Affixation and Logical Form

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0. Introduction

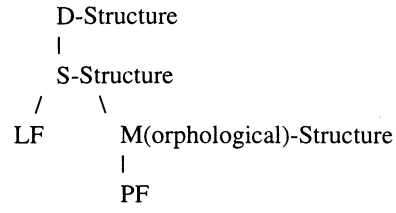
The driving force of the minimalist program is the idea that 'a particularly simple design for language would take the conceptually necessary interface levels to be the only levels' (Chomsky 1992: 3). In this paper I follow this basic idea and apply it to the theory of affixation.[1]

In section 1 I define the impact of the citation given above. In section 2 I define a notion of category change at LF, and argue that it is this type of 'semantic' category change which defines the difference between 'derivation' and 'inflection' and develop a formalism encoding the difference at LF. In section 3 it is shown that this formalism is also capable of explaining the notion of referential islandhood, while extensions are made to the theory of argument structure and to adjuncts. Section 4 addresses some additional issues and presents an illustration.

1. Morphological Models

Any morphological model accounts for the categorial properties of the base and the derived item, and any model also has an additional distinction between the phonological and the semantic properties of the derived item. More in particular, I am interested in models of the type in (1).

(1)



For 'inflection' this model has been proposed by Halle and Marantz (1993) most recently, while for 'derivation' a model of this type has been defended by Beard

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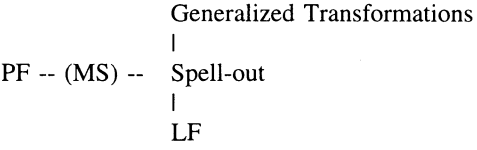
(1987) - pace some terminological changes. The model in (1) amounts to a 'process-based' type of morphology, a model in which affixes are merely a reflex of more abstract syntactic-semantic operations. As Don (1993) argues, this accounts for at least the following three phenomena. First, it is possible to spell-out one syntactic-semantic process via different affixes (e.g. event nominalizations may be spelled out with *-ion*, *-ment*, *-age*, *-ing* and others); second, it is possible to have one affix participate in several distinct syntactic-semantic processes (e.g. *-er* spells out a deverbal agent nominal or the comparative of an adjective); third, one is capable of accounting for the so-called ordering paradoxes - these simply amount to the availability of two representations for any derived item, where each representation is based on different and possibly conflicting criteria (cf. also Hoekstra, v.d. Hulst and v.d. Putten 1987 or Ackema and Don 1992).

If now one likes to proceed in the direction of a 'minimalist' morphology based on models of the type in (1), one should arrive at (2).

(2)



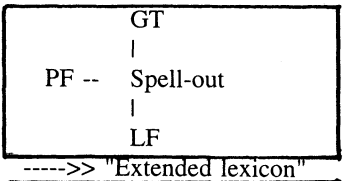
For morphology the move is much easier than for syntax. First of all, there is evidence for a spell-out point: a stray-affix filter of the type that can be found in Baker (1988) in fact is nothing more and nothing less than the stipulation that GT must combine the affix with a base prior to Spell-out. However, beyond this property, I have found no particular constraint in the literature that should operate on S-structure in the morphological model in (1). This is relevant, as the bulk of the problem for syntax proper is the existence of specific properties which were standardly associated to this level. With respect to D-structure, the solutions proposed for syntax proper simply carry over to the the morphological model. In sum, doing 'minimalist' morphology does not have much influence on the redefinition of the theory. In fact, one might even like to say that morphology has always been 'minimalist' in the sense that there never has been hard evidence for more than two levels of representation.

There is at least one effect due to minimalism for morphology. The phenomenon of 'blocking' reduces to an instance of economy. Take e.g. the blocking of a derived item by a lexical item with a comparable meaning (**stealer*, *thief*); with *thief* the derivation takes 0 steps, while with *stealer* the derivation has at least one step: the shortest and/or the fewest step requirement gives the desired result. As has been noted, blocking is related to synonymy and therefore rather lax; this is not a problem for economy, as economy does not compare derivations that lead to different meanings (taking a less econominal morphological route may thus be motivated by the desire to create a meaning difference).

