Chapter 3

A Minimalist Program for Linguistic Theory

3.1 Some General Considerations

Language and its use have been studied from varied points of view. One approach, assumed here, takes language to be part of the natural world. The human brain provides an array of capacities that enter into the use and understanding of language (the languagefaculty); these seem to be in good part specialized for that function and a common human endowment over a very wide range of circumstances and conditions. One component of the language faculty is a generative procedure (an I-language, henceforth language) that generates structural descriptions (SDs), each a complex of properties, including those commonly called "semantic" and "phonetic." These SDs are the expressions of the language. The theory of a particular language is its grammar. The theory of languages and the expressions they generate is Universal Grammar (UG); UG is a theory of the initial state S_0 of the relevant component of the language faculty. We can distinguish the language from a conceptual system and a system of pragmatic competence. Evidence has been accumulating that these interacting systems can be selectively impaired and developmentally dissociated (Curtiss 1981, Yamada 1990, Smith and Tsimpli 1991), and their properties are quite different.

A standard assumption is that UG specifies certain linguistic levels, each a symbolic system, often called a "representational system." Each linguistic level provides the means for presenting certain systematic

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information about linguistic expressions. Each linguistic expression (SD) is a sequence of representations, one at each linguistic level. In variants of the Extended Standard Theory (EST), each SD is a sequence $(6, \sigma, \pi, \lambda)$, representations at the D-Structure, S-Structure, Phonetic Form (PF), and Logical Form (LF) levels, respectively.

Some basic properties of language are unusual among biological systems, notably the property of discrete infinity. A working hypothesis in generative grammar has been that languages are based on simple principles that interact to form often intricate structures, and that the language faculty is nonredundant, in that particular phenomena are not "overdetermined" by principles of language. These too are unexpected features of complex biological systems, more like what one expects to find (for unexplained reasons) in the study of the inorganic world. The approach has, nevertheless, proven to be a successful one, suggesting that the hypotheses are more than just an artifact reflecting a mode of inquiry.

Another recurrent theme has been the role of "principles of economy" in determining the computations and the SDs they generate. Such considerations have arisen in various forms and guises as theoretical perspectives have changed. There is, I think, good reason to believe that they are fundamental to the design of language, if properly understood.'

The language is embedded in performance systems that enable its expressions to be used for articulating, interpreting, referring, inquiring, reflecting, and other actions. We can think of the SD as a complex of instructions for these performance systems, providing information relevant to their functions. While there is no clear sense to the idea that language is "designed for use" or "well adapted to its functions," we do expect to find connections between the properties of the language and the manner of its use.

The performance systems appear to fall into two general types: articulatory-perceptual and conceptual-intentional. If so, a linguistic expression contains instructions for each of these systems. Two of the linguistic levels, then, are the interface levels A-P and C-I, providing the instructions for the articulatory-perceptual and conceptual-intentional systems, respectively. Each language determines a set of pairs drawn from the A-P and C-I levels. The level A-P has generally been taken to be PF; the status and character of C-I have been more controversial.

Another standard assumption is that a language consists of two components: a lexicon and a computational system. The lexicon specifies the items that enter into the computational system, with their idiosyncratic properties. The computational system uses these elements to generate derivations and SDs. The derivation of a particular linguistic expression, then, involves a choice of items from the lexicon and a computation that constructs the pair of interface representations.

So far we are within the domain of virtual conceptual necessity, at least if the general outlook is adopted.[2] UG must determine the class of possible languages. It must specify the properties of SDs and of the symbolic representations that enter into them. In particular, it must specify the interface levels (A-P, C-I), the elements that constitute these levels, and the computations by which they are constructed. A particularly simple design for language would take the (conceptually necessary) interface levels to be the only levels. That assumption will be part of the "minimalist" program I would like to explore here.

In early work in generative grammar, it was assumed that the interface C-I is the level of T-markers, effectively a composite of all levels of syntactic representation. In descendants of EST approaches, C-I is generally taken to be LF. On this assumption, each language will determine a set of pairs (π, h) (π drawn from PF and h from LF) as its formal representations of sound and meaning, insofar as these are determined by the language itself. Parts of the computational system are relevant only to π, not h: the *PF component*.[3] Other parts are relevant only to h, not π: the LF component. The parts of the computational system that are relevant to both are the overt syntax—a term that is a bit misleading, in that these parts may involve empty categories assigned no phonetic shape. The nature of these systems is an empirical matter; one should not be misled by unintended connotations of such terms as "logical form" and "represent" adopted from technical usage in different kinds of inquiry.

The standard idealized model of language acquisition takes the initial state S_0 to be a function mapping experience (primary linguistic data, PLD) to a language. UG is concerned with the invariant principles of S_0 and the range of permissible variation. Variation must be determined by what is "visible" to the child acquiring language, that is, by the PLD. It is not surprising, then, to find a degree of variation in the PF component, and in aspects of the lexicon: Saussurean arbitrariness (association of concepts with phonological matrices), properties of grammatical formatives (inflection, etc.), and readily detectable properties that hold of lexical items generally (e.g., the head parameter). Variation in the overt syntax or LF component would be more problematic, since evidence could only be quite indirect. A narrow conjecture is that there is no such variation: beyond PF options and lexical arbitrariness (which I henceforth ignore), variation is limited to nonsubstantive parts of the lexicon and general properties of lexical items. If so, there is only one computational system and one lexicon, apart from this limited kind of variety. Let us tentatively adopt that assumption—extreme, perhaps, but it seems not implausible—as another element of the Minimalist Program.[4]

Early generative grammar approached these questions in a different way, along lines suggested by long tradition: various levels are identified, with their particular properties and interrelations; UG provides a format for permissible rule systems; any instantiation of this format constitutes a specific language. Each language is a rich and intricate system of rules that are, typically, construction-particular and language-particular: the rules forming verb phrases or passives or relative clauses in English, for example, are specific to *these* constructions in *this* language. Similarities across constructions and languages derive from properties of the format for rule systems.

The more recent principles-and-parameters (P&P) approach, assumed here, breaks radically with this tradition, taking steps toward the minimalist design just sketched. UG provides a fixed system of principles and a finite array of finitely valued parameters. The language-particular rules reduce to choice of values for these parameters. The notion of grammatical construction is eliminated, and with it, construction-particular rules. Constructions such as verb phrase, relative clause, and passive remain only as taxonomic artifacts, collections of phenomena explained through the interaction of the principles of UG, with the values of parameters fixed.

With regard to the computational system, then, we assume that S_0 is constituted of invariant principles with options restricted to functional elements and general properties of the lexicon. A selection Σ among these options determines a language. A language, in turn, determines an infinite set of linguistic expressions (SDs), each a pair (π, λ) drawn from the interface levels (PF, LF), respectively. Language acquisition involves fixing Σ; the grammar of the language states Σ, nothing more (lexical arbitrariness and PF component aside). If there is a parsing system that is invariant and unlearned (as often assumed), then it maps (C, π) into a structured percept, in some cases associated with an SD.[5] Conditions on representations—those of binding theory, Case theory, θ-theory, and so on—hold only at the interface, and are motivated by properties of the interface, perhaps properly understood as modes of interpretation by performance systems. The linguistic expressions are the optimal realizations of the interface conditions, where "optimality" is determined by the economy conditions of UG. Let us take these assumptions too to be part of the Minimalist Program.

In early work, economy considerations entered as part of the evaluation metric, which, it was assumed, selected a particular instantiation of the permitted format for rule systems, given PLD. As inquiry has progressed, the presumed role of an evaluation metric has declined, and within the P&P approach, it is generally assumed to be completely dispensable: the principles are sufficiently restrictive so that PLD suffice in the normal case to set the parameter values that determine a language.[6]

Nevertheless, it seems that economy principles of the kind explored in early work play a significant role in accounting for properties of language. With a proper formulation of such principles, it may be possible to move toward the minimalist design: a theory of language that takes a linguistic expression to be nothing other than a formal object that satisfies the interface conditions in the optimal way. A still further step would be to show that the basic principles of language are formulated in terms of notions drawn from the domain of (virtual) conceptual necessity.

Invariant principles determine what counts as a possible derivation and a possible derived object (linguistic expression, SD). Given a language, these principles determine a specific set of derivations and generated SDs, each a pair (π, λ). Let us say that a derivation D *converges* if it yields a legitimate SD and *crashes* if it does not; D *converges at PF* if π is legitimate and *crashes at PF* if it is not; D *converges at* LF if h is legitimate and *crashes at* LF if it is not. In an EST framework, with SD = (6, σ, π, h) (6 a D-Structure representation, σ an S-Structure representation), there are other possibilities: δ or σ, or relations among (6, o, x, h), might be defective. Within the Minimalist Program, all possibilities are excluded apart from the status of π and λ. A still sharper version would exclude the possibility that x and h are each legitimate but cannot be paired for UG reasons. Let us adopt this narrower condition as well. Thus, we assume that a derivation converges if it converges at PF and at LF; convergence is determined by independent inspection of the interface levels—not an empirically innocuous assumption.[7]

The principles outlined are simple and restrictive, so that the empirical burden is considerable; and fairly intricate argument may be necessary to support it—exactly the desired outcome, for whatever ultimately proves to be the right approach.

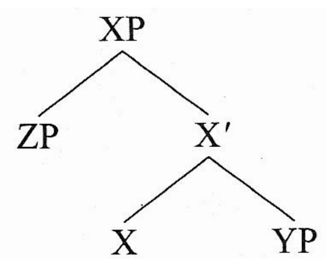
These topics have been studied and elaborated over the past several years, with results suggesting that the minimalist conception outlined may not be far from the mark. I had hoped to present an exposition in this paper, but that plan proved too ambitious. I will therefore keep to an informal sketch, only indicating some of the problems that must be dealt with.[1]

3.2 Fundamental Relations: X-Bar Theory

The computational system takes representations of a given form and modifies them. Accordingly, UG must provide means to present an array of items from the lexicon in a form accessible to the computational system. We may take this form to be some version of X-bar theory. The concepts of X-bar theory are therefore fundamental. In a minimalist theory, the crucial properties and relations will be stated in the simple and elementary terms of X-bar theory

An X-bar structure is composed of projections of heads selected from the lexicon. Basic relations, then, will involve the head as one term. Furthermore, the basic relations are typically "local." In structures of the form (1), two local relations are present: the *Spec(ifier)-head* relation of *ZP* to X, and the ***head-complement*** relation of X to YP (order irrelevant; the usual conventions apply).

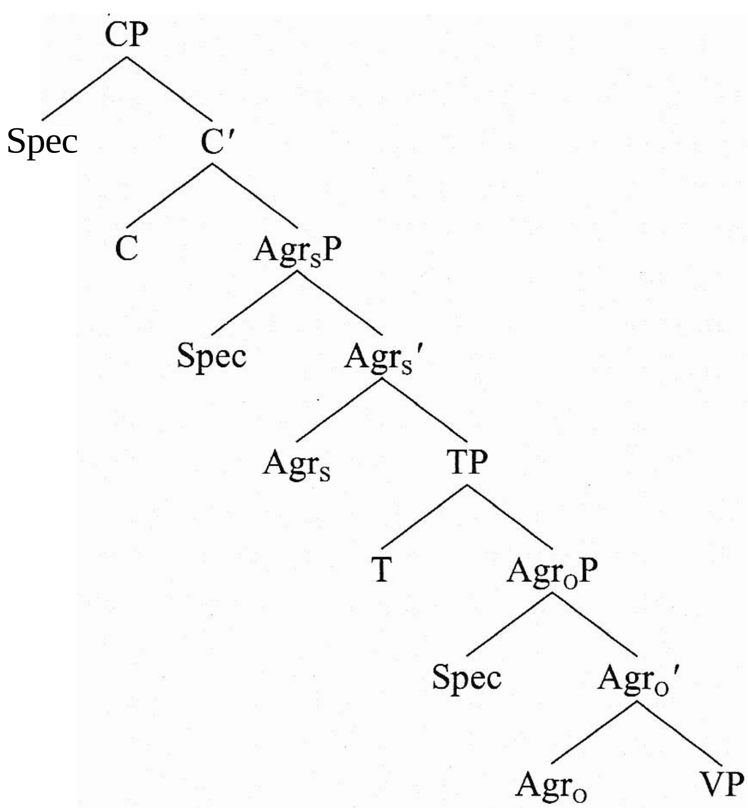
(1)



The head-complement relation is not only "more local" but also more fundamental—typically, associated with thematic (θ-) relations. The Spec-head relation, I will suggest below, falls into an "elsewhere" category. Putting aside adjunction for the moment, the narrowest plausible hypothesis is that X-bar structures are restricted to the form in (1); only local relations are considered (hence no relation between X and a phrase included within YP or ZP); and head-complement is the core local relation. Another admissible local relation is head-head, for example, the relation of a verb to (the head of) its Noun Phrase complement (selection). Another is chain link, to which we will return. The version of a minimalist program explored here requires that we keep to relations of these kinds, dispensing with such notions as government by a head (head government). But head government plays a critical role in all modules of grammar; hence, all of these must be reformulated, if this program is to be pursued.

Take Case theory. It is standardly assumed that the Spec-head relation enters into structural Case for the subject position, while the object position is assigned Case under government by V, including constructions in which the object Case-marked by a verb is not its complement (exceptional Case marking).[9] The narrower approach we are considering requires that all these modes of structural Case assignment be recast in unified X-bar-theoretic terms, presumably under the Spec-head relation. As discussed in chapter 2, an elaboration of Pollock's (1989) theory of inflection provides a natural mechanism, where we take the basic structure of the clause to be (2).

