

The Derivation of VO and OV

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1. Typology

The broad division of languages of the world into the subclasses VO and OV comes from typological studies. Greenberg (1963), dividing a 30-language sample into classes in which the 'basic' or unmarked main clause order of S[ubject], V[erb], and O[bject] is VSO, SVO, or SOV, catalogued a litany of word order patterns that corresponded with the basic word orders: he noted, for example, that in languages in which SOV order is basic, an inflected auxiliary follows the main verb; complementarily, VSO correlates with Aux-V order (Universal number 16). Exceptions are now known to many of the universals Greenberg proposed, but most of them still survive as significant tendencies.

Subsequent work, at least since Lehmann 1973, has usually collapsed SVO and VSO (along with VOS) into one type, VO, contrasting with the OV type (though see e.g. Hawkins 1983 for arguments against a unified VO type). Many of Greenberg's universals still hold up even for these more general categories VO and OV when examined against larger samples. For example, Dryer 1992 shows that the correlation of VO with Aux-V, and of OV and V-Aux hold for about 90% of the languages for which Dryer had the relevant data (64 of 71 languages with inflected auxiliaries expressing tense or aspect).

Vennemann 1974 labeled the two types VX and XV, based on the fact that other elements tend to pattern with the object. For example, there is a systematic cross-linguistic tendency for PPs and DP complements to appear on the same side of the verb. The same is true for manner adverbs: they appear on the same side of a verb, in the usual case, as the direct object: the opposite side from the auxiliary verb (cf. Dryer 1992).

Furthermore, the tendencies extend into other categories. VO languages tend to have prepositions, not postpositions, and the opposite is true of OV languages (cf. Greenberg's Universals 3 and 4). Genitive possessors in the noun phrase have a clear predisposition to follow N in VO languages, and to precede N in OV languages (cf. Greenberg's Universal 2; cf. also Hawkins 1983). The tendencies are unmistakable, though in almost every case, exceptions can also be found.

Subtler distinctions than the unmarked order of major elements may also distinguish VO from OV languages. For example, Greenberg noted some morphological tendencies: there is a correspondence between morphological case and OV order (Universal 41). Others have proposed that syntactic mechanisms are sensitive to the VO/OV distinction. For example, Ross 1967a argued that Gapping, a deletion transformation, operated to the right in VO languages, giving rise to the order *SVO and SO*, and to the left in OV languages, giving *SO and SOV*. He also argued that OV languages cannot have rightward movement rules. Similarly, Fukui 1993 suggests that orderings which do not preserve head-finality in an OV language are more costly, in terms of derivational economy (Chomsky 1992), than orderings which do. He also suggests that VO languages favor reorderings that preserve head-initiality (cf. also Steele 1978, who notes that VSO and VOS are frequently alternatives for a single language, as are SOV and OSV).

2. Analysis

Various accounts have been offered of the Greenbergian ordering correlations (see for example the various papers in Hawkins 1988), ranging from strictly formal, grammar-internal accounts to historical accounts to accounts based on processing and other potentially extragrammatical factors (cf. e.g. Frazier 1979 for an early processing-based account, Hawkins 1994 for a recent one). Historical and functional accounts necessarily interact with formal syntactic accounts, though linguists differ according to which they take to be of primary concern.

In early generative grammar, phrase structure rules were assumed to stipulate word order. Cross-categorial tendencies are potentially captured in an abstract X' theory like that

of Chomsky 1970, and with the advent of the notion of parameters it became common to assume a headedness parameter for deep structures: languages are parametrized according to whether dependents precede or follow the head (Chomsky 1980:179, 1981:128ff., Stowell 1981:74f.). On the other hand, it seems that in actual practice it has not been uncommon to assume that, for example, noun phrases in a given language are head-final while other categories are head-initial (e.g. Huang 1982). On such a view, the headedness parameter describes why no single category varies (e.g. no language has some head-initial verbs and some head-final ones),¹ but does not account for cross-categorial tendencies (but see Jackendoff 1977:81-85, who suggests that a simplicity metric will favor grammars in which X' rules are cross-categorially general).

Even given category-specific headedness parameters, there are many exceptions to the universals. One approach to these exceptions has been to take them to be historical residue, the result of a shift from consistent OV, say, to verb-before-object but retaining other OV characteristics. Another approach has been to eliminate the exceptions through fine-grained analysis. For example, if auxiliaries are taken as dependents of the verb, as in traditional grammar, then the fact that they appear on the opposite side of the verb from the object is confusing. Independent evidence, however, suggests that auxiliaries head their own projections (Pullum & Wilson 1977, Gazdar, Pullum, & Sag 1982), and that the main verb is in fact the dependent of its auxiliary. Given the analogy Aux:V::V:O, the word order facts fit neatly into place.

