

The Head Parameter in Morphology and Syntax

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1. Where's the head?¹

Recent work on parametric approaches to the study of interlinguistic variation and universals of grammar has drawn a great deal of attention to what to many appears to be one of the most basic cases of parametric variation, the position of the head element within a constituent. Many of the syntactic differences between languages are thought to derive from (in the typological tradition: to correlate with) the placement of head elements, while language acquisition is seen to rely heavily on algorithms for selecting the correct parameter settings on the basis of fairly limited evidence (cf. e.g. Gibson and Wexler 1992 and Clark 1990 for some of the issues that arise here).

In morphology, a similar wave of interest in the position of the head can be seen, due mainly to Williams' (1981) proposal of a Right-Hand Head Rule.

The goal of this paper is to consider some of the issues that arise in parameter-setting accounts of word-order variation and the acquisition of word-order. My main point is that a language may have not one but several basic patterns for a single domain (say word-order within the clause, or order within compounds), and that the main task for the acquisition device may therefore be much more complex than just the selection of a parameter value from a limited set of possibilities. But before making this point, and illustrating it with examples drawn from a variety of languages, I will digress a bit and first talk about what it means to be a head.

2. What's the head?

The notion 'head' has a good many definitions (see e.g. Zwicky 1984 for an overview and detailed discussion). I will just mention four. Note that in all four cases the head of X is assumed to be a part of X, and the head-of relation is a syntagmatic relation.

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(1) *Four definitions of 'head'.*

- (A) Semantic: The head of A is a hyperonym of A, i.e. when A denotes a set X, the head of A denotes a superset of X.
Example: *apple pie - pie*: *pie* is the head because it is a hyperonym of *apple pie*: every apple pie is a pie. *Apple* is not a head, since it's not the case that every apple pie is an apple.
- (B) Distributional: The head of X is a part with the same distribution as X.
Example: *apple pie* and *pie* are intersubstitutable.
- (C) Morphosyntactic: The head is the locus of inflection.
Example: *apple pie* receives plural inflection on the second member only: *apple pies*, not **apples pie*.
- (D) Technical: The head of X is the part which determines the category of X.
Example: The category of *ate the apple* (VP) is determined by the verb 'ate', not by any other element. This explains why it coordinates with other phrases which begin with a verb, but not with phrases that share the nominal part: *peeled the apple and ate the apple*, **ate the apple and over the apple*.

Both X-bar theory (Jackendoff 1977, Gazdar, Klein, Pullum and Sag 1985) and categorial grammar (Vennemann and Harlow 1977, Hoeksema 1985) show a preference for the technical type of definition. The other definitions are either not broad enough or otherwise problematic. Take for instance the special case of coordination:

- (2) a She walks and talks
- b She walks or talks

According to the technical definition, the above coordinations have two head elements: Both verbs determine in equal measure the category of the coordination as a finite VP with the features 3rd person singular present. The distributional and morphosyntactic definitions agree here with the technical definition, because both verbs serve as the locus of inflection and the distribution of either verb equals that of the coordination. The semantic definition, however, leads to problems. The conjunction in (2a) is still unproblematic, given that either verb is a hyperonym of the coordination (this follows directly from the usual boolean treatment of conjunction), but the disjunction in (2b) does not work in the same way. A disjunction is more general, not less, than either of its constituent members, and hence would have no head according to the semantic definition. Since it would seem unwise to distinguish among the headedness properties of disjunctions and conjunctions, the semantic definition of the 'head-of' relation has to be rejected.

The distributional definition leads to problems with head-complement structures (though generally not with head-modifier structures). Thus a transitive verb differs in its combinatorial properties from a VP, and has a different substitution class.