(2)



Omitted here are a possible specifier of TP ([Spec, TP]) and a phrase headed by the functional element *Neg(ation)*, or perhaps more broadly, a category that includes an affirmation marker and others as well (Pollock 1989, Laka 1990). Agr_S and Agr_O are informal mnemonics to distinguish the two functional roles of Agr. Agr is a collection of +-features (gender, number, person); these are common to the systems of subject and object agreement, though $\mathrm{Agr_S}$ and $\mathrm{Agr_O}$ may of course be different selections, just as two verbs or NPs in (2) may differ.[10]

We now regard both agreement and structural Case as manifestations of the Spec-head relation (NP, Agr). But Case properties depend on characteristics of T and the V head of VP. We therefore assume that T raises to $\mathrm{Agr_S}$, forming (3a), and V raises to $\mathrm{Agr_O}$, forming (3b); the complex includes the +-features of Agr and the Case feature provided by T, V.[11]

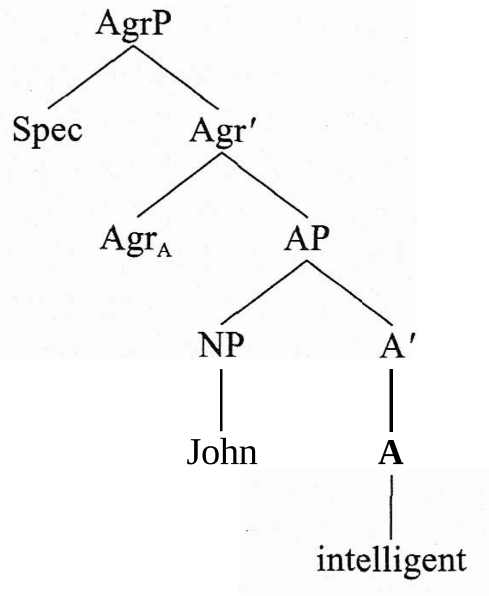
(3) a. $[_{\mathrm{Agr}}$ T Agr]
  b. $[_{\mathrm{Agr}}$ V Agr]

The basic assumption is that there is a symmetry between the subject and the object inflectional systems. In both positions the relation of NP to V is mediated by Agr, a collection of +-features; in both positions agreement is determined by the +-features of the Agr head of the Agr complex, and Case by an element that adjoins to Agr (T or V). An NP in the Spec-head relation to this Agr complex bears the associated Case and agreement features. The Spec-head and head-head relations are therefore the core configurations for inflectional morphology.

Exceptional Case marking by V is now interpreted as raising of NP to the Spec of the AgrP dominating V. It is raising to [Spec, $\mathrm{Agr_O}$], the analogue of familiar raising to [Spec, $\mathrm{Agr_S}$]. If the VP-internal subject hypothesis is correct (as I henceforth assume), the question arises why the object (direct, or in the complement) raises to [Spec, $\mathrm{Agr_O}$] and the subject to [Spec, $\mathrm{Agr_S}$], yielding unexpected crossing rather than the usual nested paths. We will return to this phenomenon below, finding that it follows on plausible assumptions of some generality, and in this sense appears to be a fairly "deep" property of language. If parameters are morphologically restricted in the manner sketched earlier, there should be no language variation in this regard.

The same hypothesis extends naturally to predicate adjectives, with the underlying structure shown in (4) (Agr_A again a mnemonic for a collection of +-features, in this case associated with an adjective).

(4)



Raising of NP to Spec and A to Agr_A creates the structure for NP-adjective agreement internal to the predicate phrase. The resulting structure is a plausible candidate for the small clause complement of consider, be, and so on. In the former construction (complement of consider), NP raises further to [Spec, Agr_O] at LF to receive accusative Case; in the latter (complement of be), NP raises overtly to receive nominative Case and verb agreement, yielding the overt form John *is* intelligent with John entering into three relations: (1) a Case relation with [T Agr_S] (hence ultimately the verbal complex [[T Agr_S] V]), (2) an agreement relation with Agr_S (hence the verbal complex), and (3) an agreement relation with Agr of structure (4) (hence the adjectival complex). In both constructions, the NP subject is outside of a full AP in the small clause construction, as required, and the structure is of a type that appears regularly.[12]

An NP, then, may enter into two kinds of structural relations with a predicate (verb, adjective): agreement, involving features shared by NP and predicate; or Case, manifested on the NP alone. Subject of verb or adjective, and object of verb, enter into these relations (but not object of adjective if that is an instance of inherent, not structural, Case). Both relations involve Agr: Agr alone, for agreement relations; the element T or V alone (raising to Agr), for Case relations.

The structure of CP in (2) is largely forced by other properties of UG, assuming the minimalist approach with Agr abstracted as a common property of adjectival agreement and the subject-object inflectional systems, a reasonable assumption, given that agreement appears without Case (as in NP-AP agreement) and Case appears without agreement (as in transitive expletives, with the expletive presumably in the [Spec, Agr_S]

position and the subject in [Spec, T], receiving Case; see note 11). Any appropriate version of the Case Filter will require two occurrences of Agr if two NPs in VP require structural Case; conditions on Move α require the arrangement given in (2) if structural Case is construed as outlined. Suppose that VP contains only one NP. Then one of the two Agr elements will be "active" (the other being inert or perhaps missing). Which one? Two options are possible: Agr_S or Agr_O. If the choice is Agr_S, then the single NP will have the properties of the subject of a transitive clause; if the choice is Agr_O, then it will have the properties of the object of a transitive clause (nominative-accusative and ergative-absolutive languages, respectively). These are the only two possibilities, mixtures apart. The distinction between the two language types reduces to a trivial question of morphology, as we expect.

Note that from this point of view, the terms ***nominative, absolutive,*** and so on, have no substantive meaning apart from what is determined by the choice of "active" versus "inert" Agr; there is no real question as to how these terms correspond across language types.

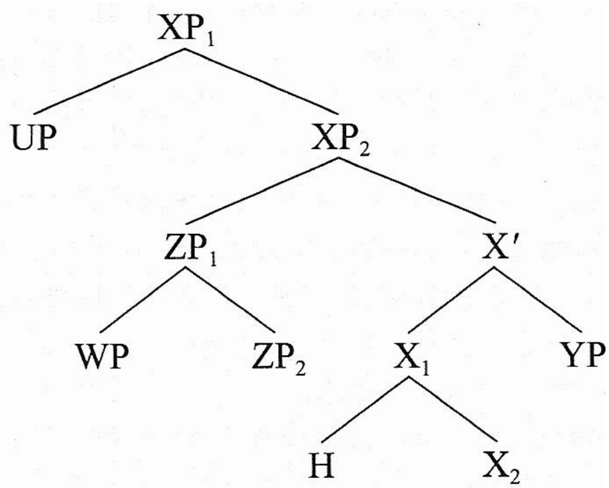
The "active" element (Agr_S in nominative-accusative languages and Agr_O in ergative-absolutive languages) typically assigns a less-marked Case to its Spec, which is also higher on the extractability hierarchy, among other properties. It is natural to expect less-marked Case to be compensated (again, as a tendency) by more-marked agreement (richer overt agreement with nominative and absolutive than with accusative and ergative). The C-Command Condition on anaphora leads us to expect nominative and ergative binding in transitive constructions.[13]

Similar considerations apply to licensing of pro. Assuming Rizzi's theory (1982, 1986a), ***pro*** is licensed in a Spec-head relation to "strong" Agr_S, or when governed by certain verbs V*. To recast these proposals in a unitary X-bar-theoretic form: pro is licensed only in the Spec-head relation to $[_{Agr}\ \alpha\ Agr]$, where α is [+tense] or V, Agr strong or V = V*. Licensing of ***pro*** thus falls under Case theory in a broad sense. Similar considerations extend rather naturally to PRO.[14]

Suppose that other properties of head government also have a natural expression in terms of the more fundamental notions of X-bar theory. Suppose further that antecedent government is a property of chains, expressible in terms of c-command and barriers. Then the concept of government would be dispensable, with principles of language restricted to something closer to conceptual necessity: local X-bar-theoretic relations to the head of a projection and the chain link relation.

Let us look more closely at the local X-bar-theoretic notions, taking these to be fundamental. Assume binary branching only, thus structures limited to (1). Turning to adjunction, on the assumptions of Chomsky 1986a, there is no adjunction to complement, adjunction (at least, in overt syntax) has a kind of "structure-preserving" character, and a segment-category distinction holds.[15] Thus, the structures to be considered are of the form shown in (5), where XP, ZP, and X each have a higher and lower segment, indicated by subscripting (H and X heads).

(5)



Let us now consider the notions that enter into a minimalist program. The basic elements of a representation are chains. We consider first the case of one-membered chains, construing notions abstractly with an eye to the general case. The structure (5) can only have arisen by raising of H to adjoin to X (we put aside questions about the possible origins of UP, WP). Therefore, H heads a chain CH = (H, . . . , t), and only this chain, not H in isolation, enters into head-a relations. The categories that we establish are defined for H as well as X, but while they enter into head-a relations for X, they do not do so for H (only for the chain CH), an important matter.

Assume all notions to be irreflexive unless otherwise indicated. Assume the standard notion of domination for the pair (o, β), σ a segment. We say that the category a dominates β if every segment of a dominates β. The category a contains β if some segment of a dominates β. Thus, the two-segment category XP dominates ZP, WP, X', and whatever they dominate; XP contains UP and whatever UP and XP dominate; ZP contains WP but does not dominate it. The two-segment category X contains H but does not dominate it.

For a head a, take Max(α) to be the least full-category maximal projection dominating a. Thus, in (5) Max(H) = Max(X) = [XP_1, XP_2], the two-segment category XP.

Take the domain of a head a to be the set of nodes contained in Max(α) that are distinct from and do not contain a. Thus, the domain of X in (5) is (UP, ZP, WP, YP, H) and whatever these categories dominate; the domain of H is the same, minus H.

As noted, the fundamental X-bar-theoretic relation is head-complement, typically with an associated 0-relation determined by properties of the head. Define the complement domain of a as the subset of the domain reflexively dominated by the complement of the construction: YP in (5). The complement domain of X (and H) is therefore YP and whatever it dominates.

The remainder of the domain of a we will call the residue of a. Thus, in (5) the residue of X is its domain minus YP and what it dominates. The residue is a heterogeneous set, including the Spec and anything adjoined (adjunction being allowed to the maximal projection, its Spec, or its head; UP, WP, and H, respectively, in (5)).

The operative relations have a local character. We are therefore interested not in the sets just defined, but rather in minimal subsets of them that include just categories locally related to the heads. For any set S of categories, let us take Min(S) (minimal S) to be the smallest subset K of S such that for any y $\in$ S, some $\beta \in$ K reflexively dominates y. In the cases that interest us, S is a function of a head a (e.g., S = domain of a). We keep to this case, that is, to Min(S(α)), for some head a. Thus, in (5) the minimal domain of X is (UP, ZP, WP, YP, H); its minimal complement domain is YP; and its minimal residue is (UP, ZP, WP, H). The minimal domain of H is (UP, ZP, WP, YP); its minimal complement domain is YP; and its minimal residue is (UP, ZP, WP).

Let us call the minimal complement domain of a its internal domain, and the minimal residue of a its checking domain. The terminology is intended to indicate that elements of the internal domain are typically internal arguments of a, while the checking domain is typically involved in checking inflectional features. Recall that the checking domain is heterogeneous: it is the "elsewhere" set. The minimal domain also has an important role, to which we will turn directly.

A technical point should be clarified. The internal and checking domains of a must be uniquely defined for a; specifically, if a (or one of its elements, if it is a nontrivial chain) is moved, we do not want the internal and checking domains to be "redefined" in the newly formed construction, or we will have an element with multiple subdomains—for example, ambiguous specification of internal arguments. We must therefore understand the notion Min(S(α)) derivationally, not representationally: it is defined for a as part of the process of introducing a into the derivation. If a is a trivial (one-membered) chain, then Min(S(α)) is defined when a is lexically inserted; if a is a nontrivial chain ($\beta_1, \dots, \beta_n$), then Min(S(α)) is defined when a is formed by raising β_1. In (5) the head H has no minimal, internal, or checking domain, because it is raised from someother position to form the chain CH = (H, . . . , t) and has already been assigned these subdomains in the position now occupied by t; such subdomains are, however, defined for the newly formed chain CH, in a manner to which we will turn directly. Similarly, if the complex [H X] is later raised to form the chain CH' = ([H X], *t'*), Min(S(α)) will be defined as part of the operation for a = CH', but not for a = X, H, or CH.

Returning to (5), suppose X is a verb. Then YP, the sole element of the internal domain of X, is typically an internal argument of X. Suppose X is Agr and H a verb raised to Agr forming the chain CH = (H, t). Then the specifier ZP (and possibly the adjoined elements UP, WP) of the checking domain of X and CH will have agreement features by virtue of their local relation to X, and Case features by virtue of their local relation to CH. H does not have a checking domain, but CH does.[16]

We have so far considered only one-membered chains. We must extend the notions defined to a nontrivial chain CH with n > 1 (a, a zero-level category), as in (6).

