, i.e. not the mother of the subject but its grandmother (or its great-grandmother, etc., if S-modifiers are stacked).

deep structure, except that it allows for reconstruction, in which rules relating to semantic interpretation sometimes apply not directly to surface structure but to a structure in which certain constituents are not in their surface positions but in underlying positions. Specifically, the framework posits phonologically null traces in the positions out of which constituents are moved, and reconstruction is taken to consist in moving a surface constituent to where the associated trace is. The puzzle that occupies Heycock is that in some cases anaphora restrictions appear to apply not to surface structure but to a reconstructed version of it, while in other cases reconstruction fails to play any role in the anaphora constraints.¹⁸

- (33) a. *How proud of Barbara_i do you think she_i said that John would be?
- a'. *She_i said that John would be so proud of Barbara_i.
- b. Which allegations about John_i do you think he_i will deny?
- b'. *He_i will deny some allegations about John_i.

The oddity of 33a seems to require that the anaphora restrictions apply to a structure in which *proud of Barbara* is inside its underlying clause, as in 33a'; 33b, however, does not exhibit the violation of anaphora restrictions that it would if the restrictions applied to a structure in which *which allegations about John* was in the position of the object of *deny*, as in 33b'.

Heycock suggests, correctly in my opinion, that at least part of the reason for this difference is that *how proud of Barbara* is a predicate phrase, while *which allegations about John* is not, and that predicate phrases in LF are always inside their host Ss, while quantified expressions are outside them. Her proposed LFs suggest logical structures as in 34a–b.

- (34) a. (WH: x degree)(you think (she_i said (John will be x-much proud of Barbara_i)))
- b. (WH: x allegation about John_i)(you think he_i will deny x)

Within the framework that I exploit in this paper, that difference in logical structure is sufficient to account for the difference in acceptability between 33a and 33b. With 34a as deep structure, the derivation of 33a will contain a cyclic output *She said John would be x-much proud of Barbara* in which *she* outranks *Barbara*, thus violating 26ii. However, with 34b as deep structure, no cyclic output in the derivation of 33b will violate it. While *he* does in fact outrank the coreferential *John* in the lowest cyclic output containing them, namely the output of Q'L (*you think he_i will deny which allegations about John_i*), strict cyclicity here renders 26ii inapplicable, just as in earlier examples it prevented transformations from applying to the output of Q'L.

The logical structure of 33b differs from that of 33b' in having an interrogative operator where the latter has an existential quantifier. Neither structure yields any violation of the constraint on cyclic outputs; it is because of a violation of the restrictions on surface anaphoric relations that 33b' is unacceptable, one that can be avoided by passivizing the matrix clause: *Some allegations about John_i will be denied by him_i*.¹⁹

¹⁸ I have altered Heycock's original example (*How proud of Barbara_i do you think she_i is?) so as to make clear that the anaphoric relation is unacceptable not merely because of coreference between the arguments of *proud*; the unacceptable pronoun/antecedent pairs can be arbitrarily far apart in the structure.

¹⁹ In the discussion of 33a, b, it is important to use examples in which the pronoun is framed by a higher clause such as *you think . . .*, as Heycock shows in her note 13. While (i) is about as low in acceptability as 35a', it is not much worse than (i'). The low acceptability of (i') presumably reflects a violation of a surface constraint on anaphora, in view of the acceptability of examples such as (ii) (cf. 35a'), in which a higher clause separates the pronoun from the WH-expression, and (ii'), in which the pronoun is an object rather than a subject.

As Heycock notes, nonpredicate constituents actually sometimes do violate anaphora restrictions on the basis of ‘reconstructed’ structural relations; for example, 35a (adapted from one of Heycock’s examples) is acceptable, but 35a’ is not.

- (35) a. How eager for the most lucrative job that she_j could get do you think Alice_j had become?
- a’. *How eager for the most lucrative job that Alice_j could get do you think she_j had become?

However, I maintain that this comes about only by virtue of scope restrictions involving other elements. The only plausible interpretation of *the most lucrative job that she/Alice could get* is one in which its scope is the implicit complement of *eager* (*eager for X* = *eager for [PRO to get/have X]*): it is implausible to take 35 as referring to a job that is antecedently known to be the most lucrative one that Alice could get. With a deep structure corresponding to a narrow scope for *the most lucrative job that she/Alice could get*, the subject will outrank *she/Alice* in the cyclic output of the *become*-clause and thus the outranked element will have to be a pronoun. For the same reason, *a friend that Zoë might confide in* in 36a violates 26ii, even though the sentence is superficially parallel to one that avoids any violation (36a’).