As another, somewhat more speculative example, take the order of nouns and possessor noun phrases: N[oun]-G[enitive] order correlates with VO and GN with OV (cf. Greenberg's Universal 2). In Hawkins' (1983) survey of 336 languages, about 96% of V-1 languages (those with basic order VSO or VOS) are NG, and about 88% of SOV languages are GN, showing a strong correlation. However, when SVO languages are examined, about 67% are NG and 33% are GN. This sort of result led Hawkins and others to doubt that VO order is a significant predictor of other features.

But careful analysis gives some hope of bringing the SVO languages back into the fold. Generativists have analyzed parallels between sentences and noun phrases in a number of ways (Lees 1959, Chomsky 1970, Abney 1987). Looking at these analyses, it is clear that a possessor NP sometimes corresponds to the subject and sometimes to the object of the corresponding clause (cf. Koptjevskaja-Tamm 1993).

In V-1 and SOV languages, whether a genitive element is objectlike or subjectlike would not make any difference with respect to NG/GN word order. But in an SVO language, it might be expected that subjectlike genitives precede the noun while objectlike ones follow. Thus, in English, the *s*-genitive is subjectlike (note that it is the natural choice for the subject of action nominalizations) and precedes N, while the *of*-genitive is objectlike, being a prepositional phrase, and follows N.² Such fine-grained analyses raise the prospect of stating exceptionless syntactic principles governing word order.

An important subcase of the general strategy of eliminating exceptions through analysis is to argue that observed tendencies are regular at Deep Structure. German, for example, has objects both before and after verbs, depending on whether one looks at finite or non-finite verb forms and at main or embedded clauses. Bach 1962 proposed that in German, surface VO order is derived from an OV Deep Structure. This kind of approach opened up the possibility of analyzing apparent exceptions to universals in terms of movement: the idea is that languages are consistent at Deep Structure in having head-initial or head-final characteristics, but transformations may give rise to surface inconsistencies.

¹ On the other hand, it seems that some languages have both prepositions and postpositions; e.g. English has the postposition *ago*.

² Preliminary investigations provide some cross-linguistic support. For example, possessive suffixes in Finnish bear some resemblance to subject agreement suffixes, suggesting that genitives are subjectlike; and Finnish is SVO and GN; possessive pronouns in Moroccan Arabic are identical to object pronouns, meaning that genitives are objectlike, and Moroccan Arabic is SVO and NG.

Ross 1967a noted that German was a counterexample to some generalizations about OV languages; he proposed that German is in fact a VO language, with OV order being derived. Japanese and Siouan, according to Ross, are 'Deep' OV languages, while German, Hindi, and Turkish are not.

This type of analysis is very common in generative work. However, moving the 'true' nature of a language back to Deep Structure runs the risk of losing Greenbergian correlations, which are stated over surface word order. A headedness parameter affecting Deep Structures can describe the Greenbergian correlations only if things don't move around very much, or on the assumption that something like Structure Preservation (Emonds 1976) prevents non-canonical orders from arising, in the usual case. Several specific proposals have been made that ensure that head-initial or head-final structures will in the usual case be preserved (e.g. those of Ross 1967a, Steele 1978, Fukui 1993 mentioned above).

Another tack has been to parametrize Surface Structure conditions. Kayne 1983 proposed that government (relevant at various levels, including Surface Structure) is directional, and that the direction is parametrized by language. Koopman 1984:106ff. and Travis 1984:32ff. propose the same for Case assignment (cf. also Li 1990). They also argue that theta assignment is directional, and that the parameter for theta role directionality is independent of that of Case assignment. Since theta roles are assumed to be assigned at D-Structure, this subsumes some of the Deep Structure directionality parameter (cf. Koopman op. cit. p. 120). Though Travis explicitly argues that a language can have different setting for headedness and theta-assignment, the natural conclusion of this line of thinking is nevertheless to do away with the headedness parameter for phrase structure altogether, letting other, independently motivated mechanisms take over.

In this vein, Haider 1992 proposes a general licensing principle, where licensing occurs to the right in VO languages and to the left in OV languages. If all sentence elements are subject to licensing, including for example manner adverbs, then the tendency for all subordinate elements (rather than just those which are Case-marked or theta-marked) to precede or follow their superordinate heads is expected. On the other hand, it is less clear exactly what is subject to the licensing principle. For example, the subject precedes the verb in many VO languages. Possibly, this could be due to some exceptional property of nominative case. If nominative case is not subject to more general licensing conditions covering other cases sentence elements, this might provide an explanation for why no ergative languages are SVO (Anderson 1979, Trask 1979, Dixon 1994, Nash 1995, 1998), since then ergative languages would have to license both arguments in the same direction, unlike accusative languages.