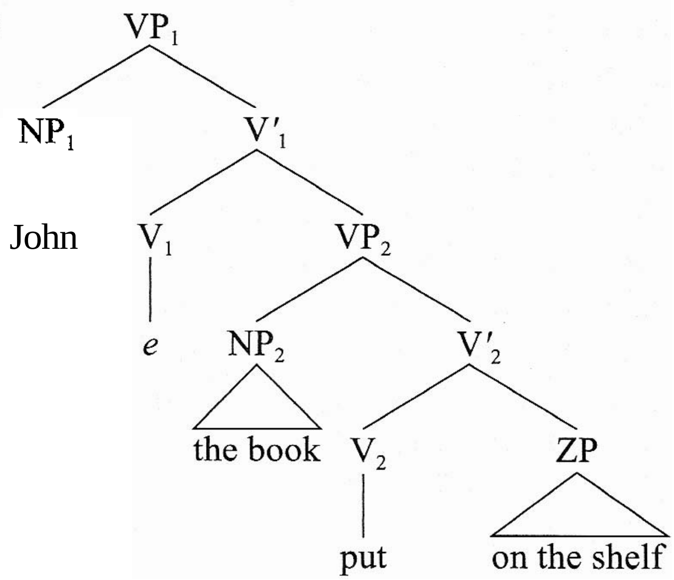
(6) CH = (a,, . . . , *a,,)*

Let us keep to the case of $n = 2$, the normal case for lexical heads though not necessarily the only one.[17]

The issue arises, for example, if we adopt an analysis of multiargument verbs along the lines suggested by Larson (1988), for example, taking the underlying structure of (7) to be (8).

(7) John put the book on the shelf

(8)



V_2 raises to the empty position V_1, forming the chain (put, t) (subsequently, NP_1 raises (overtly) to [Spec, Agr_S] and NP_2 (covertly) to [Spec, Agr_O]).

The result we want is that the minimal domain of the chain (put, t) is {NP_1, NP_2, ZP) (the three arguments), while the internal domain is {NP_2, ZP) (the internal arguments). The intended sense is given by the natural generalization of the definitions already suggested. Let us define the domain of CH in (6) to be the set of nodes contained in Max(α_1) and not containing any α_i. The complement domain of CH is the subset of the domain of CH reflexively dominated by the complement of a,. Residue and Min(S(α)) are defined as before, now for a = CH. The concepts defined earlier are the special cases where CH is one-membered.

Suppose, for example, that CH = (put, t), after raising of put to V_1 in (8), leaving t in the position V_2. Then the domain of CH is the set of nodes contained in VP_1 (= Max(V_1)) and not containing either put or t (namely, the set {NP_1, NP_2, ZP) and whatever they dominate); the minimal domain is {NP_1, NP_2, ZP). The internal domain of the chain CH is {NP_2, ZP) (the two internal arguments), and the checking domain of CH is NP_1, the typical position of the external argument in this version of the VP-internal subject hypothesis (basically Larson's).

Suppose that instead of replacing e, put had adjoined to some nonnull element X, yielding the complex category [$_X$ put X], as in adjunction of H to X in (5). The domain, internal domain, and checking domain of the chain would be exactly the same. There is no minimal domain, internal domain, or checking domain for put itself after raising; only for the chain CH = (put, t). It is in terms of these minimal sets that the local head-a relations are defined, the head now being the nontrivial chain CH.

In (8), then, the relevant domains are as intended after V-raising to V,. Note that VP_2 is not in the internal domain of CH (= (put, t)) because it dominates t (= a, of (6)).

The same notions extend to an analysis of lexical structure along the lines proposed by Hale and Keyser (1993a). In this case an analogue of (8) would be the underlying structure for John shelved the book, with V_2 being a "light verb" and ZP an abstract version of on the shelf (= [P shelf]). Here shelf raises to P, the amalgam raises to V„ and the element so formed raises to V_1 in the manner of *put* in (7).[18]

So far we have made no use of the notion "minimal domain." But this too has a natural interpretation, when we turn to Empty Category Principle (ECP) phenomena. I will have to put aside a careful development here, but it is intuitively clear how certain basic aspects will enter. Take the phenomena of superiority (as in (9a)) and of relativized minimality in the sense of Rizzi (1990) (as in (9b)).

(9) a. i. whom, did John persuade t, [to visit whom,]
ii. *whom, did John persuade whom, [to visit t_2]
b. Superraising, the Head Movement Constraint (HMC), [Spec, CP] islands (including wh-islands)

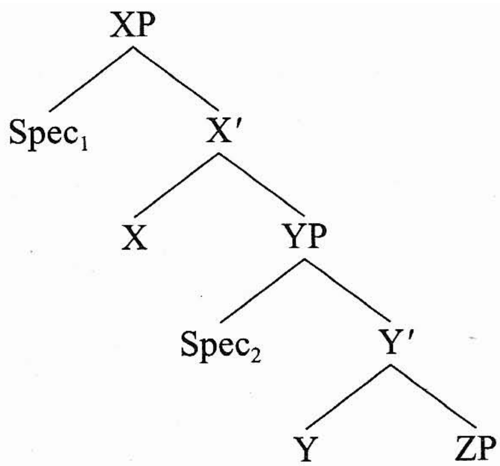
Looking at these phenomena in terms of economy considerations, it is clear that in all the "bad" cases, some element has failed to make "the shortest move." In (9aii) movement of whom, to [Spec, CP] is longer in a natural sense (definable in terms of c-command) than movement of whom, to this position. In all the cases of (9b) the moved element has "skipped" a position it could have reached by a shorter move, had that position not been filled. Spelling out these notions to account for the range of relevant cases is not a trivial matter. But it does seem possible in a way that accords reasonably well with the Minimalist Program. Let us simply assume, for present purposes, that this task can be carried out, and that phenomena of the kind illustrated are accounted for in this way in terms of economy considerations.[19]

There appears to be a conflict between two natural notions of economy: shortest move versus fewest steps in a derivation. If a derivation keeps to shortest moves, it will have more steps; if it reduces the number of steps, it will have longer moves. The paradox is resolved if we take the basic transformational operation to be not Move a but Form Chain, an operation that applies, say, to the structure (10a) to form (10b) in a single step, yielding the chain CH of (10c).

(10) a. e seems [e to be likely [John to win]]
b. John seems *[t'* to be likely [t to win]]
c. CH = (John, *t', t)*

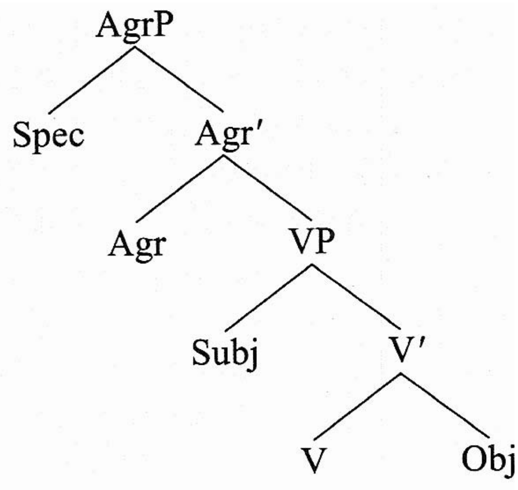
Similarly, in other cases of successive-cyclic movement. There is, then, no conflict between reducing derivations to the shortest number of steps and keeping links minimal ("Shortest Movement" Condition). There are independent reasons to suppose that this is the correct approach: note, for example, that successive-cyclic wh-movement of arguments does not treat the intermediate steps as adjunct movement, as it should if it were a succession of applications of Move a. Successive-cyclic movement raises a variety of interesting problems, but I will again put them aside, keeping to the simpler case.

A number of questions arise in the case of such constructions as (8), considered now in the more abstract form (11).

(11)


In the particular instance (8), Spec, = NP, (John), X = null V,, Spec, = NP_2 (the book), Y = V_2 ***(put)*** with ZP its complement (on the shelf). Another instance would be object raising to [Spec, Agr] (Agr = Agr_O), as in (12).

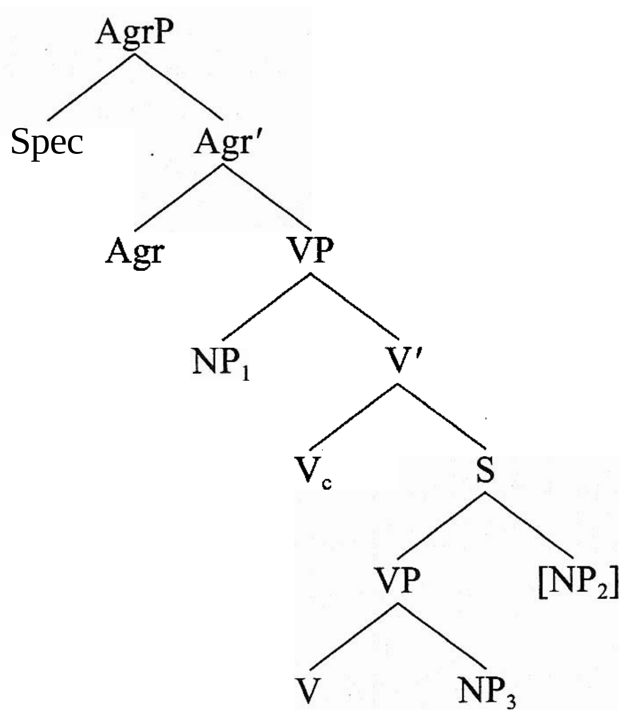
(12)



Here Subj is the VP-internal subject (or its trace), and Obj the object. The configuration and operations are exactly those of (8), except that in (12) V adjoins to Agr (as in the case of H of (5)), whereas in (8) it substitutedfor the empty position V,. On our assumptions, Obj must raise to Spec for Case checking, crossing Subj or its trace. (12) is therefore a violation of Relativized Minimality, in effect, a case of superraising, a violation of the "Shortest Movement" Condition.

Another instance of (11) is incorporation in the sense of Baker (1988). For example, V-incorporation to a causative verb has a structure like (12), but with an embedded clause S instead of the object Obj, as in (13).

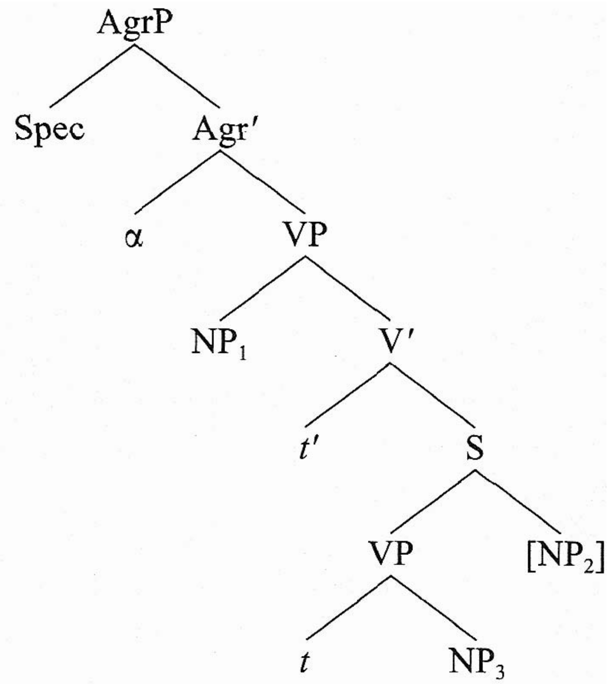
(13)



In an example of Baker's, modeled on Chicheŵa, we take NP, = the baboons, V_c = make, NP_2 = the lizards, V = hit, and NP_3 = the children;

the resulting sentence is the baboons made-hit the children [to the lizards], meaning 'the baboons made the lizards hit the children'. Incorporation of V to the causative V_c yields the chain (V, *t*), with V adjoined to V_c. The complex head [V V_c] then raises to Agr, forming the new chain ([V V_c], t'), with [V V_c] adjoining to Agr to yield a = [$_{Agr}$ [V V_c] Agr]. The resulting structure is (14).[20]

(14)



Here NP, is treated as the object of the verbal complex, assigned accusative Case (with optional object agreement). In our terms, that means that NP_3 raises to [Spec, a], crossing NP,, the matrix subject or its trace (another option is that the complex verb is passivized and NP, is raised to [Spec, Agr_S]).

In the last example the minimal domain of the chain ([V V_c], *t'*) is {Spec, NP,, S). The example is therefore analogous to (8), in which V-raising formed an enlarged minimal domain for the chain. It is natural to suppose that (12) has the same property: V first raises to Agr, yielding the chain (V, t) with the minimal domain {Spec, Subj, Obj). The cases just described are now formally alike and should be susceptible to the same analysis. The last two cases appear to violate the "Shortest Movement" Condition.

Let us sharpen the notion "shortest movement" as follows:

(15) If a, β are in the same minimal domain, they are equidistant from γ.

In particular, two targets of movement are equidistant if they are in the same minimal domain.

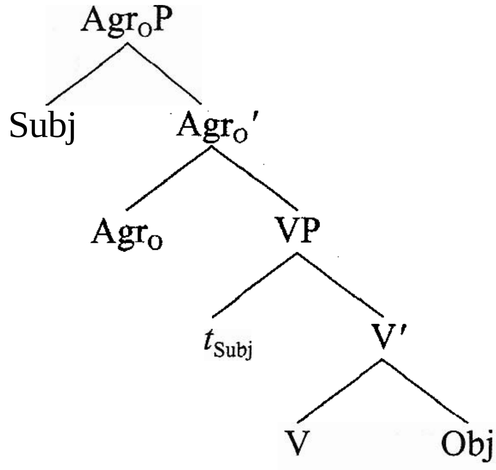
In the abstract case (11), if Y adjoins to X, forming the chain (Y, *t*) with the minimal domain {Spec,, Spec,, ZP}, then Spec, and Spec, are equidistant from ZP (or anything it contains), so that raising of (or from) ZP can cross Spec, to Spec,. Turning to the problematic instances of (11), in (12) Obj can raise to Spec, crossing Subj or its trace without violating the economy condition; and in the incorporation example (14) NP, can raise to Spec, crossing NP,.