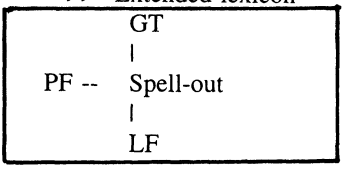
The model in (2) also has one other effect that is relevant with respect to standard GB theorizing. As GT in (2) now treats 'affixation' as one phenomenon, the distinction between 'derivation' and 'inflection' is lost. The GB-standard is that 'derivation' is treated in the lexicon, while 'inflection' is treated by the syntax. With two levels of representation only and one type of computation, the distinction is lost. In other words, for 'affixation' I assume that the GT-computation generalizes. This in turn entails that either PF or LF is relevant for the distinctions that are made between 'derivation' and 'inflection'. On the basis of the assumption that the PF-interface is nothing more and nothing less than the specified string which is the input for the articulatory-perceptual grammar-external system, PF does not seem to be suitable. My view that PF is unsuitable does not necessarily mean that the morpho-phonological component which generates the PF strings is unsensitive to the differences (level-ordering might be a case in point, but it should be noted that Kiparsky (1982) argues that 'inflection' is not a phonologically unified phenomenon). In the minimalist program it should therefore be LF that accounts for these differences. Here I elaborate this track.

Before proceeding, one large note of caution. Claiming that the GT-computation generalizes over all types of affixation does not say anything about the separation of affixation from syntax. In fact, the slogan that 'all affixation is alike' has generally led to lexicalism. This is not necessarily so, it could also lead to what might be called 'syntacticism'. Syntacticism relies on the fact that joining a base with an affix is an operation of Head-joining, where e.g. the Righthand Head Rule is a surface effect of the general property of syntax that adjunction is to the left (Kayne (1993)). For the moment two options are available:

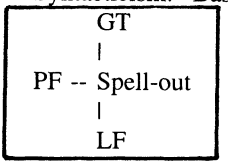
(3) a Lexicalism: "Basic lexicon"



----->> "Extended lexicon"



b Syntacticism: "Basic lexicon"



That is, with lexicalism, the models given in (1) or (2) are encapsulated in the lexicon which outputs readily formed words with affixes, an extended lexicon. In Chomsky (1992) these would be subject to the checking formalism in syntax proper, where syntax proper has the same model. With syntacticism however, there only is one system. I assume the syntacticist hypothesis, model (3B), while

delegating some discussion to section 4. Note however that both models lead to the conclusion that the distinction between 'inflection' and 'derivation' is a matter to be settled at LF, whether it is the first box in (3A) or the sole box in (3B).

2. *Syntactic and semantic category changes*

As the major problem now is the definition of the differences between 'derivation' and 'inflection' at LF, it is useful to make a distinction between 'syntactic' categories and 'semantic' categories. Independently, there have been several proposals as to the LF-interpretation of the syntactic categories V,N,A: E(VENT), R(EFERENT), P(ROPERTY) respectively. Although several sub- and crossclassifications are available, this set is sufficient in this paper. It leads to lexical information of the following type for basic elements: *dog* {syncat:N, semcat:R}, *nice* {syncat:A, semcat:P}, *sing* {syncat:V, semcat:E}.

The basic question is to know which type of categories define the difference between 'inflection' and 'derivation' - the syntactic ones (V,N,A) or the semantic ones (E,R,P)? As we argued above that LF has to define the difference, the prediction would be that the semantic ones are dominant. This is indeed what I will argue here.

First, consider 'derivation'. When deriving *modernize* from *modern* one changes the syntactic category (A becomes V), but one also changes the semantic category (P becomes E). Abstracting from known problems such as diminutives, let us take this example as illustrative and state (4):

(4) Derivation: simultaneous change syncat - semcat.