The morphosyntactic definition leads to problems in languages which lack inflection and does not generalize well to morphological structures, except, importantly, for compounding structures. If I want to say that in the Dutch nominalization *gebrul* 'baying, shouting' either the affix *ge-* or the verbal stem *brul* serves as the head element, I run into the problem that neither may be inflected, and if I conclude from this that the word in question does not have a head, I am in conflict with a principle which is assumed more often than explicitly stated, and which I will formulate as follows:

(3) *Omniheadedness*: every complex structure has a head (overtly or covertly)

This principle is behind modern formalizations of X-bar theory and follows directly from the categorial account of headedness in Hoeksema (1985, 1988).

3. The head parameter

The position of the head is considered to be one of the main parameters of language variation. Opinions differ as to the precise definition of a parametric theory of head-positions. There is the possibility to encode the position of the head directly in the X-bar schema of the language. There are also more relational approaches, which derive the position of the head from the direction of case assignment or more abstractly the direction of government. Since my concern is as much with morphology as it is with syntax, I will henceforth ignore case assignment and other mechanisms by which the position of the head may be fixed indirectly, and just consider parametric systems which directly manipulate the position of the head. In the simplest case, we can imagine a parameter which takes one of the three values in (4):

(4) *Headedness parameter*

- a The head is phrasal-initial (Head First)
- b The head is phrasal-final (Head Last)
- c The position of the head is free (Head Variable)

The parameter may have different values for different categories (in Dutch for instance VP is head-final, PP usually head-initial and CP always head-initial). Typologists point out that variation of this kind is usually limited because of rather powerful tendencies within languages to harmonize head-complement order across categories.

Since there appear to be roughly equal numbers of OV and VO languages, there is no prima facie evidence for an innate bias for either (a) or (b) in (4). Let us assume for the sake of the argument that (c) is the initial setting of the parameter. This will create havoc in our theory of language acquisition. Any language in which the position of the head within a phrase is free forms a superset of the two languages which one can derive

from it by fixing the position of the head. Since every sentence in a head-initial or head-final language is also compatible with setting (c), the child never needs to change her/his mind about this setting (always assuming of course that frequency of use and other statistical matters do not play a role in the setting of parameters). More generally, any setting of a parameter which defines a superset of the language permitted by another setting cannot be an initial setting because of this problem.

This brings us back to the somewhat bizarre conclusion that there is an innate bias for either the a-setting or the b-setting, a conclusion for which there is no evidence from the vast acquisition literature, at least none that I know of. Perhaps the conclusion is less bizarre for somebody like Edwin Williams, who proposes an asymmetric theory of head-placement in the domain of morphology. His *Right-Hand Head Rule* (Williams 1981) states that in morphology, complex structures are head-final. If this rule is correct, then at least in the area of morphology one might opt for setting (b) as the initial and final setting of the parameter. But this still leaves us with the problem of headedness in syntax. And what about our theory of language acquisition, with its crucial assumption of no negative evidence?

4. The Subset Principle

Strong versions of learning theories which exclude negative evidence must abide by what Berwick (1986) calls the Subset Principle, according to which children follow a conservative strategy for language acquisition, always adjusting their grammar to generate subsets of the target language which eventually converge with that language. Language acquisition would then be characterized by a monotone increasing function L from points in time to sets of sentences:

$$(5) \quad \text{If } t_1 < t_2, \text{ then } L(t_1) \subseteq L(t_2)$$

From what is known about first-language acquisition, it seems that Berwick's principle is too strong if it is to characterize children's actual utterances. Children are known to overgeneralize in some domains and although their speech shows a certain caution (it does not diverge wildly from the parental speech patterns), it is not always conservative. Presumably, children are capable of distinguishing their own speech patterns from those of their parents, for otherwise they would be unable to steer away from their own innovations to the adult patterns that eventually dominate their output and replace the innovations.² Language acquisition is not monotonic in the sense of (5),

² Rini Huybregts suggests that perhaps the problem of overgeneralization is not a serious challenge for the Subset Principle if we make some assumptions about morphological blocking. For instance, if a child uses *bringed*, and then learns the correct past tense form *brought*, we view this as a move from the set $\{\textit{bringed}\}$ to the set $\{\textit{bringed}, \textit{brought}\}$, and interpreted the subsequent blocking of the form *bringed* not as a change in the grammar which reduces $\{\textit{bringed}, \textit{brought}\}$ to its subset $\{\textit{brought}\}$, but rather as a rule of use which suppresses the regular form whenever there is an irregular form. This is a reasonable proposal, even though it needs further fleshing out (e.g. to account for cases where there are genuine doublets, e.g.

since further development may well lead to the removal, rather than the addition, of classes of utterances.