This analysis predicts that object raising as in (12) should be possible only if V has raised to Agr. In particular, overt object raising will be possible only with overt V-raising. That prediction is apparently confirmed for the Germanic languages (Vikner 1990). The issue does not arise in the LF analogue, since we assume that invariably, V raises to Agr_O covertly, if not overtly, therefore "freeing" the raising of object to [Spec, Agr_O] for Case checking.

Baker explains structures similar to (13)–(14) in terms of his Government Transparency Corollary (GTC), which extends the government domain of V_1 to that of V_2 if V_2 adjoins to V, . The analysis just sketched is an approximate analogue, on the assumption that Case and agreement are assigned not by head government but in the Spec-head relation. Note that the GTC is not strictly speaking a corollary; rather, it is an independent principle, though Baker gives a plausibility argument internal to a specific theory of government. A possibility that might be investigated is that the GTC falls generally under the independently motivated condition (15), on the minimalist assumptions being explored here.

Recall that on these assumptions, we faced the problem of explaining why we find crossing rather than nesting in the Case theory, with VP-internal subject raising to [Spec, Agr_S] and object raising to [Spec, Agr_O], crossing the trace of the VP-internal subject. The principle (15) entails that this is a permissible derivation, as in (12) with V-raising to Agr_O. It remains to show that the desired derivation is not only permissible but obligatory: it is the only possible derivation. That is straightforward. Suppose that in (12) the VP-internal subject in [Spec, VP] raises to [Spec, Agr_O], either overtly or covertly, yielding (16), t_{Subj} the trace of the raised subject Subj.

(16)



Suppose further that V raises to Agr_O, either overtly or covertly, forming the chain (V, t) with the minimal domain {Subj, t_{Subj}, Obj). Now Subj and its trace are equidistant from Obj, so that Obj can raise to the [Spec, Agr_O] position. But this position is occupied by Subj, blocking that option. Therefore, to receive Case, Obj must move directly to some higher position, crossing [Spec, Agr_O]: either to [Spec, T] or to [Spec, Agr_S]. But that is impossible, even after the element [V, Agr_O] raises to higher inflectional positions. Raising of [V, Agr_O] will form a new chain with trace in the Agr_O position of (16) and a new minimal domain M. But t_{Subj} is not a member of M. Accordingly, Obj cannot cross t_{Subj} to reach a position in M (apart from the position [Spec, Agr_O] already filled by the subject). Hence, raising of the VP-internal subject to the [Spec, Agr_O] position blocks any kind of Case assignment to the object; the object is "frozen in place."[22]

It follows that crossing and not nesting is the only permissible option in any language. The paradox of Case theory is therefore resolved, on natural assumptions that generalize to a number of other cases.

3.3 Beyond the Interface Levels: D-Structure

Recall the (virtual) conceptual necessities within this general approach. UG determines possible symbolic representations and derivations. A language consists of a lexicon and a computational system. The computational system draws from the lexicon to form derivations, presenting items from the lexicon in the format of X-bar theory. Each derivation determines a linguistic expression, an SD, which contains a pair (π, λ) meeting the interface conditions. Ideally, that would be the end of the story: each linguistic expression is an optimal realization of interface conditions expressed in elementary terms (chain link, local X-bar-theoretic relations), a pair (π, λ) satisfying these conditions and generated in the most economical way. Any additional structure or assumptions require empirical justification.

The EST framework adds additional structure; for concreteness, take Lectures on Government and Binding (LGB; Chomsky 1981a). One crucial assumption has to do with the way in which the computational system presents lexical items for further computation. The assumption is that this is done by an operation, call it Satisfy, which selects an array of items from the lexicon and presents it in a format satisfying the conditions of X-bar theory. Satisfy is an "all-at-once" operation: all items that function at LF are drawn from the lexicon before computation proceeds[23] and are presented in the X-bar format.

We thus postulate an additional level, D-Structure, beyond the two external interface levels PF and LF. D-Structure is the internal interface between the lexicon and the computational system, formed by Satisfy. Certain principles of UG are then held to apply to D-Structure, specifically, the Projection Principle and the θ-Criterion. The computational procedure maps D-Structure to another level, S-Structure, and then "branches" to PF and LF, independently. UG principles of the various modules of grammar (binding theory, Case theory, the pro module, etc.) apply at the level of S-Structure (perhaps elsewhere as well, in some cases).

The empirical justification for this approach, with its departures from conceptual necessity, is substantial. Nevertheless, we may ask whether the evidence will bear the weight, or whether it is possible to move toward a minimalist program.

Note that the operation Satisfy and the assumptions that underlie it are not unproblematic. We have described Satisfy as an operation that selects an array, not a set; different arrangements of lexical items will yield different expressions. Exactly what an array is would have to be clarified. Furthermore, this picture requires conditions to ensure that D-Structure has basic properties of LF. At LF the conditions are trivial. If they are not met, the expression receives some deviant interpretation at the interface; there is nothing more to say. The Projection Principle and the 8-Criterion have no independent significance at LF.[24] But at D-Structure the two principles are needed to make the picture coherent; if the picture is abandoned, they will lose their primary role. These principles are therefore dubious on conceptual grounds, though it remains to account for their empirical consequences, such as the constraint against substitution into a 8-position. If the empirical consequences can be explained in some other way and D-Structure eliminated, then the Projection Principle and the θ-Criterion can be dispensed with.

What is more, postulation of D-Structure raises empirical problems, as noticed at once when EST was reformulated in the more restrictive P&P framework. One problem, discussed in *LGB*, is posed by complex adjectival constructions such as (17a) with the S-Structure representation (17b) (t the trace of the empty operator Op).

(17) a. John is easy to please

b. John is easy $[_{CP}$ Op $[_{IP}$ PRO to please t]]

The evidence for the S-Structure representation (17b) is compelling, but *John* occupies a non-8-position and hence cannot appear at D-Structure. Satisfy is therefore violated. In *LGB* it is proposed that Satisfy be weakened: in non-8-positions a lexical item, such as *John*, can be inserted in the course of the derivation and assigned its 8-role only at LF (and irrelevantly, S-Structure). That is consistent with the principles, though not with their spirit, one might argue.

We need not tarry on that matter, however, because the technical device does not help. As noted by Howard Lasnik, the *LGB* solution fails, because an NP of arbitrary complexity may occur in place of *John* (e.g., an NP incorporating a structure such as (17a) internally). Within anything like the *LGB* framework, then, we are driven to a version of generalized transformations, as in the very earliest work in generative grammar. The problem was recognized at once, but left as an unresolved paradox. More recent work has brought forth other cases of expressions interpretable at LF but not in their D-Structure positions (Reinhart 1991), along with other reasons to suspect that there are generalized transformations, or devices like them (Kroch and Joshi 1985, Kroch 1989, Lebeaux 1988, Epstein 1991). If so, the special assumptions underlying the postulation of D-Structure lose credibility. Since these assumptions lacked independent conceptual support, we are led to dispense with the level of D-Structure and the "all-at-once" property of Satisfy, relying in its place on a theory of generalized transformations for lexical access —though the empirical consequences of the D-Structure conditions remain to be faced.[25]

A theory of the preferred sort is readily constructed and turns out to have many desirable properties. Let us replace the EST assumptions of *LGB* and related work by an approach along the following lines. The computational system selects an item X from the lexicon and projects it to an X-bar structure of one of the forms in (18), where $X = X^0 = [_X X]$.

(18) a. X
b. $[_{X'} X]$
c. $[_{XP} [_{X'} X]]$

This will be the sole residue of the Projection Principle.

We now adopt (more or less) the assumptions of LSLT, with a single generalized transformation GT that takes a phrase marker K^1 and inserts it in a designated empty position $\emptyset$ in a phrase marker K, forming the new phrase marker K*, which satisfies X-bar theory. Computation proceeds in parallel, selecting from the lexicon freely at any point. At each point in the derivation, then, we have a structure Σ, which we may think of as a set of phrase markers. At any point, we may apply the operation Spell-Out, which switches to the PF component. If Σ is not a single phrase marker, the derivation crashes at PF, since PF rules cannot apply to a set of phrase markers and no legitimate PF representation π is generated. If Σ is a single phrase marker, the PF rules apply to it, yielding π, which either is legitimate (so the derivation converges at PF) or not (the derivation again crashes at PF).

After Spell-Out, the computational process continues, with the sole constraint that it has no further access to the lexicon (we must ensure, for example, that *John* ***left*** does not mean 'they wondered whether John left before finishing his work'). The PF and LF outputs must satisfy the (external) interface conditions. D-Structure disappears, along with the problems it raised.

GT is a substitution operation. It targets K and substitutes K^1 for $\emptyset$ in K. But $\emptyset$ is not drawn from the lexicon; therefore, it must have been inserted by GT itself. GT, then, targets K, adds $\emptyset$, and substitutes K^1 for $\emptyset$, forming K*, which must satisfy X-bar theory. Note that this is a description of the inner workings of a single operation, GT. It is on a par with some particular algorithm for Move α, or for the operation of modus ponens in a proof. Thus, it is invisible to the eye that scans only the derivation itself, detecting only its successive steps. We never see $\emptyset$; it is subliminal, like the "first half" of the raising of an NP to subject position.

Alongside the binary substitution operation GT, which maps (K, K^1) to K*, we also have the singulary substitution operation Move *a*, which maps K to K*. Suppose that this operation works just as GT does: it targets K, adds $\emptyset$, and substitutes a for $\emptyset$, where a in this case is a phrase marker within the targeted phrase marker K itself. We assume further that the operation leaves behind a trace t of a and forms the chain (a, t). Again, $\emptyset$ is invisible when we scan the derivation; it is part of the inner workings of an operation carrying the derivation forward one step.

Suppose we restrict substitution operations still further, requiring that $\emptyset$ be external to the targeted phrase marker K. Thus, GT and Move a extend K to K*, which includes K as a proper part.[26] For example, we can target K = V', add $\emptyset$ to form $[_{\beta}\ \emptyset$ V'], and then either raise a from within V' to replace $\emptyset$ or insert another phrase marker K^1 for $\emptyset$. In either case the result must satisfy X-bar theory, which means that the element replacing $\emptyset$ must be a maximal projection YP, the specifier of the new phrase marker VP = β.

The requirement that substitution operations always extend their target has a number of consequences. First, it yields a version of the strict cycle, one that is motivated by the most elementary empirical considerations: without it, we would lose the effects of those cases of the ECP that fall under Relativized Minimality (see (9b)). Thus, suppose that in the course of a derivation we have reached the stage (19).

(19) a. $[_{I'}$ seems $[_{I'}$ is certain [John to be here]]]
b. $[_{C'}$ C $[_{VP}$ fix the car]]
c. $[_{C'}$ C [John wondered $[_{C'}$ C $[_{IP}$ Mary fixed what how]]]]

Violating no "Shortest Movement" Condition, we can raise John directly to the matrix Spec in (19a) in a single step, later inserting it from the lexicon to form John seems it is certain t to be here (superraising); we can raise *fix* to adjoin to C in (19b), later inserting can from the lexicon to form fix John can t the car (violating the HMC); and we can raise how to the matrix [Spec, CP] position in (19c), later raising what to the embedded [Spec, CP] position to form how did John wonder what Mary fixed t_{how} (violating the Wh-Island Constraint).[27]

The "extension" version of the strict cycle is therefore not only straightforward, but justified empirically without subtle empirical argument.

A second consequence of the extension condition is that given a structure of the form $[_{X'}$ X YP], we cannot insert ZP into X' (yielding, e.g., $[_{X'}$ X YP ZP]), where ZP is drawn from within YP (raising) or inserted from outside by GT. Similarly, given $[_{X'}$ X], we cannot insert ZP to form $[_{X'}$ X ZP]. There can be no raising to a complement position. We therefore derive one major consequence of the Projection Principle and θ-Criterion at D-Structure, thus lending support to the belief that these notions are indeed superfluous. More generally, as noted by Akira Watanabe, the binarity of GT comes close to entailing that X-bar structures are restricted to binary branching (Kayne's "unambiguous paths"), though a bit more work is required.

The operations just discussed are substitution transformations, but we must consider adjunction as well. We thus continue to allow the X-bar structure (5) as well as (1), specifically (20).[28]

(20) a. $[_{X}$ Y X]
b. $[_{XP}$ YP XP]

In (20a) a zero-level category Y is adjoined to the zero-level category X, and in (20b) a maximal projection YP is adjoined to the maximal projection XP. GT and Move α must form structures satisfying X-bar theory, now including (20). Note that the very strong empirical motivation for the strict cycle just given does not apply in these cases. Let us assume, then, that adjunction need not extend its target. For concreteness, let us assume that the extension requirement holds only for substitution in overt syntax, the only case required by the trivial argument for the cycle.[29]

3.4 Beyond the Interface Levels: S-Structure

Suppose that D-Structure is eliminable along these lines. What about S-Structure, another level that has only theory-internal motivation? The basic issue is whether there are S-Structure conditions. If not, we can dispense with the concept of S-Structure, allowing Spell-Out to apply freely in the manner indicated earlier. Plainly this would be the optimal conclusion.