At yet another remove from Deep Structure, it is sometimes argued that ordering is strictly a P[honetic] F[orm] phenomenon (e.g. Chomsky 1994, Uriagereka 1998). Takano 1996 and Fukui & Takano 1998 propose a specific process of linearization of syntactic terminals occurring at PF. They identify two mechanisms operating on syntactic trees to derive pronounceable phonetic structures, DEMERGE and CONCATENATE. Demerge breaks down syntactic trees, operating top-down and removing maximal projections, defined as non-projecting nodes, and passing them to Concatenate, which linearizes them. A specifier is always a maximal projection, while its sister is not; this leads to specifiers consistently being linearized before their sisters. A complement XP will also be linearized before a head Y, since the head projects Y' and is therefore not maximal. Fukui & Takano assimilate head movement to phrasal movement in taking head movement to attach to phrasal projections; from the derived position, a moved head does not project, while its sister does. Therefore, a moved head will be linearized before other material in the phrase it has attached to. The difference between VO and OV structures, on this view, is due to the fact that in VO structures, the verb has moved to a higher position. Fukui & Takano provide morphosyntactic evidence that this is correct, drawing for example on the connection between OV languages and case noted by Greenberg, as well as various other features.

In this volume, Takano and Fukui extend their analysis to noun phrases, arguing that English has N to D raising, resulting in N-initial structures, while Japanese does not. They connect the lack of N to D raising in Japanese to the presence of a classifier system there. They also present a novel analysis of relative clauses and connect the placement of the relative clause (prenominal in Japanese) to the presence or absence of a relative complementizer (absent in Japanese).

3. Asymmetry

Though most of the typological traits mentioned so far in association with the VO/OV distinction have involved symmetry, neither Haider's theory nor Fukui & Takano's lead to symmetrical structures for VO and OV languages. This is no accident; asymmetrical properties of languages have been apparent from the start.

For example, in all of Greenberg's original basic categories, SVO, SOV, and VSO, the subject precedes the object (Universal 1). Bach 1971 noted that wh-movement, when it occurs, is invariably to the left, and that SOV languages don't usually have wh-movement at all (cf. Greenberg's Universal 12). It has also been noted that clausal dependents have a tendency to appear to the right of the elements they are dependent on. For example, many OV languages have clausal complements to the right of V (Dryer 1980, Givón 1984).

Such observations often invite explanations in terms of processing (cf. Hawkins 1994 and references there, e.g. on pp. 5-9). Frequently, processing accounts can fruitfully be seen as interacting with formal syntactic accounts. For example, NRel (relative clause after noun) is vastly more likely than RelN in VO languages, but OV languages are mixed (cf. Hawkins 1983). Two tendencies can thus be seen as interacting: the tendency for clausal elements to be to the right, plausibly due to processing factors, and the headedness parameter, placing dependents on the same side of their heads, arguably not a function of processing.

In this light, consider the fact that the subject almost always precedes the verb in OV languages, but VO languages are more mixed; the two tendencies, then, might be for the subject to appear on the same side of the verb as the other dependent elements versus the tendency for the subject to be to the left. In this case as well, the force counteracting the headedness parameter may be amenable to a functional interpretation: subjects may appear to the left because they tend to be topics, and the tendency of topics to be initial may stem from information packaging strategies (Halliday 1967, Li & Thompson 1976, Vallduví 1990).

On the other hand, grammar has a tendency to steer the individual language; for example, in many languages, subjects appear in a fixed position, whether they are topics or not, and in others, there is a distinct position for subjects which are not topics. Thus, the functional explanation for the relative order of the subject and the object interacts with a formalist explanation for the properties of positions of case assignment and other types of formal licensing. In the papers in this volume, the formal constraints are of central interest. Thus, given that Dutch and English are identical in the relative order of indirect object and direct object, or of direct object and PP, as seen in (1) (from Haider 1992), it can be assumed that the licensing positions for the various elements are identical (presumably universally), as in the analyses of Haider 1992 and Zwart 1993, without investigating why exactly the order of the licensing positions is the way it is. Attention focuses then on the position of the verb, which precedes the VP-internal elements in English and follows them in Dutch, in an embedded clause.

- (1) a. ...omdat ze iedereen een package naar hem thuis zullen opsturen
 because they everybody a package to his home should send
 b. ...because they would send everybody a package to his home address

Haider's proposal, referred to above, is designed to account for the parallel word order. On Haider's account, OV order is basic: VP-internal elements are base-generated in the

projection of V. The verb starts low and stays there in a strict OV language, but in a VO language, it climbs by head movement to a higher position. Thus, a clause like the English one in (1b) is derived by head movement, and the VP-internal arguments are in situ, much as in Larson 1988.

(2) $[_{AuxP} \text{ would } [_{VP} \text{ send}_i [_{VP} \text{ everybody } t_i [_{VP} \text{ a package } [_{V'} t_i \text{ to his house}]]]]]$

But the structure for the corresponding German clause is not identical; the Basic Branching Conjecture that Haider proposes coupled with the licensing parameter gives the same hierarchical ranking for the sentence elements, but with the verbal heads in substantially different locations, as sketched in (3) (see Haider's paper for details).