- (36) a. *How eager for a friend that Zoë_i might confide in has she_i become?
(Heycock’s 47b)
- a’. How worried about the friend that Zoë_i confided in has she_i become?

Heycock takes up the ambiguity that sentences containing *how much/many* often have between what she calls ‘referential’ and ‘nonreferential’ interpretations, as in the paraphrases in 37.

- (37) a. How many people did she decide to hire?
- a’. ‘How many people are there such that she decided to hire those people?’
(referential)
- a”. ‘What is the number such that she decided that that would be how many people she would hire?’ (nonreferential)

These paraphrases readily lend themselves to a formalization in which the interrogative expression is split into an interrogative operator having the whole question as its scope and an existential quantifier having multiple scope possibilities (*how many people* = ‘for what number x’ + ‘there is a set of x-many people’), so that the ambiguity of 37a becomes an ambiguity in the scope of the existential.

- (38) a’. (wh: x cardinal number)
(she decided
[(: M set of x-many persons)
(: y ∈ M)(she will hire y)])(= 37a’)

- (i) *I wonder how eager for the most lucrative job that Alice_j could get she_j had become.
- (i’) ??I wonder how pleased with the works Pollock_j painted in his youth he_j really was.
- (ii) How pleased with the works Pollock_j painted in his youth do you think he_j really was?
- (ii’) How displeased with the works Pollock_j painted in his youth did their commercial failure make him_j?

Since the pronoun does not c-command the antecedent in (i–i’) according to either the traditional definition of c-command or my revision of it (see n. 17), evidently the command relation that figures in the surface constraint on anaphora should not be precisely c-command but one in which the node corresponding to the bracketed part of *Which paintings did [he like]* is not a bounding node.

- a''. (wh: x cardinal number)
 (: M set of x-many persons)
 (: $y \in M$) (she decided
 [she will hire y]) (= 37a'')

Inexplicably, Heycock does not represent the ambiguity in terms of scope but in terms of whether the N' appears in her LF as part of the interrogative expression (referential) or in its position prior to extraction (nonreferential). That the ambiguity is one of scope is clear from the fact that the deeper the extraction site is, the more ways the sentence is ambiguous, e.g. 39 is three-ways ambiguous, allowing any of the three clauses as the scope of the .

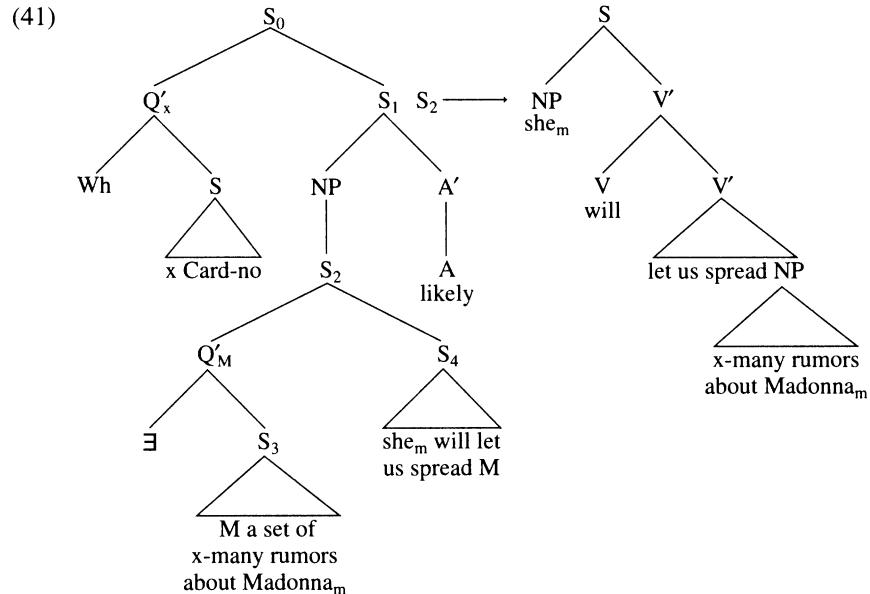
- (39) How many people did Fred say that Susan had decided to hire?