There are two kinds of evidence for S-Structure conditions.

(21) a. Languages differ with respect to where Spell-Out applies in the course of the derivation to LF. (Are wh-phrases moved or in situ? Is the language French-style with overt V-raising or English-style with LF V-raising?)
b. In just about every module of grammar, there is extensive evidence that the conditions apply at S-Structure.

To show that S-Structure is nevertheless superfluous, we must show that the evidence of both kinds, though substantial, is not compelling.

In the case of evidence of type (21a), we must show that the position of Spell-Out in the derivation is determined by either PF or LF properties, these being the only levels, on minimalist assumptions. Furthermore, parametric differences must be reduced to morphological properties if the Minimalist Program is framed in the terms so far assumed. There are strong reasons to suspect that LF conditions are not relevant. We expect languages to be very similar at the LF level, differing only as a reflex of properties detectable at PF; the reasons basically reduce to considerations of learnability. Thus, we expect that at the LF level there will be no relevant difference between languages with phrases overtly raised or in situ (e.g., wh-phrases or verbs). Hence, we are led to seek morphological properties that are reflected at PF. Let us keep the conclusion in mind, returning to it later.

With regard to evidence of type (21b), an argument against S-Structure conditions could be of varying strength, as shown in (22).

(22) a. The condition in question can apply at LF alone.
b. Furthermore, the condition sometimes must apply at LF.
c. Furthermore, the condition must not apply at S-structure.

Even (22a), the weakest of the three, suffices: LF has independent motivation, but S-Structure does not. Argument (22b) is stronger on the assumption that, optimally, conditions are unitary: they apply at a single level, hence at LF if possible. Argument (22c) would be decisive.

To sample the problems that arise, consider binding theory. There are familiar arguments showing that the binding theory conditions must apply at S-Structure, not LF. Thus, consider (23).

(23) a. you said he liked [the pictures that John took]
b. [how many pictures that John took] did you say he liked *t*
c. who [t said he liked [$_\alpha$ how many pictures that John took]]

In (23a) *he* c-commands John and cannot take John as antecedent; in (23b) there is no c-command relation and John can be the antecedent of he. In (23c) John again cannot be the antecedent of he. Since the binding properties of (23c) are those of (23a), not (23b), we conclude that he c-commands John at the level of representation at which Condition C applies. But if LF movement adjoins α to who in (23c), Condition C must apply at S-Structure.

The argument is not conclusive, however. Following the line of argument in section 1.3.3 (see (105)), we might reject the last assumption: that LF movement adjoins a of (23c) to who, forming (24), t' the trace of the LF-moved phrase.

(24) [[how many pictures that John took] who] [*t* said he liked t']

We might assume that the only permissible option is extraction of how many from the full NP α, yielding an LF form along the lines of (25), *t'* the trace of how *many*.[30]

(25) [[how many] who] [t said he liked [[*t'* pictures] that John took]]

The answer, then, could be the pair (Bill, 7), meaning that Bill said he liked 7 pictures that John took. But in (25) he c-commands John, so that Condition C applies as in (23a). We are therefore not compelled to assume that Condition C applies at S-Structure; we can keep to the preferable option that conditions involving interpretation apply only at the interface levels. This is an argument of the type (22a), weak but sufficient. We will return to the possibility of stronger arguments of the types (22b) and (22c).

The overt analogue of (25) requires "pied-piping" of the entire NP [how many pictures that John took], but it is not clear that the same is true in the LF component. We might, in fact, proceed further. The LF rule that associates the in-situ wh-phrase with the wh-phrase in [Spec, CP] need not be construed as an instance of Move a. We might think of it as the syntactic basis for absorption in the sense of Higginbotham and May (1981), an operation that associates two wh-phrases to form a generalized quantifier.[31] If so, then the LF rule need satisfy none of the conditions on movement.

There has long been evidence that conditions on movement do not hold for multiple questions. Nevertheless, the approach just proposed appeared to be blocked by the properties of Chinese- and Japanese-type languages, with wh- in situ throughout but observing at least some of the conditions on movement (Huang 1982). Watanabe (1991) has argued, however, that even in these languages there is overt wh-movement—in this case movement of an empty operator, yielding the effects of the movement constraints. If Watanabe is correct, we could assume that a wh-operator always raises overtly, that Move a is subject to the same conditions everywhere in the derivation to PF and LF, and that the LF operation that applies in multiple questions in English and direct questions in Japanese is free of these conditions. What remains is the question why overt movement of the operator is always required, a question of the category (21a). We will return to that.

Let us recall again the minimalist assumptions that I am conjecturing can be upheld: all conditions are interface conditions; and a linguistic expression is the optimal realization of such interface conditions. Let us consider these notions more closely.

Consider a representation π at PF. PF is a representation in universal phonetics, with no indication of syntactic elements or relations among them (X-bar structure, binding, government, etc.). To be interpreted by the performance systems A-P, π must be constituted entirely of *legitimate PF* objects, that is, elements that have a uniform, language-independent interpretation at the interface. In that case we will say that π satisfies the condition of *Full Interpretation* (FI). If π fails FI, it does not provide appropriate instructions to the performance systems. We take FI to be the convergence condition: if π satisfies FI, the derivation D that formed it converges at PF; otherwise, it crashes at PF. For example, if π contains a stressed consonant or a [+high, +low] vowel, then D crashes; similarly, if π contains some morphological element that "survives" to PF, lacking any interpretation at the interface. If D converges at PF, its output π receives an articulatory-perceptual interpretation, perhaps as gibberish.

All of this is straightforward—indeed, hardly more than an expression of what is tacitly assumed. We expect exactly the same to be true at LF.

To make ideas concrete, we must spell out explicitly what are the legitimate objects at PF and LF. At PF, this is the standard problem of universal phonetics. At LF, we assume each legitimate object to be a chain CH = (a,, . . . , a,): at least (perhaps at most) with CH a head, an argument, a modifier, or an operator-variable construction. We now say that the representation λ satisfies FI at LF if it consists entirely of legitimate objects; a derivation forming λ converges at LF if λ satisfies FI, and otherwise crashes. A convergent derivation may produce utter gibberish, exactly as at PF. Linguistic expressions may be "deviant" along all sorts of incommensurable dimensions, and we have no notion of "well-formed sentence" (see note 7). Expressions have the interpretations assigned to them by the performance systems in which the language is embedded: period.

To develop these ideas properly, we must proceed to characterize notions with the basic properties of A- and $\bar{A}$-position. These notions were well defined in the LGB framework, but in terms of assumptions that are no longer held, in particular, the assumption that 8-marking is restricted to sisterhood, with multiple-branching constructions. With these assumptions abandoned, the notions are used only in an intuitive sense. To replace them, let us consider more closely the morphological properties of lexical items, which play a major role in the minimalist program we are sketching. (See section 1.3.2.)

Consider the verbal system of **(2).** The main verb typically "picks up" the features of T and Agr (in fact, both Agr_S and Agr_O in the general case), adjoining to an inflectional element I to form [V I]. There are two ways to interpret the process, for a lexical element a. One is to take a to be a bare, uninflected form; PF rules are then designed to interpret the abstract complex [a I] as a single inflected phonological word. The other approach is to take a to have inflectional features in the lexicon as an intrinsic property (in the spirit of lexicalist phonology); these features are then checked against the inflectional element I in the complex [a I].[32] If the features of a and I match, I disappears and a enters the PF component under Spell-Out; if they conflict, I remains and the derivation crashes at PF. The PF rules, then, are simple rewriting rules of the usual type, not more elaborate rules applying to complexes [a I].

I have been tacitly assuming the second option. Let us now make that choice explicit. Note that we need no longer adopt the Emonds-Pollock assumption that in English-type languages I lowers to V. V will have the inflectional features before Spell-Out in any event, and the checking procedure may take place anywhere, in particular, after LF movement. French-type and English-type languages now look alike at LF, whereas lowering of I in the latter would have produced adjunction structures quite unlike those of the raising languages.

There are various ways to make a checking theory precise, and to capture generalizations that hold across morphology and syntax. Suppose, for example, that Baker's Mirror Principle is strictly accurate. Then we may take a lexical element—say, the verb V—to be a sequence V = (a, Infl,, . . . , Infl,), where a is the morphological complex [R-$Infl_1$-. . . -$Infl_n$], R a root and Infl, an inflectional feature.[33] The PF rules only "see" a. When V is adjoined to a functional category F (say, Agr_O), the feature Infl, is removed from V if it matches F; and so on. If any Infl, remains at LF, the derivation crashes at LF. The PF form a always satisfies the Mirror Principle in a derivation that converges at LF. Other technologies can readily be devised. In this case, however, it is not clear that such mechanisms are in order; the most persuasive evidence for the Mirror Principle lies outside the domain of inflectional morphology, which may be subject to different principles. Suppose, say, that richer morphology tends to be more "visible," that is, closer to the word boundary; if so, and if the speculations of the paragraph ending with note 13 are on the right track, we would expect nominative or absolutive agreement (depending on language type) to be more peripheral in the verbal morphology.

The functional elements T and Agr therefore incorporate features of the verb. Let us call these features ***V-features:*** the function of the V-features of an inflectional element I is to check the morphological properties of the verb selected from the lexicon. More generally, let us call such features of a lexical item L ***L-features.*** Keeping to the X-bar-theoretic notions, we say that a position is ***L-related*** if it is in a local relation to an L-feature, that is, in the internal domain or checking domain of a head with an L-feature. Furthermore, the checking domain can be subdivided into two categories: nonadjoined (Spec) and adjoined. Let us call these positions ***narrowly*** and ***broadly*** L-related, respectively. ***A*** structural position that is narrowly L-related has the basic properties of A-positions; one that is not L-related has the basic properties of $\bar{\text{A}}$-positions, in particular, [Spec, C], not L-related if C does not contain a V-feature. The status of broadly L-related (adjoined) positions has been debated, particularly in the theory of scrambling.[34] For our limited purposes, we may leave the matter open.

Note that we crucially assume, as is plausible, that V-raising to C is actually I-raising, with V incorporated within I, and is motivated by properties of the (C, I) system, not-morphological checking of V. C has other properties that distinguish it from the V-features, as discussed in section 1.4.1.

The same considerations extend to nouns (assuming the D head of DP to have N-features) and adjectives. Putting this aside, we can continue to speak informally of A- and $\bar{\text{A}}$-positions, understood in terms of L-relatedness as a first approximation only, with further refinement still necessary. We can proceed, then, to define the legitimate LF objects CH = (a,, . . . , a,) in something like the familiar way: heads, with α_i an X^0; arguments, with α_i in an A-position; adjuncts, with α_i in an $\bar{\text{A}}$-position; and operator-variable constructions, to which we will briefly return.[35] This approach seems relatively unproblematic. Let us assume so, and proceed.

The morphological features of T and Agr have two functions: they check properties of the verb that raises to them, and they check properties of the NP (DP) that raises to their Spec; thus, they ensure that DP and V are properly paired. Generalizing the checking theory, let us assume that, like verbs, nouns are drawn from the lexicon with all of their morphological features, including Case and $-features, and that these too must be checked in the appropriate position:[36] in this case, [Spec, Agr] (which may include T or V). This checking too can take place at any stage of a derivation to LF.

A standard argument for S-Structure conditions in the Case module is that Case features appear at PF but must be "visible" at LF; hence, Case must be present by the time the derivation reaches S-Structure. But that argument collapses under a checking theory. We may proceed, then, with the assumption that the Case Filter is an interface condition—in fact, the condition that all morphological features must be checked somewhere, for convergence. There are many interesting and subtle problems to be addressed; reluctantly, I will put them aside here, merely asserting without argument that a proper understanding of economy of derivation goes a long way (maybe all the way) toward resolving them.[37]

Next consider subject-verb agreement, as in *John hits Bill.* The ϕ-features appear in three positions in the course of the derivation: internal to *John*, internal to *hits*, and in $\mathrm{Agr_S}$. The verb *hits* raises ultimately to $\mathrm{Agr_S}$ and the NP *John* to [Spec, $\mathrm{Agr_S}$], each checking its morphological features. If the lexical items were properly chosen, the derivation converges. But at PF and LF the $-features appear only twice, not three times: in the NP and verb that agree. Agr plays only a mediating role: when it has performed its function, it disappears. Since this function is dual, V-related and NP-related, Agr must in fact have two kinds of features: V-features that check V adjoined to Agr, and NP-features that check NP in [Spec, Agr]. The same is true of T, which checks the tense of the verb and the Case of the subject. The V-features of an inflectional element disappear when they check V, the NP-features when they check NP (or N, or DP; see note 36). All this is automatic, and within the Minimalist Program.

Let us now return to the first type of S-Structure condition (21a), the position of Spell-Out: after V-raising in French-type languages, before V-raising in English-type languages (we have now dispensed with lowering). As we have seen, the Minimalist Program permits only one solution to the problem: PF conditions reflecting morphological properties must force V-raising in French but not in English. What can these conditions be?