(3) $[_{AuxP} [_{VP} \text{ jedem } [_{VP} \text{ ein Paket } [_{V'} \text{ an seine Privatadresse } \text{ schenken}]]]] \text{ werden}]$
everyone a package to his private.address send would

In his contribution to this volume, Haider extends and refines his proposal, showing how it makes better predictions in several arenas than competing analyses (for which see below).

4. The Universal Base Hypothesis

Bach 1968 proposed the Universal Base Hypothesis (UBH), that all languages have identical Deep Structures, which are permuted by language-specific transformations. This completely shifts the weight of cross-linguistic correlations from the Deep Structure to other parts of the grammar. In fact, Peters & Ritchie 1969 demonstrated that the UBH is vacuous in the absence of meaningful constraints on transformations. However, once transformations are better understood, the UBH invites a different kind of explanation for asymmetries of the type noted in the previous section.

For example, consider the fact that in languages in which the auxiliary precedes the main verb, or Aux-V languages (generally VO languages), material can generally appear between the auxiliary and the main verb, whereas in V-Aux languages, this is not the case. Furthermore, in languages in which both orders are possible, Aux-V order tends to allow elements to intervene, while V-Aux order does not. This can be straightforwardly illustrated using German.³

- (4) a. Ich habe (schwer) arbeitet. (German)
I have hard worked
 'I have worked (hard)'
- b. ...daß ich arbeitet (*schwer) habe
that I worked hard have
 '...that I have worked'

The obligatory adjacency of V-Aux order, as opposed to Aux-V order, can be seen as a function of the one being derived from the other (various specific implementations of this

³ The generalization, as stated here, holds for very many languages, though perhaps not always for the same reasons. For example, it holds of languages with second-position auxiliaries such as various Slavic, Australian, and Uto-Aztec languages, but there the obligatory adjacency of V-Aux order may be of a different nature from the obligatory adjacency of V-Aux in for example Japanese or Persian.

- i. Aux-V order may be interrupted
 ii. V-Aux order may not be interrupted

The generalization can be read on two levels: as a claim about unmarked orders and as a claim about any order. As a claim about unmarked orders, counterexamples to [i] are Spanish and Rumanian, and Dutch in embedded clauses. Counterexamples to [ii] include two Bongo-Bagirmi languages, Ngambay and Mbaye. These two languages were the only ones listed in Dryer 1998 as having base order SVOAux (with verbal auxiliary), while very many languages turned up with base order SAuxOV.

As a claim about derived orders, various VP-topicalization structures violate [ii], e.g. in Scandinavian languages.

are discussed below). If the two orders were simply a matter of the auxiliary taking its complement to the left or the right, this systematic difference would be unexpected.

The Universal Base hypothesis has been revived in a new form by Kayne 1994, who proposes, among other things, that all branching is binary, all complements are to the right, all adjuncts or specifiers are to the left, and all movement is to the left. On this view, whatever differences there are between Japanese and English must be a function of the derivation of their respective surface structures.

Zwart 1993, 1997, and Koster 1994 demonstrated how OV order in Dutch could be derived from a basic VO order by movement of VP-internal material to the left, into functional specifier positions (making good the promise of Ross 1967a).

A Dutch embedded clause is analyzed much as in (5) (cf. Zwart 1993, chapter IV).

- (5) ...dat [_{AgrSP} Jan₁ [_{AgrOP} het boek₂ [_{PredP} op de tafel₃ [_{VP} wil t₁ leggen t₂ t₃]]]]
that John the book on the table will put

In English, on this view, the movements to licensing positions such as SpecAgr_oP occur covertly. However, such accounts raise various questions. For example, if such movements as those in (5) are triggered by strong features, why are the features generally strong (in consistent OV languages) or generally weak (in consistent VO languages)? In mixed cases, what determines what stays behind (e.g. CP) and what moves (e.g. DP)? If the word order in OV languages is the result of movement, what ensures that the derived order of constituents is identical to the order of those same constituents in a VO language, in cases like those discussed in §3? The same-order cases are handled straightforwardly by Haider's account, as they are actually in essentially the same positions. In addition, the fact that everything shows up on the same side of the verb is handled by Haider's account, based on a general licensing principle.

Two different types of solution have been proposed for same-order effects in VO and OV languages. One solution is to assume that the individual elements do not move separately, but together. For example, if the Dutch clause begins somewhat as in (6a) (after subject movement to a high functional projection), then if the main verb moves to a low functional head as in (6b), followed by movement of the VP remnant to a specifier position above the auxiliary as in (6c), the correct surface order is established.