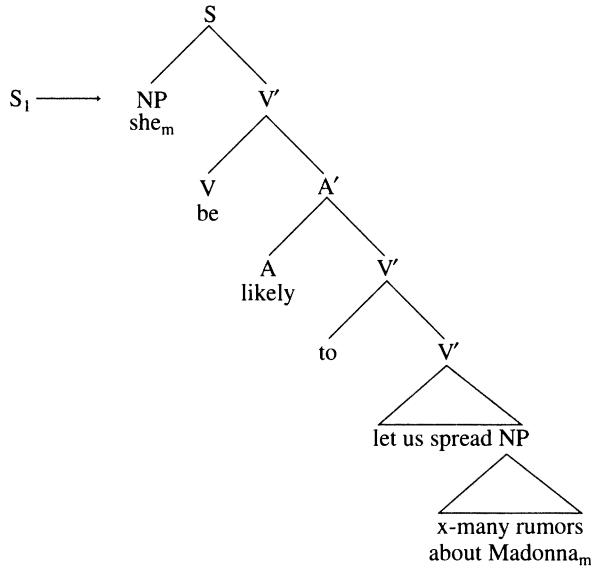
Anaphoric relations sometimes block a nonreferential interpretation of the quantifier, as in 40a, which Heycock notes can be interpreted only with a wide scope for the existential quantifier—not as 40a' but only as 40a''.

- (40) a. How many rumors about Madonna is she_m likely to let us spread?

- a'. (wh: x cardinal number)
 (likely)
 (: M set of x-many rumors about Madonna_m)
 (: $y \in M$) (she_m will let us spread y))
 a''. (wh: x cardinal number)
 (: M set of x-many rumors about Madonna_m)
 (: $y \in M$) (likely
 (she_m will let us spread y))

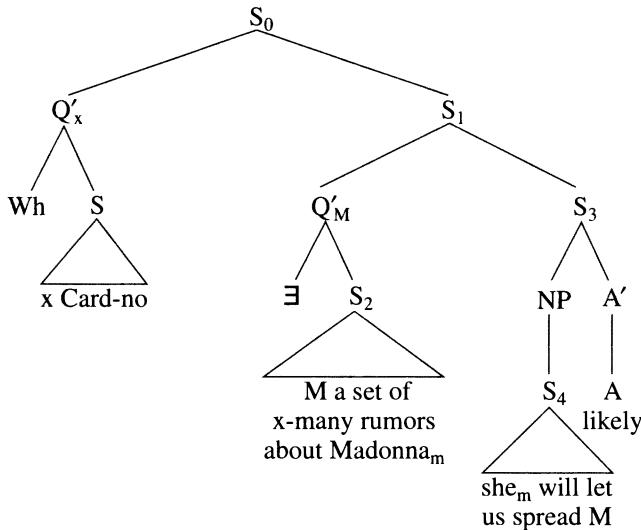
An explanation of why only the wider scope of the existential quantifier is possible in 40a emerges if deep structures are identified with logical structures such as are posited in 38. The relevant cyclic outputs for a deep structure corresponding to 40a' are as in 41. In the cyclic outputs both of S₂ and of S₁, *she* outranks *Madonna*, and we thus presumably have a violation of 26ii; an interpretation corresponding to 40a' is thus correctly excluded for 40a.





A deep structure corresponding to 40a" is shown in 42.

(42)



The cyclic output of S_1 in this case is identical to that of S_1 in 41, in which *she* outranks *Madonna*. However, we do not obtain the false implication that neither interpretation of 40a should be possible, since here the cyclic output is derived by Q'L and accordingly strict cyclicity makes the condition 26ii inapplicable; by contrast, the cyclic output of S_1 in 41 is derived by raising, and the application of 26ii does not violate strict cyclicity. Thus, we correctly exclude a derivation of 37a with narrow scope for *she* while allowing a derivation with wide scope for *she*.²⁰

²⁰ A full analysis of these examples would require that tenses and the cyclic outputs of the S s that they head be taken into account. While the tense that the full version of 37 must contain could have either S_1 or S_3 as its complement, only the latter possibility prevents the S headed by the tense from violating 26ii.

6. PROBLEMS WITH REFLEXIVES. If I were to end this paper here, I would answer the questions posed in the title as follows. Surface syntactic structure reflects logical structure as much as it does because of the cyclic principle, in that the domains to which syntactic transformations apply are syntactic counterparts of constituents of logical structure, whose parts (in view of the cyclic principle) differ in only small respects from surface syntactic constituents of relevantly related sentences. And surface syntactic structure often diverges from logical structure in virtue of the cyclic principle, in that structures that match logical structure can be disrupted by the application of cyclic transformations that extract some part of that structure, as where attraction-to-tense affects an auxiliary verb that is the niece of a floated quantifier or raising moves a quantified NP into subject position.