Recall the underlying intuition of Pollock's approach, which we are basically assuming: French-type languages have "strong" Agr, which forces overt raising, and English-type languages have "weak" Agr, which blocks it. Let us adopt that idea, rephrasing it in our terms: the V-features of Agr are strong in French, weak in English. Recall that when the V-features have done their work, checking adjoined V, they disappear. If V does not raise to Agr overtly, the V-features survive to PF. Let us now make the natural assumption that "strong" features are visible at PF and "weak" features invisible at PF. These features are not legitimate objects at PF; they are not proper components of phonetic matrices. Therefore, if a strong feature remains after Spell-Out, the derivation crashes.[38] In French overt raising is a prerequisite for convergence; in English it is not.

Two major questions remain: Why is overt raising barred in English? Why do the English auxiliaries have and be raise overtly, as do verbs in French?

The first question is answered by a natural economy condition: LF movement is "cheaper" than overt movement (call the principle Procrastinate). (See section 1.3.3.) The intuitive idea is that LF operations are a kind of "wired-in" reflex, operating mechanically beyond any directly observable effects. They are less costly than overt operations. The system tries to reach PF "as fast as possible," minimizing overt syntax. In English-type languages, overt raising is not forced for convergence; therefore, it is barred by economy principles.

To deal with the second question, consider again the intuition that underlies Pollock's account: raising of the auxiliaries reflects their semantic vacuity; they are placeholders for certain constructions, at most "very light" verbs. Adopting the intuition (but not the accompanying technology), let us assume that such elements, lacking semantically relevant features, are not visible to LF rules. If they have not raised overtly, they will not be able to raise by LF rules and the derivation will crash.[39]

Now consider the difference between SVO (or SOV) languages like English (Japanese) and VSO languages like Irish. On our assumptions, V has raised overtly to I (Agr_S) in Irish, while S and O raise in the LF component to [Spec, Agr_S] and [Spec, Agr_O], respectively.[40] We have only one way to express these differences: in terms of the strength of the inflectional features. One possibility is that the NP-feature of T is strong in English and weak in Irish. Hence, NP must raise to [Spec, [Agr T]] in English prior to Spell-Out or the derivation will not converge, The principle Procrastinate bars such raising in Irish. The Extended Projection Principle, which requires that [Spec, IP] be realized (perhaps by an empty category), reduces to a morphological property of T: strong or weak **NP-** features. Note that the NP-feature of Agr is weak in English; if it were strong, English would exhibit overt object shift. We are still keeping to the minimal assumption that Agr_S and Agr_O are collections of features, with no relevant subject-object distinction, hence no difference in strength of features. Note also that a language might allow both weak and strong inflection, hence weak and strong NP-features: Arabic is a suggestive case, with SVO versus VSO correlating with the richness of visible verb inflection.

Along these lines, we can eliminate S-Structure conditions on raising and lowering in favor of morphological properties of lexical items, in accord with the Minimalist Program. Note that a certain typology of languages is predicted; whether correctly or not remains to be determined.

If Watanabe's (1991) theory of wh-movement is correct, there is no parametric variation with regard to wh- in situ: language differences (say, English-Japanese) reduce to morphology, in this case, the internal morphology of the wh-phrases. Still, the question arises why raising of the wh-operator is ever overt, contrary to Procrastinate. The basic economy-of-derivation assumption is that operations are driven by necessity: they are "last resort," applied if they must be, not otherwise (Chomsky 1986b, and chapter 2). Our assumption is that operations are driven by morphological necessity: certain features must be checked in the checking domain of a head, or the derivation will crash. Therefore, raising of an operator to [Spec, CP] must be driven by such a requirement. The natural assumption is that C may have an operator feature (which we can take to be the Q- or wh-feature standardly assumed in C in such cases), and that this feature is a morphological property of such operators as wh-. For appropriate C, the operators raise for feature checking to the checking domain of C: [Spec, CP], or adjunction to Spec (absorption), thereby satisfying their scopal properties.[41] Topicalization and focus could be treated the same way. If the operator feature of C is strong, the movement must be overt. Raising of I to C may automatically make the relevant feature of *C* strong (the V-second phenomenon). If Watanabe is correct, the wh-operator feature is universally strong.

3.5 Extensions of the Minimalist Program

Let us now look more closely at the economy principles. These apply to both representations and derivations. With regard to the former, we may take the economy principle to be nothing other than FI: every symbol must receive an "external" interpretation by language-independent rules. There is no need for the Projection Principle or $-Criterion at LF. **A** convergent derivation might violate them, but in that case it would receive a defective interpretation.

The question of economy of derivations is more subtle. We have already noted two cases: Procrastinate, which is straightforward, and the Last Resort principle, which is more intricate. According to that principle, a step in a derivation is legitimate only if it is necessary for convergence—had the step not been taken, the derivation would not have converged. NP-raising, for example, is driven by the Case Filter (now assumed to apply only at LF): if the Case feature of NP has already been checked, NP may not raise. For example, (26a) is fully interpretable, but (26b) is not.

(26) a. there is [$_\alpha$ a strange man] in the garden
b. there seems to [$_\alpha$ a strange man] [that it is raining outside]

In (26a) ***a*** is not in a proper position for Case checking; therefore, it must raise at LF, adjoining to the LF affix ***there*** and leaving the trace ***t***. The phrase ***a*** is now in the checking domain of the matrix inflection. The matrix subject at LF is ***[a-there]***, an LF word with all features checked but interpretable only in the position of the trace ***t*** of the chain (α, t), its head being "invisible" word-internally. In contrast, in (26b) ***a*** has its Case properties satisfied internal to the PP, so it is not permitted to raise, and we are left with freestanding ***there.*** This is a legitimate object, a one-membered A-chain with all its morphological properties checked. Hence, the derivation converges. But there is no coherent interpretation, because freestanding ***there*** receives no semantic interpretation (and in fact is unable to receive a θ-role even in a θ-position). The derivation thus converges, as semigibberish.

The notion of Last Resort operation is in part formulable in terms of economy: a shorter derivation is preferred to a longer one, and if the derivation D converges without application of some operation, then that application is disallowed. In (26b) adjunction of ***a*** to ***there*** would yield an intelligible interpretation (something like 'there is a strange man to whom it seems that it is raining outside'). But adjunction is not permitted: the derivation converges with an unintelligible interpretation. Derivations are driven by the narrow mechanical requirement of feature checking only, not by a "search for intelligibility" or the like.

Note that raising of *a* in (26b) is blocked by the fact that *its own requirements* are satisfied without raising, even though such raising would arguably overcome inadequacies of the LF affix *there.* More generally, Move *a* applies to an element *a* only if morphological properties of *a* itself are not otherwise satisfied. The operation cannot apply to *a* to enable some different element β to satisfy *its* properties. Last Resort, then, is always "self-serving": benefiting other elements is not allowed. Alongside Procrastinate, then, we have a principle of *Greed:* self-serving Last Resort.

Consider the expression (27), analogous to (26b) but without *there*-insertion from the lexicon.

(27) seems to [$_\alpha$ a strange man] [that it is raining outside]

Here the matrix T has an NP-feature (Case feature) to discharge, but a cannot raise (overtly or covertly) to overcome that defect. The derivation cannot converge, unlike (26b), which converges but without a proper interpretation. The self-serving property of Last Resort cannot be overridden even to ensure convergence.

Considerations of economy of derivation tend to have a "global" character, inducing high-order computational complexity. Computational complexity may or may not be an empirical defect; it is a question of whether the cases are correctly characterized (e.g., with complexity properly relating to parsing difficulty, often considerable or extreme, as is well known). Nevertheless, it makes sense to expect language design to limit such problems. The self-serving property of Last Resort has the effect of restricting the class of derivations that have to be considered in determining optimality, and might be shown on closer analysis to contribute to this end.[42]

Formulating economy conditions in terms of the principles of Procrastinate and Greed, we derive a fairly narrow and determinate notion of *most economical convergent derivation* that blocks all others. Precise formulation of these ideas is a rather delicate matter, with a broad range of empirical consequences.

We have also assumed a notion of "shortest link," expressible in terms of the operation Form Chain. We thus assume that, given two convergent derivations D_1 and D,, both minimal and containing the same number of steps, D_1 blocks D, if its links are shorter. Pursuing this intuitive idea, which must be considerably sharpened, we can incorporate aspects of Subjacency and the ECP, as briefly indicated.

Recall that for a derivation to converge, its LF output must be constituted of legitimate objects: tentatively, heads, arguments, modifiers, and operator-variable constructions. A problem arises in the case of pied-piped constructions such as (28).

(28) (guess) [[$_{wh}$ in which house] John lived t]

The chain (wh, t) is not an operator-variable construction. The appropriate LF form for interpretation requires "reconstruction," as in (29) (see section 1.3.3).

(29) a. [which x, x a house] John lived [in x]
b. [which x] John lived [in [x house]]

Assume that (29a) and (29b) are alternative options. There are various ways in which these options can be interpreted. For concreteness, let us select a particularly simple one.[43]

Suppose that in (29a) x is understood as a DP variable: regarded substitutionally, it can be replaced by a DP (the answer can be the old one); regarded objectually, it ranges over houses, as determined by the restricted operator. In (29b) x is a D variable: regarded substitutionally, it can be replaced by a D (the answer can be that (house)); regarded objectually, it ranges over entities.

Reconstruction is a curious operation, particularly when it is held to follow LF movement, thus restoring what has been covertly moved, as often proposed (e.g., for (23c)). If possible, the process should be eliminated. An approach that has occasionally been suggested is the "copy theory" of movement: the trace left behind is a copy of the moved element, deleted by a principle of the PF component in the case of overt movement. But at LF the copy remains, providing the materials for "reconstruction." Let us consider this possibility, surely to be preferred if it is tenable.

The PF deletion operation is, very likely, a subcase of a broader principle that applies in ellipsis and other constructions (see section 1.5). Consider such expressions as (30a–b).

(30) a. John said that he was looking for a cat, and so did Bill
b. John said that he was looking for a cat, and so did Bill [$_E$ say that he was looking for a cat]

The first conjunct is several-ways ambiguous. Suppose we resolve the ambiguities in one of the possible ways, say, by taking the pronoun to refer to Tom and interpreting *a cat* nonspecifically, so that John said that Tom's quest would be satisfied by any cat. In the elliptical case (30a), a parallelism requirement of some kind (call it PR) requires that the second conjunct must be interpreted the same way—in this case, with *he* referring to Tom and a cat understood nonspecifically (Lakoff 1970, Lasnik 1972, Sag 1976, Ristad 1993). The same is true in the full sentence (30b), a nondeviant linguistic expression with a distinctive low-falling intonation for E; it too must be assigned its properties by the theory of grammar. PR surely applies at LF. Since it must apply to (30b), the simplest assumption would be that only (30b) reaches LF, (30a) being derived from (30b) by an operation of the PF component deleting copies. There would be no need, then, for special mechanisms to account for the parallelism properties of (30a). Interesting questions arise when this path is followed, but it seems promising. If so, the trace deletion operation may well be an obligatory variant of a more general operation applying in the PF component.

Assuming this approach, (28) is a notational abbreviation for (31).

(31) [$_{wh}$ in which house] John lived [$_{wh}$ in which house]

The LF component converts the phrase *wh* to either (32a) or (32b) by an operation akin to QR.

(32) a. [which house] [$_{wh}$ in *t*]
b. [which] [$_{wh}$ in [*t* house]]

We may give these the intuitive interpretations of (33a–b).

(33) a. [which x, x a house] [in x]
b. [which x] [in [x house]]

For convergence at LF, we must have an operator-variable structure. Accordingly, in the operator position [Spec, CP], everything but the operator phrase must delete; therefore, the phrase *wh* of (32) deletes. In the trace position, the copy of what remains in the operator position deletes, leaving just the phrase *wh* (an LF analogue to the PF rule just described).

In the present case (perhaps generally), these choices need not be specified; other options will crash. We thus derive LF forms interpreted as (29a) or (29b), depending on which option we have selected. The LF forms now consist of legitimate objects, and the derivations converge.

Along the same lines, we will interpret which book did John read either as '[which x, x a book] [John read x]' (answer: War and Peace) or as '[which x] [John read [x book]]' (answer: that (book)).

The assumptions are straightforward and minimalist in spirit. They carry us only partway toward an analysis of reconstruction and interpretation; there are complex and obscure phenomena, many scarcely understood. Insofar as these assumptions are tenable and properly generalizable, we can eliminate reconstruction as a separate process, keeping the term only as part of informal descriptive apparatus for a certain range of phenomena.

Extending observations of Van Riemsdijk and Williams (1981), Freidin (1986) points out that such constructions as (34a–b) behave quite differently under reconstruction.[44]

(34) a. which claim [that John was asleep] was he willing to discuss
     b. which claim [that John made] was he willing to discuss

In (34a) reconstruction takes place: the pronoun does not take John as antecedent. In contrast, in (34b) reconstruction is not obligatory and the anaphoric connection is an option. While there are many complications, to a first approximation the contrast seems to reduce to a difference between complement and adjunct, the bracketed clause of (34a) and (34b), respectively. Lebeaux (1988) proposed an analysis of this distinction in terms of generalized transformations. In case (34a) the complement must appear at the level of D-Structure; in case (34b) the adjunct could be adjoined by a generalized transformation in the course of derivation, in fact, after whatever processes are responsible for the reconstruction effect?'

The approach is appealing, if problematic. For one thing, there is the question of the propriety of resorting to generalized transformations. For another, the same reasoning forces reconstruction in the case of A-movement. Thus, (35) is analogous to (34a); the complement is present before raising and should therefore force a Condition C violation.