- (6) a. dat Jan [_{AuxP} wil [_{IP} [_{VP} leggen het boek op de tafel]]]
that Jan will put the book on the table
 b. dat Jan [_{AuxP} wil [_{IP} leggen [_{VP} t_v het boek op de tafel]]]
that Jan will put the book on the table
 c. dat Jan [_{AuxP} [_{VP} t_v het boek op de tafel] wil [_{IP} leggen t_{VP}]]
that Jan the book on the table will put
 '...that John will put the book on the table tomorrow'

This type of movement is proposed by Hinterhölzl (cf. his 1997a:198/1997b:14), though only in conjunction with various other movements. It is also advocated in the contributions to this volume by Pearson and Haegeman. As Haegeman points out, since such an analysis requires the verb to move to a higher functional head, it is consistent with the assumption that verbs in languages like German move overtly to a relatively high functional position, bringing the OV languages more into line with facts about VO languages. Haegeman demonstrates that well-motivated assumptions about negation also support the idea that the verb in West Flemish occupies a relatively high position overtly, even though West Flemish exhibits OV structures like Dutch.

The second type of UBH approach to identical sequences in VO and OV structures is to assume that the individual elements in a given clause do occupy the same positions but that the verb moves, roughly as in Haider's approach but with a universal base. Barbiers, in this volume, argues for identical base positions in English and Dutch for a number of different sentence elements, arguing that differences in word order are due primarily to the

obligatoriness of ‘verb intraposition’ (see below) in English coupled with the existence of a short verb movement in English. Verb intraposition, on Barbiers’ analysis, is optional in Dutch, and Dutch has no short verb movement.

An important variation on this type of approach is to assume that the surface positions of sentence elements are derived: the individual elements in a given clause move to distinct specifier positions in OV languages, as on the Kayne and Zwart proposals, but the same also occurs in VO languages, followed by movement of the verb across those elements roughly as in the Haider and Barbiers proposals. In other words, languages like English would have (5) or (6c) above as an intermediate structure, followed by raising of a constituent containing the auxiliary and the main verb to a position below the subject.

Such proposals have an ancestor in Larson’s 1988 analysis of Heavy NP Shift phenomena as VP-movement to the left of a heavy object (cf. also Kayne 1994). A more direct influence is Hinterhölzl’s 1997a analysis of Verb Raising in German as remnant VP movement, as sketched in (7): first, arguments move out of VP into higher positions, then the functional projection (FP in (7)) containing the verb moves to a specifier to the left of the higher verb (the specifier of PredP in (7), cf. Hinterhölzl 1997a).

- (7)
- a. er nicht [_{PredP} wagte [_{FP} zu küssen sie]]
he not dared to kiss her
 - b. er sie₁ nicht [_{PredP} wagte [_{FP} zu küssen t₁]]
he her not dared to kiss
 - c. er sie₁ nicht [_{PredP} [_{FP} zu küssen t₁] wagte t_{FP}]
he her not to kiss dared
 - d. er sie₁ nicht [_{PredP} [_{FP} zu küssen t₁] wagte t_{FP}]
he her not to kiss dared
 ‘...(because) he didn’t dare to kiss her’

On a VP-fronting analysis of VO languages, the remnant moving to the left is larger (it contains the auxiliaries) and moves further (it moves to the left of the licensing position for the object). Thus, Kayne 1998 argues that in English, there are in fact overt movements in some cases of VP-internal material to the left of the VP, followed by VP-remnant fronting past that material again, resulting in what superficially looks like the original word order. This brings VO languages much closer to Hinterhölzl’s vision for the OV ones. For instance, to account for wide scope of negation in a sentence like *I will force you to marry noone*, Kayne postulates the derivation in (8), where ‘W’ and ‘Neg’ are heads in the extended projection of every verb, but shown only for the superordinate clause. For the narrow scope reading, the derivation in (9) is used, and here the functional heads are only shown for the embedded clause.

- (8)
- a. I will [_{WP} W [_{NegP} Neg [_{VP} force you to marry noone]]]
 - b. I will [_{WP} W [_{NegP} noone₁ Neg [_{VP} force you to marry t₁]]]]
 - c. I will [_{WP} [_{VP} force you to marry t₁] W [_{NegP} noone₁ Neg t_{VP}]]]]
- (9)
- a. I will force you to [_{WP} W [_{NegP} Neg [_{VP} marry noone]]]
 - b. I will force you to [_{WP} W [_{NegP} noone₁ Neg [_{VP} marry t₁]]]]
 - c. I will force you to [_{WP} [_{VP} marry t₁] W [_{NegP} noone₁ Neg t_{VP}]]]]

Note that the surface position of *noone* in each case matches the scope of negation. In this way, Kayne proposes to eliminate covert movement from the system of grammar. Note that the claim that objects in VO languages like English leave their base positions overtly has been around for a while; for example, Johnson 1991, Borer 1994, and Runner 1995 all take this position. In each of those proposals, however, the verb moves to the left by head movement, as on Haider’s account, rather than by VP-remnant movement, as in (8-9).