An illustration from the domain of morphology which illustrates this phenomenon is the acquisition of verbal compounds. Eve Clark and coworkers (cf. Clark 1984, Clark, Hecht and Mulford 1986, Clark and Barron 1988) have shown that children acquiring English often go through a period in which they coin deverbal compounds reflecting the dominant VO-pattern of English syntax: e.g. **driver-truck* rather than *truck-driver*, and **eater-candy* rather than *candy-eater*. Later on, the adult OV-pattern for verbal compounds takes over, and these innovative forms die out. Clark's examples are also of some interest here because they are at odds with the Right-Hand Head Rule of Williams (1981): the head element is the initial member in these compounds. It has been proposed (e.g. by Trommelen and Zonneveld 1986) that children exploit this rule to facilitate their acquisition of morphological features. In this case, apparently, they don't, either because ordering principles from syntax overrule the RHR, or because children don't use the RHR in the first place.³

Suppose we reject the Subset Principle, does that mean we can go back to the original notion of a headedness parameter with three settings, with (c) (free order) as the initial setting? Not necessarily. To gain some further understanding of the issues involved, let us take a brief look at the history of the Germanic languages.

5. Germanic word order variation

In the history of the Germanic languages, there is more variation in word order than in most modern dialects, as well as some spectacular changes in basic word order patterns (e.g. the change from Old English SOV with Verb Second to Middle English SVO with Verb Second). In some languages, there is a period in which two patterns occur

kneeled/knelt), but even so, the problem could easily be shifted to other domains where children are innovative. An appeal to blocking strategies is also made in some functionalist approaches to language acquisition as a general solution to the problem of negative evidence (cf. MacWhinney's 1987 Competition Model).

³ Rini Huybregts suggests yet another way in which to interpret these data. Perhaps children derive these forms transformationally from a source *-er(drive truck)* by head-movement of the verb to the affix position. This would be analogous to some analyses of finite verb phrases in English (e.g. deriving *walks home* from *-s(walk home)*) and assume that children misanalyze a derivational construction for a syntactic one. This type of treatment is best compatible with the phrasal derivation analysis of verbal compounds (as proposed by a number of linguists, including Botha 1984—for critical discussion and arguments against it as an analysis of the adult system, cf. Hoeksema 1985). Note that a transformational analysis along these lines would remove the problem for the RHR raised here, but not the problem for the Subset Principle, since it would still require that children at some point learn that their output is not grammatical (without negative evidence) and that they revise their grammars accordingly.

simultaneously (Pintzuk 1991, Santorini 1989). Both in the Old English of the Anglo-Saxon chronicles and older Yiddish texts, we see subordinate clauses with SOV order and subordinate clauses with SVO order, perhaps due to dialect mixing. At any rate, the very juxtaposition of two patterns in the same period is not expected on the parametric view sketched earlier on, in which a parameter cannot have two conflicting values. To be sure, we could reject the claim that there are two distinct patterns in these texts, and that the real fact of the matter is that the position of the head is free. However, free word order would predict more ordering possibilities than those which we actually find. What Pintzuk and Santorini discovered is that the position of the finite verb correlates with other order properties. For instance, particles occur only postverbally in early Yiddish if the sentence has the Verb Second order. If word order were free, then particles ought to occur also after infinitival verbs. Likewise, in the Anglo-Saxon Chronicles, the auxiliary verb typically follows the main verb in OV (Infl-final) sentences and precedes it in VO (or Infl-medial) positions.