(35) the claim that John was asleep seems to him [$_{IP}$ ***t*** to be correct]

Under the present interpretation, the trace ***t*** is spelled out as identical to the matrix subject. While it deletes at PF, it remains at LF, yielding the unwanted reconstruction effect. Condition C of the binding theory requires that the pronoun him cannot take its antecedent within the embedded IP (compare **I* seem to him [to like John], with him anaphoric to John). But him can take John as antecedent in (35), contrary to the prediction.

The proposal now under investigation overcomes these objections. We have moved to a full-blown theory of generalized transformations, so there is no problem here. The extension property for substitution entails that complements can only be introduced cyclically, hence before *wh*-extraction, while adjuncts can be introduced noncyclically, hence adjoined to the wh-phrase after raising to [Spec, CP]. Lebeaux's analysis of (34) therefore could be carried over. As for (35), if "reconstruction" is essentially a reflex of the formation of operator-variable constructions, it will hold only for $\bar{A}$-chains, not for A-chains. That conclusion seems plausible over a considerable range, and yields the right results in this case.

Let us return now to the problem of binding-theoretic conditions at S-Structure. We found a weak but sufficient argument (of type (22a)) to reject the conclusion that Condition C applies at S-Structure. What about Condition A?

Consider constructions such as those in (36).[46]

(36) a. i. John wondered [which picture of himself] [Bill saw t]
ii. the students asked [what attitudes about each other] [the teachers had noticed t]
b. i. John wondered [who [t saw [which picture of himself]]]
ii. the students asked [who [t had noticed [what attitudes about each other]]]

The sentences of (36a) are ambiguous, with the anaphor taking either the matrix or embedded subject as antecedent; but those of (36b) are unambiguous, with the trace of who as the only antecedent for himself, each other. If (36b) were formed by LF raising of the in-situ wh-phrase, we would have to conclude that Condition A applies at S-Structure, prior to this operation. But we have already seen that the assumption is unwarranted; we have, again, a weak but sufficient argument against allowing binding theory to apply at S-Structure. A closer look shows that we can do still better.

Under the copying theory, the actual forms of (36a) are (37a–b).

(37) a. John wondered [$_{wh}$ which picture of himself] [Bill saw [$_{wh}$ which picture of himself]]
b. the students asked [$_{wh}$ what attitudes about each other] [the teachers had noticed [$_{wh}$ what attitudes about each other]]

The LF principles map (37a) to either (38a) or (38b), depending on which option is selected for analysis of the phrase wh.

(38) a. John wondered [[which picture of himself] [$_{wh}$ t]] [Bill saw [[which picture of himself] [$_{wh}$ *t*]]]
b. John wondered [which [$_{wh}$ t picture of himself]] [Bill saw [which [$_{wh}$ t picture of himself]]]

We then interpret (38a) as (39a) and (38b) as (39b), as before.

(39) a. John wondered [which x, x a picture of himself] [Bill saw x]
b. John wondered [which x] [Bill saw [x picture of himself]]

Depending on which option we have selected, himself will be anaphoric to John or to *Bill*.[47]

The same analysis applies to (37b), yielding the two options of (40) corresponding to (39).

(40) a. the students asked [what x, x attitudes about each other] [the teachers had noticed x]
b. the students asked [what x] [the teachers had noticed [x attitudes about each other]]

In (40a) the antecedent of each other is the students; in (40b) it is the teachers.

Suppose that we change the examples of (36a) to (41a–b), replacing saw by took and had noticed by had.

(41) a. John wondered [which picture of himself] [Bill took t]
b. the students asked [what attitudes about each other] [the teachers had]

Consider (41a). As before, himself can take either John or Bill as antecedent. There is a further ambiguity: the phrase take...picture can be interpreted either idiomatically (in the sense of 'photograph') or literally ('pick up and walk away with'). But the interpretive options appear to correlate with the choice of antecedent for *himself*: if the antecedent is

John, the idiomatic interpretation is barred; if the antecedent is *Bill*, it is permitted. If Bill is replaced by Mary, the idiomatic interpretation is excluded.

The pattern is similar for (41b), except that there is no literal-idiomatic ambiguity. The only interpretation is that the students asked what attitudes each of the teachers had about the other teacher(s). If the teachers is replaced by Jones, there is no interpretation.

Why should the interpretations distribute in this manner?

First consider (41a). The principles already discussed yield the two LF options in (42a–b).

(42) a. John wondered [which x, x a picture of himself] [Bill took x]
b. John wondered [which x] [Bill took [x picture of himself]]

If we select the option (42a), then himself takes John as antecedent by Condition A at LF; if we select the option (42b), then himself takes Bill as antecedent by the same principle. If we replace Bill with Mary, then (42a) is forced. Having abandoned D-Structure, we must assume that idiom interpretation takes place at LF, as is natural in any event. But we have no operations of LF reconstruction. Thus, take ... picture can be interpreted as 'photograph' only if the phrase is present as a unit at LF —that is, in (42b), not (42a). It follows that in (42a) we have only the nonidiomatic interpretation of take; in (42b) we have either. In short, only the option (42b) permits the idiomatic interpretation, also blocking John as antecedent of the reflexive and barring replacement of *Bill* by Mary.

The same analysis holds for (41b). The two LF options are (43a–b).

(43) a. the students asked [what x, *x* attitudes about each other] [the teachers had x]
b. the students asked [what x] [the teachers had [x attitudes about each other]]

Only (43b) yields an interpretation, with have ... attitudes given its unitary sense.

The conclusions follow on the crucial assumption that Condition A not apply at S-Structure, prior to the LF rules that form (42).[48] If Condition A were to apply at S-Structure, John could be taken as antecedent of himself in (41a) and the later LF processes would be free to choose either the idiomatic or the literal interpretation, however the reconstruction phenomena are handled; and the students could be taken as antecedent of each other in (41b), with reconstruction providing the interpretation of have ... attitudes. Thus, we have the strongest kind of argument against an S-Structure condition (type (22c)): Condition A cannot apply at S-Structure.

Note also that we derive a strong argument for LF representation. The facts are straightforwardly explained in terms of a level of representation with two properties: (1) phrases with a unitary interpretation such as the idiom take ... picture or have ... attitudes appear as units; (2) binding theory applies. In standard EST approaches, LF is the only candidate. The argument is still clearer in this minimalist theory, lacking D-Structure and (we are now arguing) S-Structure.

Combining these observations with the Freidin-Lebeaux examples, we seem to face a problem, in fact a near-contradiction. In (44a) either option is allowed: himself may take either John or Bill as antecedent. In contrast, in (44b) reconstruction appears to be forced, barring Tom as antecedent of he (by Condition ***C)*** and Bill as antecedent of him (by Condition B).

(44) a. John wondered [which picture of himself] [Bill saw t]
  b. i. John wondered [which picture of Tom] [he liked t]
   ii. John wondered [which picture of him] [Bill took t]
   iii. John wondered [what attitude about him] [Bill had t]

The Freidin-Lebeaux theory requires reconstruction in all these cases, the of-phrase being a complement of picture. But the facts seem to point to a conception that distinguishes Condition A of the binding theory, which does not force reconstruction, from Conditions B and C, which do. Why should this be?

In our terms, the trace t in (44) is a copy of the wh-phrase at the point where the derivation branches to the PF and LF components. Suppose we now adopt an LF movement approach to anaphora (see section 1.4.2), assuming that the anaphor or part of it raises by an operation similar to cliticization—call it cliticization,,. This approach at least has the property we want: it distinguishes Condition **A** from Conditions B and ***C.*** Note that cliticization,, is a case of Move or; though applying in the LF component, it necessarily precedes the "reconstruction" operations that provide the interpretations for the LF output. Applying cliticization,, to (44a), we derive either (45a) or (45b), depending on whether the rule applies to the operator phrase or its trace TR.[49]

(45) a. John self-wondered [which picture oft,,,,] [NP saw [$_{TR}$ which picture of himself]]
b. John wondered [which picture of himself] [NP self-saw [$_{TR}$ which picture of t_{self}]]

We then turn to the LF rules interpreting the wh-phrase, which yield the two options (46a–b) (a = either t_{self} or himself).

(46) a. [[which picture of a] t]
b. [which] [*t*picture of α]

Suppose that we have selected the option (45a). Then we cannot select the interpretive option (46b) (with a = t_{self}); that option requires deletion of [t picture oft,,,] in the operator position, which would break the chain (self, t_{self}), leaving the reflexive element without a Q-roleat LF. We must therefore select the interpretive option (46a), yielding a convergent derivation without reconstruction:

(47) John self-wondered [which x, *x* a picture oft,,,,] NP saw x

In short, if we take the antecedent of the reflexive to be John, then only the nonreconstructing option converges.

If we had Tom or him in place of himself, as in (44b), then these issues would not arise and either interpretive option would converge. We thus have a relevant difference between the two categories of (44). To account for the judgments, it is only necessary to add a preference principle for reconstruction: Do it when you can (i.e., try to minimize the restriction in the operator position). In (44b) the preference principle yields reconstruction, hence a binding theory violation (Conditions C and B). In (44a) we begin with two options with respect to application of cliticization$_{LF}$: either to the operator or to the trace position. If we choose the first option, selecting the matrix subject as antecedent, then the preference principle is inapplicable because only the nonpreferred case converges, and we derive the nonreconstruction option. If we choose the second option, selecting the embedded subject as antecedent, the issue of preference again does not arise. Hence, we have genuine options in the case of (44a), but a preference for reconstruction (hence the judgment that binding theory conditions are violated) in the case of (44b).[50]

Other constmctions reinforce these conclusions, for example, (48).[51]

(48) a. i. John wondered what stories about us we had heard
ii'. *John wondered what stories about us we had told
ii''. John wondered what stories about us we expected Mary to tell
b. i'. John wondered what opinions about himself Mary had heard
i''. *John wondered what opinions about himself Mary had
ii'. they wondered what opinions about each other Mary had heard
ii''. *they wondered what opinions about each other Mary had
c. i. John wondered how many pictures of us we expected Mary to take
ii. *John wondered how many pictures of us we expected to take (idiomatic sense)

Note that we have further strengthened the argument for an LF level at which all conditions apply: the LF rules, including now anaphor raising, provide a crucial distinction with consequences for reconstruction.

The reconstruction process outlined applies only to operator-variable constructions. What about A-chains, which we may assume to be of the form CH = (a, t) at LF (a the phrase raised from its original position t, intermediate traces deleted or ignored)? Here *t* is a full copy of its antecedent, deleted in the PF component. The descriptive account must capture the fact that the head of the A-chain is assigned an interpretation in the position t. Thus, in John **was** killed t, John is assigned its 0-role in the position t, as complement of kill. The same should be true for such idioms as (49).

(49) several pictures were taken t

Here pictures is interpreted in the position of t, optionally as part of the idiom take ... pictures. Interesting questions arise in the case of such constructions as (50a–b).

(50) a. the students asked [which pictures of each other] [Mary took t]
b. the students asked [which pictures of each other] [t' were taken t by Mary]

In both cases the idiomatic interpretation requires that *t* be [x pictures *of* each other] after the operator-variable analysis ("reconstruction"). In (50a) that choice is blocked, while in (50b) it remains open. The examples reinforce the suggested analysis of A-reconstruction, but it is now necessary to interpret the chain (t', t) in (50b) just as the chain (several pictures, t) is interpreted in (49). One possibility is that the trace t of the A-chain enters into the idiom interpretation (and, generally, into θ-marking), while the head of the chain functions in the usual way with regard to scope and other matters.

Suppose that instead of (44a) we have (51).

(51) the students wondered [$_{wh}$ how angry at each other (themselves)] [John was t]

As in the case of (44a), anaphor raising in (51) should give the interpretation roughly as 'the students each wondered [how angry at the other John was]' (similarly with reflexive). But these interpretations are impossible in the case of (51), which requires the reconstruction option, yielding gibberish. Huang (1990) observes that the result follows on the assumption that subjects are predicate-internal (VP-, AP-internal; see (4)), so that the trace of ***John*** remains in the subject position of the raised operator phrase **wh-**, blocking association of the anaphor with the matrix subject (anaphor raising, in the present account).

Though numerous problems remain unresolved, there seem to be good reasons to suppose that the binding theory conditions hold only at the LF interface. If so, we can move toward a very simple interpretive version of binding theory as in (52) that unites disjoint and distinct reference (D the relevant local domain), overcoming problems discussed particularly by Howard Lasnik.[52]

(52) **A.** If a is an anaphor, interpret it as coreferential with a c-commanding phrase in D.
B. If a is a pronominal, interpret it as disjoint from every c-commanding phrase in D.
C. If a is an r-expression, interpret it as disjoint from every c-commanding phrase.

Condition A may be dispensable if the approach based upon cliticization$_{LF}$ is correct and the effects of Condition A follow from the theory of movement (which is not obvious); and further discussion is necessary at many points. All indexing could then be abandoned, another welcome result.[53]

Here too we have, in effect, returned to some earlier ideas about binding theory, in this case those of Chomsky 1980a, an approach superseded largely on grounds of complexity (now overcome), but with empirical advantages over what appeared to be simpler alternatives (see note 52).

I stress again that what precedes is only the sketch of a minimalist program, identifying some of the problems and a few possible solutions, and omitting a wide range of topics, some of which have been explored, many not. The program has been pursued with some success. Several related and desirable conclusions seem within reach.