In this volume, Taraldsen and Hróarsdóttir argue for a much expanded role for VP movement in VO languages. Taraldsen reasons that if VO order is derived by VP movement, then in some cases, it should be possible to observe material other than the verb being pied-piped along with the VP. Drawing on evidence from a range of Germanic languages, he argues that prepositional particles provide exactly this kind of evidence for VP movement. For example, Taraldsen argues that the particle-noun phrase order illustrated in (10a) is derived in stages, one stage being similar to the OV structure in (10b).

- (10) a. at han slapp inn katten. (Norwegian)
that he let in the.cat
- b. ...dat hij de kat binnenliet. (Dutch)
that he the cat in.let
 ‘...that he let in the cat’

Taraldsen argues that the particle originates to the left of the verb, with the object first moving across both verb and particle, leading to the Dutch order. In VO languages, a series of VP movements results in the Norwegian order.

Thus, all languages are alike in requiring various VP-internal elements to move overtly to licensing positions, and VO languages in addition have the property that there is successive leftward movement of verbal projections to specifier positions. Taraldsen argues that object shift, too, may profitably be seen as a result of leftward VP movement.

Hróarsdóttir, drawing on her previous work (see references in her paper), examines historical data from Icelandic, demonstrating that various types of OV structures disappeared simultaneously from Icelandic. In particular, before the nineteenth century, objects frequently appeared to the left of non-finite verbs (finite verbs appeared in second position, as in modern Icelandic). With non-finite auxiliaries preceding the main verb, various options are observed: the object might precede both verbs, follow both verbs, or appear between the two verbs. In addition, the auxiliary could precede or follow the main verb. The following word orders are then attested.

- (11) a. Aux V O
 b. Aux O V
 c. O Aux V
 d. V Aux O
 e. O V Aux

(The final logical possibility, V O Aux, is unattested; cf. the discussion of V-Aux adjacency above.) Hróarsdóttir shows that OV orders (including VAux orders) disappeared simultaneously from Icelandic in the nineteenth century, with the result that only the order in (11a) is grammatical. Pintzuk 1998 has also documented the same observation for the history of English, showing that various classes of elements ceased to appear to the left of their selecting verbs at the same time.

This is puzzling on an approach to OV structures like that in (5) above, because if distinct features move the object to the different positions above and below the auxiliary and cause the reversal, then there is no reason to expect them all to have become weak simultaneously. Hróarsdóttir demonstrates how an analysis of VO order based on VP movement yields the right results: if what happened in the history of Icelandic is that VP movement of the type illustrated in the derivations in (8-9) went from being optional to being obligatory, then only one change need be postulated, instead of a series of independent but simultaneous ones.

Deriving VO order through phrasal movement rather than head movement is one of the main themes running through this volume. Holmberg’s and Pearson’s papers (discussed below) also take up this issue, as does Brody’s, in a way, and Hinterhölzl’s, briefly. Aside from this difference, the main distinction between the type of account

- (15) a. Hij is door 'n stuurfout met een knal op het hek gestrand. (Dutch)
he is through a steering.error with a bang on the fence stranded
- b. Hij is gestrand op het hek met een knal door een stuurfout.
he is stranded on the fence with a bang through a steering.error
 'He got stranded on the fence with a bang because of a steering error'

The order in (15b) is basically the same as in English, while the preverbal order in (15a) is the reverse.

Mirror-image structures are familiar from morphology; Baker's 1985 Mirror Principle observed that the relative closeness of morphemes to a stem reflects the order in which the corresponding syntactic transformations take place; for example, if a benefactive argument is realized as a direct object when an applicative morpheme is attached to the verb, and if passive promotes a direct object to subject position, then in order for a benefactive argument to appear as a subject under passive, the applicative morpheme must be closer to the stem than the passive morpheme. This can be seen in the Chichewa example in (16) (from Baker 1988:307; SP is subject agreement, ASP is aspect).

- (16) Mbewa zi-na-sem-**er-edw**-a mitondo. (Chichewa)
mice SP-PAST-carve-APPL-PASS-ASP mortars
 'The mice were carved mortars'
 (i.e. somebody carved mortars for the mice)

Baker derives the order of morphemes through strictly local head movement (following Travis 1984). In the case of the applicative passive, the applicative suffix is argued to originate as a preposition in a PP complement to the verb, and the passive morpheme is taken to occupy a higher head. The derivation of the applicative passive in (16) proceeds as sketched in (17), ignoring the prefixes and the aspect suffix.

- (17) a. PASS [_{VP} carve [_{PP} APPL mice] mortars]
 b. PASS [_{VP} carve-APPL₁ [_{PP} t₁ mice] mortars]
 c. [carve-APPL₁]₂-PASS [_{VP} t₂ [_{PP} t₁ mice] mortars]
 d. mice₃ [carve-APPL₁]₂-PASS [_{VP} t₂ [_{PP} t₁ t₃] mortars]

In (17a), the verb takes two complements, a PP and an NP. In (17b), the preposition has incorporated into the verb, appearing as a suffix (cf. Baker op. cit. p. 231). In (17c), the verb has moved to a higher head, attaching to the left of the passive suffix (op. cit. p. 309). (17d) simply shows the NP movement of the derived subject.