But there is more to those questions than these answers cover, and in this section and the next, I take up some cases where more needs to be said about the relationship between logical structure and surface structure. A very banal class of sentences that is problematic from the point of view developed here is those in which a quantified NP contains a reflexive pronoun, as in 43.

- (43) Roger's wife_i inadvertently destroyed several pictures of herself_i.

If 43 has a logical structure of the sort assumed above, in which a Q' *several pictures of her_i* is combined with *Roger's wife_i, inadvertently destroyed x*, strict cyclicity would prevent a reflexivization transformation from making the pronoun reflexive, because its presumable input would have to be the structure derived by Q'L. Reflexivization could not apply before Q'L had moved the Q' into its host S, since the possibility of reflexivization depends not just on the Q' having that host S as its scope, but on the position into which the Q' is moved being sufficiently close structurally to the antecedent.

- (44) Roger's wife was unaware that he had heard several nasty rumors about her/
*herself.

It is important here to distinguish among the multiple uses of reflexive pronouns. Besides STRUCTURAL reflexives, which are licensed by virtue of their syntactic relation to their antecedents (45a), there are LOGOPHORIC reflexives, which are licensed by virtue of their being in a context that takes the point of view of the person that they denote (45b) and are subject to much weaker structural restrictions, and EMPHATIC reflexives (45c).

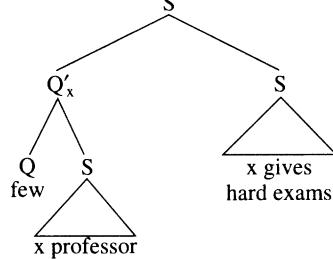
- (45) a. John exposed himself to ridicule.
 b. He saw, sitting on the bed, a man of about the same age as himself.
 (Rushdie, *Satanic Verses*)
 c. Stalin ordered their execution himself.

I have chosen the content of 43 so as to exclude the possibility of a logophoric interpretation that takes the wife's point of view, and I will stick to such examples here, so as to focus on problems raised by structural reflexives and ignore for the present all other kinds.

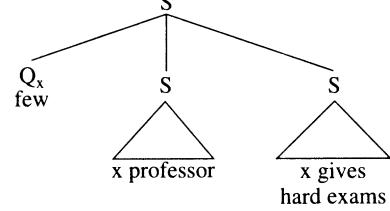
It becomes worthwhile at this point to reexamine one detail of the logical structures that I have assumed up to now, namely the constituency relations among the three parts that make up a restricted quantifier structure: the quantifier, the restrictor (which specifies the relevant values of the variable), and the matrix (whose truth for those values of the variable is at issue). I have operated in my recent work in terms of logical structures in which the quantifier and the restrictor make up a constituent (46a), in

conformity with the surface syntactic structure of most languages,²¹ in which the quantifier and the restrictor usually correspond to the Det and N' of what is traditionally called a NP and jointly denote what is commonly but misleadingly called a ‘generalized quantifier’; two other possibilities are the ternary structure of such works as Kratzer 1995 (46b), and the structure adopted in McCawley 1972, in which the restrictor and the matrix were taken to define a set of propositions, here the set of all propositions of the form ‘ x gives hard exams’, in which x takes professors as its values (46c).²²

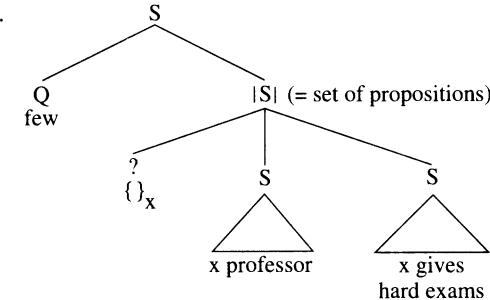
(46) a.



b.



c.



In all three cases, of course, the restrictor is still outside of the matrix, and so none of them in itself provides a domain to which a structural reflexivization transformation could apply in 43 without violating strict cyclicity. However, 46c, unlike the others, opens up the possibility of a plausible systematic exception to strict cyclicity, allowing reflexivization to apply to an input such as *Roger's wife_i destroyed pictures of her_i* in a derivation of 43, namely, that a constituent denoting a set would not count as syntactically superordinate to a constituent representing in general terms the members of that set. Then with the |S| constituent as domain, transformations could still apply to the result of substituting the restrictor for the variable.

While allowing reflexivization in examples such as 43, this relaxation of strict cyclicity still excludes it in examples such as 47, brought to my attention by Pieter Seuren.