These correlations in fact make it unlikely that the default value of the head-parameter is (c). Instead, I will assume now that children must be capable of discriminating among several patterns in the same language, with conflicting settings for the same parameter, without falling back on the assumption that order is free (an assumption which is compatible with all the available data, but one which does not seem to be adopted at all).

From the Germanic data, the following generalization emerges. The position of I and V (and if we look at other languages than the Germanic ones, we may add here C) can be either left or right, or both, and the choice of position is constrained by the following hierarchy.

(6) Head Placement Hierarchy

V left ⇒ I left ⇒ C left

Possible patterns

a	V right	I right	C right
b	V right	I right	C left
c	V right	I left	C left
d	V left	I left	C left

Impossible patterns

e	V right	I left	C right
f	V left	I right	C left
g	V left	I right	C right
h	V left	I left	C right

This hierarchy may be universal. Hawkins (1990) maintains that the complementizer is always on the left in SVO languages whereas SOV languages sometimes have complementizers to the right (Japanese, Korean), and sometimes to the left (Dutch, German, Persian). Likewise, there are no languages, apparently, where infinitival verbs precede their objects, but finite verbs and auxiliaries move to the end of the clause. Old English and early Yiddish combine the patterns in (b) and (c).

Van Zonneveld (1990) notes that this hierarchy also seems to reflect the order of acquisition, in the sense that in child language first the verbs emerge, then verbal inflection and then complementizers. The hierarchy also reflects the dependency relation between these three elements: V(P) is selected by I and I(P) by C.

How crazy is it to assume that children can learn multiple patterns of head-complement order? It seems that we are proposing here that children are not just little linguists, but little statisticians as well, who constantly monitor the language for correlations so as to rule out unattested combinations of parameter settings. Yet we know there are things that children can do which clearly suggest they can learn and distinguish opposing patterns. For instance, children learning English and Japanese at the same time must be capable of doing this and making separate parameter settings for each language. Indeed, the acquisition device must allow for as many settings as there are linguistic systems to be learned. And it does not seem likely that the occurrence of multiple patterns within what we like to call a single language is to be treated any different from the occurrence of multiple patterns in different languages. We are already used to this when we distinguish head placement in morphology from head placement in syntax. Moreover, given the readiness with which bilinguals use code-switching, the bilingual child may also encounter conflicting patterns within the same discourse, sometimes within the same utterance in much the same way that children learning Old English would have encountered Infl-Medial and Infl-Final orders in the same data set. Just how children learn to distinguish two languages and how they learn to distinguish two systems given the input available to them is a matter on which the parameter-setting model of language acquisition sheds little light. All we must assume right now is that children will rather postulate two different patterns than free order.⁴

6. Multiple patterns in morphology

The phenomenon of multiple head-position patterns can also be found in the domain of morphology. It is well-known that some languages have right-headed compounds and others left-headed ones (cf. Hoeksema 1985, Scalise 1988). Dutch has almost exclusively right-headed compounds, Samoan has left-headed compounds, as well as, for instance, Zulu (cf. Doke 1945). Another language often (see e.g. Lieber 1983: 254)

⁴ This makes interesting predictions for the acquisition of true free word-order languages, such as Warlpiri. Unfortunately, I do not control the relevant data, so I do not know if such languages are first learned with some word order fixed.

characterized as left-headed in its compounding system is Vietnamese. In this language we find left-handed structures such as in the following series:

- (7) a nhà-máy 'house-machine = factory'
 b nhà-máy-loc 'house-machine-filtrate = refinery'
 c nhà-máy-loc-dau 'house-machine-filtrate-oil = oil-refinery'

The head status of the initial element is suggested by the semantics of these compounds, but also by the fact that it is the word-class category of the initial member which determines the word-class category of the whole. Cf. example (7b), where the first element is a compound noun and the second element a verb or adjective (the difference between V and A is not very sharp in Vietnamese), whereas the whole word is a noun again.