In subsequent work, however, it has often been assumed that head-movement necessarily leads to adjunction to the left, with the result that suffixes on a stem must reflect successively higher functional heads above that stem (cf. Kayne 1994); predictions about prefixes are less clear; see Julien 1999 for some discussion.

Furthermore, it has been common to take these mirroring effects to cover non-grammatical function changing affixes as well; thus, Belletti could argue that AgrP dominates TenseP, contra Pollock, on the grounds that agreement morphemes occur further from the stem than tense morphemes, cross-linguistically. The order of functional elements appears to support this view. For example, the order of suffixes in the Northern Sámi verb form in (18a), where the potential mood suffix is closer to the stem than the subject agreement suffix, is taken to mirror the order of those heads in the syntactic tree. This view is strongly supported by structures like that in (18b), where the negative and perfective auxiliary verbs take the same suffixes, but where the first auxiliary takes the agreement suffix and the second the mood suffix (cf. Mitchell 1991, Holmberg et al. 1993 on Finnish).

- (18) a. Veahkeh-eaçça-n. (Northern Sámi)
help-POT-1SG
 'I could help'
- b. I-n l-eaçça veahkeh-an.
NEG-1SG be-POT help-PERFECT
 'I couldn't have helped'

Cinque 1999 develops an strong argument for this extended mirror principle, identifying a number of categories of adverbial meaning and connecting different morphemes with those categories. He demonstrates that cross-linguistically, the ordering of the adverbs mirrors the ordering of the morphemes. The adverbs are taken to occupy specifier positions in phrases projected by functional heads, and the morphemes are taken to be associated with those selfsame heads; morphology then mirrors the syntactic tree in a striking way.

Brody 1997 takes these observations as fundamental and proposes the Mirror Theory, by which morphological structure and complement structure are isomorphic: a syntactic complement is realized with its selecting head as a suffix; this yields a result similar to that of a theory in which the head of a complement always raises to its selecting head (cf. Svenonius 1994), but only if head to head movement happens at the surface: Brody points out, in his contribution to this volume, that in his theory there is no room for covert incorporation. He examines the case of Romance restructuring, and demonstrates the advantages of his analysis over one involving covert head movement.

He also examines the case of Hungarian verbal clusters, which exhibit an interesting property: certain sequences of Hungarian verbs can appear in either order, e.g. 'begin-swim' or 'swim-begin,' with the same meaning ('begin to swim'). He argues that this reflects an option, either the dependent (main) verb is identified as the specifier or the complement of the superordinate (auxiliary) verb. If the dependent verb is a complement, then by Mirror Theory, the superordinate verb must immediately follow it, as a suffix; if the dependent verb is a specifier, then it precedes the superordinate verb, and is a distinct phrase. This is strikingly like the cross-linguistic observation noted above that while Aux-V order does not necessarily require adjacency, V-Aux order does. If V-Aux order is generally derived by head movement or a closely related mechanism, as in Brody's theory, then this cross-linguistic fact may be captured.

However, there are other ways in which mirror images may be derived, and head-movement is often reserved for cases in which the elements so combined are clearly wordlike. Kayne (1992 talk cited in Cinque 1994:100 fn. 21) has suggested a derivation for mirror-image ordering based on a phrasal analogue of head-movement: if an element Z moves from the right to the left of an element Y, then the order of Z and Y is reversed. If a node dominating both Y and Z then moves leftward across a node X, the order Z-Y-X results, the opposite of the original order. This is illustrated in (19) for the (gloss of the) Indonesian noun phrase in (14b) above. Brody (1997) refers to structures produced by movement of a node dominating the target of previous movement as 'roll-up' structures.

- (19) a. [_{XP} beautiful [_{YP} big [_{ZP} red [_{NP} ball]]]]
 b. [_{XP} beautiful [_{YP} big [_{AP} [_{NP} ball] red t_{NP}]]]
 c. [_{XP} beautiful [_{YP} [_{ZP} [_{NP} ball] red t_{NP}] big t_{ZP}]]
 d. [_{XP} [_{YP} [_{ZP} [_{NP} ball] red t_{NP}] big t_{ZP}] beautiful t_{YP}]]

If *beautiful* is the head of XP, *big* the head of YP, and *red* the head of ZP, then no functional projections need be assumed. This is consistent with the view of Abney 1987 that adjectives are heads in the extended projection of N. However, if the elements in the reverse order are phrasal, some more complicated structure is necessary.