(47) Father: A well educated boy wouldn't behave like that.

Son: I didn't educate me.

The son conveys ‘It’s your fault if I’m not well educated’ by contrasting values of x with regard to whether they satisfy $(\lambda x)(x \text{ educated me})$. If the deep structure of the

²¹ See, however, Gil 1993 for discussion of a language in which quantifiers are not allowed in the position that I am describing here as ‘normal’.

²² The notation $|S|$ is taken from McCawley 1993:§8.2, where a notion of logical type is developed in which sets of entities of type α constitute a different type (represented as $|\alpha|$) from truth-functions taking arguments of type α .

son's response contains that λ -expression (more generally, if focus constructions are assigned deep structures in which the focus is combined with an appropriate λ -expression), then reflexivization cannot apply: its conditions of application are not met in 'x educated me', and while they are met in the form derived by substituting *I* for the variable, strict cyclicity prevents its application to that form, since the substitution leaves all of the material of its input within the *S* that corresponds to 'x educated me'. Note that this case does not fall within the purview of the suggested weakening of strict cyclicity, since *I* is not part of the restrictor of the λ -expression.

The proposed relaxation of strict cyclicity has implications not only for reflexive pronouns but also for simple pronouns, since it broadens the range of cases in which the condition on cyclic outputs 26ii would be applicable. It in fact accounts correctly for the following distinctions noted in Safir 1998 (his examples 29a, 29c, 66a, 66b).

- (48) a. *I always respect a journalist whose depiction of *Madonna_i* she_i objects to.
- a'. I always respect a journalist whose depiction of *Madonna_i* offends her_i.
- b. *[Pictures of anyone_i] which he_i displays prominently are likely to be attractive ones.
- b'. [Pictures of anyone_i] which put him_i in a good light are likely to be attractive ones.

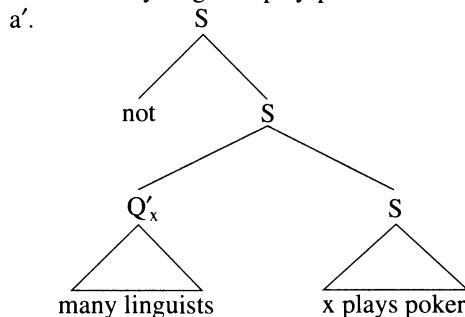
Under the proposed revisions, the cyclic outputs of the |*S*| constituents in 48a and 48b would be 49a–b, in which *she* outranks *Madonna* and the subject pronoun outranks the one in *pictures of him_i*:

- (49) a. She_i objects to [x depiction of *Madonna_i*].
- b. He_i displays [x pictures of *him_i*].

Accordingly, those constituents would have to be pronouns with the indicated subjects as antecedents, a condition that is violated in 48a and 48b (in the latter, by virtue of the application of Q'L that replaces the variable by *anyone*). By contrast, the relevant cyclic outputs in 48a' and 48b' would be [x depiction of *Madonna_i*] offends her_i and [x pictures of *him_i*] put him_i in a good light, in which neither of the coindexed items outranks the other.

7. OTHER SOURCES OF SYNTAX/SEMANTICS PARALLELISMS. Finally, I turn to two classes of cases in which there are parallelisms between logical structure and surface constituent structure on which the cyclic principle seems to have no bearing at all. Expressions in which negatives are incorporated into quantifiers, as in *nobody*, *not many linguists*, and *not all politicians* can be decomposed straightforwardly into a negation and a quantified expression that is in the scope of the negation, as in 50a' as a logical structure for 50a.

- (50) a. Not many linguists play poker.



The quantified expression, however, has to be not just in the scope of the negation but in its IMMEDIATE scope: if there is another quantified expression elsewhere in the sentence, it cannot intervene semantically between the negation and the quantifier of an item like *no one*. For example, 51a can be interpreted as 51b, for some speakers also as 51b', but not as 51b'', which allows incorporation of the negative only into the other quantifier, as in 51c, which in turn disallows readings such as 51b–b' in which *all* is not in the immediate scope of *not*.

- (51) a. Not many women admire all men.
- b. not (many women)_x (all men)_y [x admires y]
 (= There aren't many women who admire all men.)
- b'. (all men)_y not (many women)_x [x admires y]
 (= All men are such that not many women admire them.)
- b''. not (all men)_y (many women)_x [x admires y]
 (= Not all men are such that many women admire them.)
- c. Not all men are admired by many women.