(53) a. A linguistic expression (SD) is a pair (π, λ) generated by an optimal derivation satisfying interface conditions.
b. The interface levels are the only levels of linguistic representation.
c. All conditions express properties of the interface levels, reflecting interpretive requirements.
d. UG provides a unique computational system, with derivations driven by morphological properties to which syntactic variation of languages is restricted.
e. Economy can be given a fairly narrow interpretation in terms of FI, length of derivation, length of links, Procrastinate, and Greed.

Notes

I am indebted to Samuel Epstein, James Higginbotham, Howard Lasnik, and Alec Marantz for comments on an earlier draft of this paper, as well as to participants in courses, lectures, and discussions on these topics at MIT and elsewhere, too numerous to mention.

1. For early examination of these topics in the context of generative grammar, see Chomsky 1951, 1975a (henceforth LSLT). On a variety of consequences, see Collins 1994a.

2. Not literal necessity, of course; I will avoid obvious qualifications here and below.

3. On its nature, see Bromberger and Halle 1989.

4. Note that while the intuition underlying proposals to restrict variation to elements of morphology is clear enough, it would be no trivial matter to make it explicit, given general problems in selecting among equivalent constructional systems. An effort to address this problem in any general way would seem premature. It is a historical oddity that linguistics, and "soft sciences" generally, are often subjected to methodological demands of a kind never taken seriously in the far more developed natural sciences. Strictures concerning Quinean indeterminacy and formalization are a case in point. See Chomsky 1990, 1992b, Ludlow 1992. Among the many questions ignored here is the fixing of lexical concepts; see Jackendoff 1990b for valuable discussion. For my own views on some general aspects of the issues, see Chomsky 1992a,b, 1994b,c, 1995.

5. Contrary to common belief, assumptions concerning the reality and nature of I-language (competence) are much better grounded than those concerning parsing. For some comment, see references of preceding note.

6. Markedness of parameters, if real, could be seen as a last residue of the evaluation metric.

7. See Marantz 1984, Baker 1988, on what Baker calls "the Principle of PF Interpretation," which appears to be inconsistent with this assumption. One might be tempted to interpret the class of expressions of the language L for which there is a convergent derivation as "the well-formed (grammatical) expressions of L." But this seems pointless. The class so defined has no significance. The concepts "well-formed" and "grammatical" remain without characterization or known empirical justification; they played virtually no role in early work on generative grammar except in informal exposition, or since. See LSLT and Chomsky 1965; and on various misunderstandings, Chomsky 1980b, 1986b.

8. Much additional detail has been presented in class lectures at MIT, particularly in fall 1991. I hope to return to a fuller exposition elsewhere. As a starting point, I assume here a version of linguistic theory along the lines outlined in chapter 1.

9. In Chomsky 1981a and other work, structural Case is unified under government, understood as m-command to include the Spec-head relation (a move that was not without problems); in the framework considered here, m-command plays no role.

10. I will use ***NP*** informally to refer to either NP or DP, where the distinction is playing no role. ***IP*** and ***I*** will be used for the complement of C and its head where details are irrelevant.

11. I overlook here the possibility of NP-raising to [Spec, T] for Case assignment, then to [Spec, Agr_S] for agreement. This may well be a real option. For development of this possibility, see Bures 1992, Bobaljik and Carnie 1992, Jonas 1992, and sections 4.9 and 4.10 of this book.

12. Raising of A to Agr_A may be overt or in the LF component. If the latter, it may be the trace of the raised NP that is marked for agreement, with further raising driven by the morphological requirement of Case marking (the Case Filter); I put aside specifics of implementation. The same considerations extend to an analysis of participial agreement along the lines of Kayne 1989; see chapter 2 and Branigan 1992.

13. For development of an approach along such lines, see Bobaljik 1992a,b. For a different analysis sharing some assumptions about the Spec-head role, see Murasugi 1991, 1992. This approach to the two language types adapts the earliest proposal about these matters within generative grammar (De Rijk 1972) to a system with inflection separated from verb. See Levin and Massam 1985 for a similar conception.

14. See chapter 1.

15. I put aside throughout the possibility of moving X' or adjoining to it, and the question of adjunction to elements other than complement that assign or receive interpretive roles at the interface.

16. This is only the simplest case. In the general case V will raise to Agr_O, forming the chain CH_V = (V, t). The complex [V, Agr_O] raises ultimately to adjoin to Agr_S. Neither V nor CH, has a new checking domain assigned in this position. But V is in the checking domain of Agr_S and therefore shares relevant features with it, and the subject in [Spec, Agr_S] is in the checking domain of Agr_S, hence agrees indirectly with V.

17. To mention one possibility, V-raising to Agr_O yields a two-membered chain, but subsequent raising of the [V, Agr_O] complex might pass through the trace of T by successive-cyclic movement, finally adjoining to Agr_S. The issues raised in note 11 are relevant at this point. I will put these matters aside.

18. Hale and Keyser make a distinction between (1) operations of lexical conceptual structure that form such lexical items as shelve and (2) syntactic operations that raise put to V_1 in (8), attributing somewhat different properties to (1) and (2). These distinctions do not seem to me necessary for their purposes, for reasons that I will again put aside.

19. Note that the ECP will now reduce to descriptive taxonomy, of no theoretical significance. If so, there will be no meaningful questions about conjunctive or disjunctive ECP, the ECP as an LF or PF phenomenon (or both), and so on. Note that no aspect of the ECP can apply at the PF interface itself, since there we have only a phonetic matrix, with no relevant structure indicated. The proposal that the ECP breaks down into a PF and an LF property (as in Aoun et al. 1987) therefore must take the former to apply either at S-Structure or at a new level of "shallow structure" between S-Structure and PF.

20. Note that the two chains in (14) are ([V V_c], t') and (V, t). But in the latter, V is far removed from its trace because of the operation raising [V V_c]. Each step of the derivation satisfies the HMC, though the final output violates it (since the head t' intervenes between V and its trace). Such considerations tend to favor a derivational approach to chain formation over a representational one. See chapters 1 and 2. Recall also that the crucial concept of minimal subdomain could only be interpreted in terms of a derivational approach.

21. For an example, see Baker 1988, 163.

22. Recall that even if Obj is replaced by an element that does not require structural Case, Subj must still raise to [Spec, Agr_S] in a nominative-accusative language (with "active" Agr_S).

23. This formulation allows later insertion of functional items that are vacuous for LF interpretation, for example, the do of do-support or the of of of-insertion.

24. This is not to say that 8-theory is dispensable at LF, for example, the principles of θ-discharge discussed in Higginbotham 1985. It is simply that the θ-Criterion and Projection Principle play no role.

25. I know of only one argument against generalized transformations, based on restrictiveness (Chomsky 1965): only a proper subclass of the I-languages (there called "grammars") allowed by the LSLT theory appear to exist, and only these are permitted if we eliminate generalized transformations and T-markers in favor of a recursive base satisfying the cycle. Elimination of generalized transformations in favor of cyclic base generation is therefore justified in terms of explanatory adequacy. But the questions under discussion then do not arise in the far more restrictive current theories.

26. A modification is necessary for the case of successive-cyclic movement, interpreted in terms of the operation Form Chain. I put this aside here.

27. Depending on other assumptions, some violations might be blocked by various "conspiracies." Let us assume, nevertheless, that overt substitution operations satisfy the extension (strict cycle) condition generally, largely on grounds of conceptual simplicity.

28. In case (19b) we assumed that V adjoins to (possibly empty) C, the head of CP, but it was the substitution operation inserting can that violated the cycle to yield the HMC violation. It has often been argued that LF adjunction may violate the "structure-preserving" requirement of (20), for example, allowing XP-incorporation to X^0 or quantifier adjunction to XP. Either conclusion is consistent with the present considerations. See also note 15.

29. On noncyclic adjunction, see Branigan 1992 and section 3.5 below.

30. See Hornstein and Weinberg 1990 for development of this proposal on somewhat different assumptions and grounds.

31. The technical implementation could be developed in many ways. For now, let us think of it as a rule of interpretation for the paired wh-phrases.

32. Technically, a raises to the lowest I to form $[_I$ a I]; then the complex raises to the next higher inflectional element; and so on. Recall that after multiple adjunction, a will still be in the checking domain of the "highest" I.

33. More fully, $Infl_i$ is a collection of inflectional features checked by the relevant functional element.

34. The issue was raised by Webelhuth (1989) and has become a lively research topic. See Mahajan 1990 and much ongoing work. Note that if I adjoins to C, forming $[_C$ I C], [Spec, C] is in the checking domain of the chain (I, *t*). Hence, [Spec, C] is L-related (to I), and non-L-related (to C). A sharpening of notions is therefore required to determine the status of C after I-to-C raising. If C has L-features, [Spec, C] is L-related and would thus have the properties of an A-position, not an $\bar{A}$-position. Questions arise here related to proposals of Rizzi (1990) on agreement features in C, and his more recent work extending these notions; these would take us too far afield here.

35. Heads are not narrowly L-related, hence not in A-positions, a fact that bears on ECP issues. See section 1.4.1.

36. I continue to put aside the question whether Case should be regarded as a property of N or D, and the DP-NP distinction generally.

37. See section 1.4.3 for some discussion.

38. Alternatively, weak features are deleted in the PF component so that PF rules can apply to the phonological matrix that remains; strong features are not deleted so that PF rules do not apply, causing the derivation to crash at PF.

39. Note that this is a reformulation of proposals by Emmon Bach and others in the framework of the Standard Theory and Generative Semantics: that these auxiliaries are inserted in the course of derivation, not appearing in the semantically relevant underlying structures. See Tremblay 1991 for an exploration of similar intuitions.

40. This leaves open the possibility that in VSO languages subject raises overtly to [Spec, TP] while T (including the adjoined verb) raises to Agr_S; for evidence that that is correct, see the references of note 11.

41. Raising would take place only to [Spec, CP], if absorption does not involve adjunction to a wh-phrase in [Spec, CP]. See note 31. I assume here that CP is not an adjunction target.

42. See chapter 2 and Chomsky 1991b. The self-serving property may also bear on whether LF operations are costless, or simply less costly.

43. There are a number of descriptive inadequacies in this overly simplified version. Perhaps the most important is that some of the notions used here (e.g., objectual quantification) have no clear interpretation in the case of natural language, contrary to common practice. Furthermore, we have no real framework within which to evaluate "theories of interpretation"; in particular, considerations of explanatory adequacy and restrictiveness are hard to introduce, on the standard (and plausible) assumption that the LF component allows no options. The primary task, then, is to derive an adequate descriptive account, no simple matter; comparison of alternatives lacks any clear basis. Another problem is that linking to performance theory is far more obscure than in the case of the PF component. Much of what is taken for granted in the literature on these topics seems to me highly problematic, if tenable at all. See LGB and the references of note 4 for some comment.

44. The topicalization analogues are perhaps more natural: the claim that John is asleep (that John made), ... The point is the same, assuming an operator-variable analysis of topicalization.

45. In Lebeaux's theory, the effect is determined at D-Structure, prior to raising; I will abstract away from various modes of implementing the general ideas reviewed here. For discussion bearing on these issues, see Speas 1990, Epstein 1991. Freidin (1994) proposes that the difference has to do with the difference between LF representation of a predicate (the relative clause) and a complement; as he notes, that approach provides an argument for limiting binding theory to LF (see (22)).

46. In all but the simplest examples of anaphora, it is unclear whether distinctions are to be understood as tendencies (varying in strength for different

speakers) or sharp distinctions obscured by performance factors. For exposition, I assume the latter here. Judgments are therefore idealized, as always; whether correctly or not, only further understanding will tell.

47. Recall that LF wh-raising has been eliminated in favor of the absorption operation, so that in (36b) the anaphor cannot take the matrix subject as antecedent after LF raising.

48. I ignore the possibility that Condition A applies irrelevantly at S-Structure, the result being acceptable only if there is no clash with the LF application.

49. I put aside here interesting questions that have been investigated by Pierre Pica and others about how the morphology and the raising interact.

50. Another relevant case is (i),

(i) (guess) which picture of which man he saw *t*

a Condition C violation if he is taken to be bound by which man (Higginbotham 1980). As Higginbotham notes, the conclusion is much sharper than in (44b). One possibility is that independently of the present considerations, absorption is blocked from within [Spec, CP], forcing reconstruction to (iia), hence (iib),

(ii) a. which x, he saw [*x* picture of which man]
b. which *x*, y, he saw x picture of [$_{NP}$ y man]

a Condition C violation if he is taken to be anaphoric to NP (i.e., within the scope of which man). The same reasoning would imply a contrast between (iiia) and (iiib),

(iii) a. who would have guessed that proud of John, Bill never was
b. *who would have guessed that proud of which man, Bill never was

(with absorption blocked, and no binding theory issue). That seems correct; other cases raise various questions.

51. Cases (48ai), (48aii) correspond to the familiar pairs John (heard, told) stories about him, with antecedence possible only in the case of heard, presumably reflecting the fact that one tells one's own stories but can hear the stories told by others; something similar holds of the cases in (48b).

52. See the essays collected in Lasnik 1989; also section 1.4.2.

53. **A** theoretical apparatus that takes indices seriously as entities, allowing them to figure in operations (percolation, matching, etc.), is questionable on more general grounds. Indices are basically the expression of a relationship, not entities in their own right. They should be replaceable without loss by a structural account of the relation they annotate.