This is how Barbiers 1995 analyzes postverbal PPs in Dutch. According to Barbiers, the various PPs are adjoined to VP, as shown in (20a) (in pseudo-English; compare (15)), where the different segments of VP are marked with different lower-case

letters. The lowest segment of VP moves into the specifier position of the lowest PP, in order to enter into a subject-predicate relation with it, as shown in (20b) (this is the ‘intraposition’ alluded to above). The next two segments (marked ‘b’ and ‘c’) moves into the next two PP specifiers in (20c-d), resulting in reverse order (cf. Barbiers 1995:115).

- (20) a. $[_{VPd} [_{PP} \text{by mistake}] [_{VPc} [_{PP} \text{with bang}] [_{VPb} [_{PP} \text{on fence}] [_{VPa} \text{stuck}]]]]]$
 b. $[_{VPd} [_{PP} \text{by mistake}] [_{VPc} [_{PP} \text{with bang}] [_{VPb} [_{PP} [_{VPa} \text{stuck}] \text{on fence}] t_{VPa}]]]]]$
 c. $[_{VPd} [_{PP} \text{by mistake}] [_{VPc} [_{PP} [_{VPb} [_{PP} [_{VPa} \text{stuck}] \text{on fence}] t_{VPa}] \text{with bang}] t_{VPb}]]]]]$
 d. $[_{VPd} [_{PP} [_{VPc} [_{PP} [_{VPb} [_{PP} [_{VPa} \text{stuck}] \text{on fence}] t_{VPa}] \text{with bang}] t_{VPb}] \text{by mistake}] t_{VPc}]]]]]$

These movements, according to Barbiers, are necessary in order to establish the spec-head relation necessary for a PP to predicate over the relevant VP, and must occur covertly in languages in which they do not occur overtly.

Holmberg proposes a kind of roll-up structure for Finnish verbal clusters in his contribution to this volume. He notes that in Finnish, V-Aux order requires strict adjacency. He proposes that V-Aux order is derived by movement of VP into the specifier of a functional head which selects the auxiliary. This leads to derivations like that in (21).

- (21) a. $[_{TP} \text{Tense} [_{AuxP} \text{have} [_{AspP} \text{Aspect} [_{VP} \text{write novel}]]]]]$
 b. $[_{TP} \text{Tense} [_{AuxP} \text{have} [_{AspP} \text{Aspect} [_{VP} \text{novel}_1 \text{write } t_1]]]]]]$
 c. $[_{TP} \text{Tense} [_{AuxP} \text{have} [_{AspP} [_{VP} \text{novel}_1 \text{write } t_1] \text{Aspect } t_{VP}]]]]]]$
 d. $[_{TP} \text{Tense} [_{AuxP} [_{AspP} [_{VP} \text{novel}_1 \text{write } t_1] \text{Aspect } t_{VP}] \text{have } t_{AspP}]]]]]]$
 e. $[_{TP} [_{AuxP} [_{AspP} [_{VP} \text{novel}_1 \text{write } t_1] \text{Aspect } t_{VP}] \text{have } t_{AspP}] \text{Tense } t_{AuxP}]]]]]]$

In (21a), the base order of heads is shown. In (21b), the object has moved to the left of the verb (here, to SpecVP). In (21c), the VP has moved into the specifier of AspectP, in order for the verb to check its aspectual features against the functional head of that phrase. The same occurs in the next two steps. It can be seen that as long as adjunctions to X' are not allowed, and adjunctions to the right of XP are not allowed, no material will intervene between the verb and its auxiliary in the resulting head-final structure. In the final string, *novel write Aspect have Tense*, the functional elements Aspect and Tense are suffixal, and are pronounced as a word with the immediately preceding stems, hence something like *novel writ-ten ha-s* in pseudo-English, ‘has written a novel.’ This affixation is subject to adjacency, according to Holmberg, so that for example the object could not have remained in situ in the first step, leading to an AspP of the form **write novel -Aspect*.

Pearson, in his paper in this volume, applies the roll-up technology to several additional kinds of mirror-image effects. He notes that there are although same-order patterns of the type discussed above are common, they are not universal. There are languages, such as Malagasy, Palauan, and Zapotec, in which the unmarked order for indirect object and direct object is the reverse of that in English. Similarly, some of these languages have the reverse relative order for certain series of adverbs, and show scrambling effects to the right, rather than to the left.

But Pearson notes that the mirror effects do not warrant a fully symmetric analysis; each of these languages also shows some same-order effects, for example they are consistently VO, and never OV. Pearson develops an analysis that is consistent with Kayne’s LCA, and proposes a novel kind of rationale for why roll-up structures occur; in short, they occur in languages in which verb movement is systematically unavailable. In this way, the proposal bears a relation to Holmberg’s, in which V movement and VP movement are alternatives for checking V features; but unlike Holmberg’s proposal, in which the two possibilities are manifested within a single language, Pearson casts the option as a point of cross-linguistic variation.

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