However, Vietnamese also has a large class of so-called Sino-Vietnamese compounds, which have been borrowed, either in parts or in their entirety, from Chinese, but which have acquired a Vietnamese pronunciation and in some cases also a different meaning. Such compounds have the Chinese pattern (which is typically right-headed, if we ignore for the moment exocentric and coordinative compounds). Some relevant examples are given in (8) (data are taken from Tru'o'ng 1970):

- (8) a triet - hoc 'wise study = philosophy'
 V/A N
 b ái - luc 'love power = affinity'
 V N

Sino-Vietnamese compounds may be embedded in Vietnamese compounds:

- (9) giáo su dai hoc
 teach:V master:N great:A study:N

 teacher:N university:N

 professor:N

- (10) ngu vi hoc
 language:N unit:N study:N

 morpheme:N

 morphology:N

- (11) ap chien luoc
village:N fight:V plan:N

 strategy:N

 strategic village: N
- (12) dong co 8xy-lanh
move:V machine:N 8-cylinder:N

 engine:N

 8-cylinder engine:N

In examples (9) and (12), we see that the head of a compound does not have to be in a peripheral position: the ultimate head of the structure is *su* in (9) and *co* in (12). Similarly, in the Vietnamese word for division artillery commander, *chi huy truong phao binh su doan* (literally: 'commander head fireworks soldier division'), the head element is the third element from the left and the fifth from the right, *truong* 'head'. Now for Vietnamese, the determination of the lexical head of a compound is not particularly relevant, and certainly not as important as it is for languages like Dutch in which the lexical head is the locus of inflection, or the determiner of grammatical gender. But we would guess that if Vietnamese were to have these features, it would clearly be problematic for the view put forward in Hammond (1991), according to which inflection is defined not with respect to heads, but with respect to marginal positions of a word: either the initial or the final element. We return to Hammond's proposal in the next section.

We see some of the problems that might have arisen in Vietnamese, had it been a language with richer inflection, if we take a look at the Romance languages. Scalise (1988) notes that Italian has two types of compounds: right-headed compounds reflecting the Latin pattern, and more modern left-headed compounds reflecting the head-first syntax of modern Italian. The position of the head is the locus of inflection, cf.:

- (13) Latinate
singular plural

terremoto terremoti 'earth quake(s)'
sanguisuga sanguisughe 'bloodsucker(s) = leech(es)'
- (14) Modern
singular plural

divano letto divani letto 'divan-bed(s)'
nave traghetto navi traghetto 'ferry-boat(s)'

Scalise does not give any examples of Latinate compounds within modern ones, but presumably these are not excluded, although a search in dictionaries did not yield any results. The main problem in finding any relevant cases seems to be a general resistance in Italian to the use of long compounds.

Scalise draws the conclusion that in Italian, the head is not positionally defined. Since the position of the head is not free either (we cannot freely commute the two members of a compound), a further conclusion might be drawn: There is no headedness parameter for compounding. This conclusion can be avoided if we suppose that the head position is not fixed for all compounds (or all compounds of a certain type, e.g. N+N compounds) in a language, but per compounding system. Italian, like Vietnamese, uses two systems, and the resulting variation reflects this fact.

7. Head marking and other systems

Languages within compounding structures usually mark inflectional features on the head of the compound, just as in syntax the head of a phrase is typically the bearer of inflectional features. In the framework of Generalized Phrase Structure Grammar, this observation is enshrined in the Head Feature Convention, which governs the default pattern of feature percolation: the inflectional features of a phrase are the features of its head daughter.