The cyclic principle is no help in explaining why 51c cannot have the interpretation 51b, since 52 is ambiguous between the propositions that are negated in 51b and in 51b'', and thus the difference would be wiped out by the applications of Q'L that would precede negative incorporation.

- (52) All men are admired by many women.

In McCawley 1998a:585–86, I consider inconclusively various ways in which the quantifier could be required to be in the immediate scope of the negation; for example, negative incorporation might be precyclic rather than cyclic. Whatever formal device is adopted to so restrict it, the rationale for the restriction is precisely the iconic relation that it mediates between logical structure and surface structure: the direct syntactic and/or morphological connection between the negative and the quantifier matches the immediate scope relation in logical structure.

There is, however, an intriguing deviation from such iconicity in German, where plural NPs with *kein* (Kratzer 1995, following Bech 1955/57) not only allow an interpretation in which something intervenes between the negation and the existential quantifier but indeed exclude interpretations in which the existential quantifier is in the immediate scope of the negation, i.e. 53a can be interpreted only as 53b, not as 53b' or 53b''.

- (53) a. . . . weil keine Beispiele bekannt sein müssen.
 'since it is not necessary that any examples be known'
- b. not (necessary (: x example)(x is known))
- b'. not (: x example)(necessary (x is known))
- b''. necessary (not (: x example)(x is known))

Kratzer distinguishes two kinds of incorporation: the syntactic/semantic incorporation of the English examples and indeed of most German incorporations (including *kein* with a singular N'), vs. a special morphological incorporation that is restricted to combinations of *nicht* and an indefinite plural: '*keine Beispiele* is not a normal quantifier phrase. It seems to be a particular realization of the string *nicht Beispiele*, consisting of the negation adverb *nicht* and the bare plural *Beispiele*'.²³

²³ At first glance, *little imagination* in *It takes little imagination to think of counterexamples to this* might seem to behave like *keine Beispiele*. For example, one might interpret it as 'To think of counterexamples to this, \neg necessary((: x is much imagination)(one have x))'. However, an alternative with *much* in the immediate scope of the negation can be constructed on the model of the logical structures for 37: 'To think of counterexamples to this, \neg ((: y is a large quantity) necessary(one have y-much imagination))'.

Another type of parallelism between surface structure and logical structure that cannot be attributed to the cyclic principle is illustrated by interactions between inversion in questions and the placement of negative elements in English. In negative declarative sentences, the negative element is normally contracted, and in corresponding yes-no questions, it normally is included in the inversion rather than stranded.²⁴

- (54) a. He can't see what's wrong.
- a'. ?He can not see what's wrong.
- b. Can't you see what's wrong?
- b'. (?)Can you not see what's wrong?

But when the negation is in the scope of an adverb such as *really*, the negative element not only can be but must be stranded.

- (55) a. He really can't see what's wrong.
- b. Can you really not see what's wrong?
- b'. *Can't you really see what's wrong?

The obligatoriness of inversion insures that there will be some discrepancy between surface form and logical structure, in that a tensed auxiliary verb has to assume a position higher than *really*, even when it is in the scope of *really*, as in 55b. But by leaving the negative element behind, speakers of English are able to at least make the surface relation of *really* to *not* match the scope relation. In both 54b' and 55b, stranding *not* leaves it in a position that deviates from its scope relation to *can*, but only in the latter case is there a compensating motivation for stranding *not*, namely its being in the scope of *really*. A similar account can be given of why the interrogative counterparts of 56a and 56b, in which a quantified subject is combined with a negated V', are 56a' and 56b', in which the negative element, contrary to the usual tendency, is stranded.

- (56) a. Someone hasn't replied to the invitation.
- a'. Has someone not replied to the invitation?
- b. Most of the students couldn't solve problem #3.
- b'. Could most of the students not solve problem #3?

My informal description of these examples, in terms of a ranking of goals that determines the resolution of conflicts among the goals, could of course easily be formalized in terms of optimality.

8. CONCLUSION. If syntactic deep structures are identified with logical structures, an appropriately chosen cyclic principle guarantees that cyclic rules will apply in such a way as to yield large-scale parallelisms between surface syntactic structures and corresponding logical structures but also provides for ways in which other rules can yield deviations from those parallelisms. In cases in which a language has syntactic rules that explicitly demand there be structural mismatches between the two levels, choices among the options that the language provides are made in ways that reduce the mismatch where that is possible.

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²⁴ For further discussion of the relation of logical scope to the syntax of auxiliary verbs, see McCawley 1998b.

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