A problem within the domain of morphology is the existence of uninflecting elements. Many affixes, for instance, are fixed elements, and do not carry any inflectional features. As Hammond (1991) has pointed out, this is a problem for theories which put much stock in the use of the notion 'head' for marking inflectional information. If inflection is always marked on the head of a word, we would expect to find inflected prefixes in Dutch and English. For instance, in Dutch the prefixes *ver-* and *be-* are heads in the sense that they determine the category of the complex word: e.g. *beklemtoon* 'stress, emphasize' is a verbal stem, whereas *klemtoon* 'stress' is unambiguously a noun, and the verbal stem *bezuinig* 'economize' is derived from *zuinig* 'parsimonious', an adjective. Yet the inflection goes on the stem, and not on the affix: *beklemtoonde*, *bezuigde*, *bezocht* (irregular inflection on the stem *zoek* 'seek') etc. Similarly in English. Hammond's proposal is that inflection is defined positionally: it always appears on a peripheral constituent, in English and Dutch, the final one. However, if we do away with the notion 'head' for the marking of inflection, we have a serious problem in the Italian compounding case, because the variation in inflection would now no longer follow from the differences in head position, but be entirely random. This seems counterproductive.

It seems preferable, in light of this, to propose that inflectional features are not expressed according to a single principle, but that there may be several ways of expressing inflection:

(15) *Inflectional Marking: Main Types*

- A Head Feature Convention: Percolation to/from the head
- B Stem-expression: If the head affixes do not inflect, the stem is marked
- C Peripheral: The marker is external to the entire construction
- D On all daughters

Examples of types (a) and (b) have already been discussed. An interesting example of type (c) is found in Dutch: a small set of verbal compounds (all involving verbs followed by body-part nouns, cf. Van Ginneken 1940) are left-headed but bear inflection on the right, cf.:

(16) *Dutch Left-Headed Right-Inflected Verb Compounds*

[kwispel - staart] - en	'tail-wagging'
wag:V tail:N infl	
[klapper - tand] - en	'tooth-rattling'
rattle:V tooth:N -infl	
[likke - baard] - en	'beard-licking'
lick:V beard:N infl	
[stamp - voet] - en]	'stamp-footing'
stamp foot infl	

Note that inflection is not *on* the final member, but after it: the nouns *staart*, *tand* and *baard* do not bear verbal inflection. A more familiar example of external inflection is offered by the English genitive ending, as in *the King of England's crown*. Examples of type (d) may be found in the Romance languages (or in the Celtic family, cf. e.g. Allen 1975 and Stump 1991). Thus, in French, we have:

(17)	le bateau-feu	les bateaux-feus
	le petit-maître	les petits-maîtres
	le timbre-taxe	les timbres-taxes

Sometimes, several of these marking systems may be combined. An interesting example of this can be found in Bulgarian. In a small number of left-headed compounds plural marking is on both members, but definiteness is marked only on the head element (Scatton 1984):

(18)	a	studént-otlícnik	'prize-student'
	b	studénti-otlícnici	'prize-students'
	c	studéntûk-otlicnik	'the prize-student'

Such possibilities show that inflection must have access to the notion 'head', but also, that it is wrong to *define* the head as the locus of inflection, since nonheads may also be marked for inflection sometimes.

8. Summary and conclusions

We have seen that the position of the head within a certain domain, say that of the verb within the sentence, or that of the modified element within a compound, does not have to be fixed once and for all in a given language, but that there may be mixed systems, often originating through language contact. This means that the task awaiting the language-acquisition device is not just picking the right parameter setting on the basis of positive evidence, but also the more complicated task of separating the data into systematic classes. Otherwise the acquisition device will predict free word-order in cases where the order is not in fact free, but fixed within a certain subsystem of the language. The notion of a 'language', which is often taken for granted, must be reconstructed (or 'deconstructed' if you like) into several interacting, and sometimes competing, systems, each of which has considerable simplicity, but the combined output of which may be much less transparent. Another conclusion that can be drawn from this article is that there is no such thing as a universal Right-Hand Head Rule or even a parametrized version of it which says that the head position is fixed (either left or right) for any given language (cf. Van Beurden's 1988 *Peripheral Head Rule*).

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