As the change is simultaneous, it is impossible to untangle what is the matter, but now consider the following list of processes, which have been argued to illustrate 'nominalizations in syntax' or 'adjectivizations in syntax', (5), a list extendable in several directions.

(5) a Nominalized infinitives in Dutch (cf. Hoekstra 1986)
b Gerundive nominals in English (cf. Chomsky 1970)
c Present participles in Germanic (cf. Drijkoningen 1992)
d Passive and perfective participles in French (cf. Drijkoningen 1992)

What is happening in all these cases is that the meaning of the verb is preserved, while the constuctions function as nominal or adjectival constituents for other properties (e.g. nominalized infinitives must occur in Case-bearing positions). In fact, gerundive *-ing*, the infinitival ending and participle morphologies are in the same paradigm as TENSE. With respect to TENSE, I assume it is an Operator, cf.

Pollock (1989). According to Higginbotham (1985) the TENSE-Operator binds the Event-variable of the verb: T<Op_i> [.. V<E_i> ..].

Once affixes may be operators, the constructions in (5) are accounted for by saying that they have the same semantic category as TENSE - Operator - while being of the syntactic category A or N.[2] As an Operator they license the E-variable of the verb, thus accounting for the preservation of the verbal meaning. This is illustrated in (6).

(6) a N <Op_i> [.. V <Ev_i> ..]
b A <Op_i> [.. V <Ev_i> ..]

In more general terms, I propose that the difference between the processes in (5) and 'derivational' processes is a difference in licensing of the E-variable. The list in (5) changes the syntactic category but licenses the E-variable. In other words:

(7) Inflection: syncat change without semcat change.

To sum up so far, the inflectional class of elements receives the general characterization in (8a), while for derivational elements I propose (8b) - that is, the fact that *modernize* is an Event is caused by the fact that *-ize* is not an Operator, but an item with its own semantic variable (*-ize* {syncat:V, semcat:E}).

(8) a Inflectional class of affixes:
Operator$_i$ {V,A,N} [<Variable$_i$> {V,A,N}]
b Derivational class of affixes:
<Variable> {V,A,N} [<Variable$_{arb}$> {V,A,N}]

The properties with respect to the change in semantic category define the difference between 'derivation' and 'inflection', not the properties with respect to the change in syntactic category. Put differently, Generalized Transformations are capable of changing the syntactic category, while LF defines the difference as a difference in reading between licensed and unlicensed variables of the E,R,P type. Operators license the E,R,P variables, while derivational functors bear their own E,R,P type Variable.

As to the question what happens to the embedded variable under a derivational process, I have encoded this as 'arb'. This means that I propose that head-variables of the type illustrated can also be 'arb' in interpretation. The notion of 'arb' has always been used for maximal projections (mostly NP), I propose that the 'arb' interpretation may also hold for heads. In this way, a

[2] For TENSE I use V as syntactic category.

natural link with the notion of referential island is made; it has always been claimed that the base of a derived item does not have the normal referential properties when compared to the base of an inflected item. Giving the index 'arb' to the head-variable is nothing more and nothing less than a formalization of this intuition. The advantage of making this a formalism becomes clear in the next section.

3. *Referential islands*

As now the notion 'arbitrary' applied to a head governed by a derivational functor is no longer a reflex of the model, but directly encoded in the structure, this allows us to use the arbitrary property of the head for the explanation of other phenomena.

3.1. Heads. Let us first consider heads. Words of the derivational class get a GT-derivation of the type illustrated in (9).

(9) .. X_2+X_1 [.. t_2 ..]: $modern_2$+ize_1, $shelv_2$+e_1

For e.g. Hale and Keyser (1992) an algorithm will apply, which assures the property of referential islandhood. The general effect of this algorithm is that the whole will function as the X_1 for syntax, while the algorithm itself is responsible for the deletion of the trace, which makes the embedded element invisible for interpretation. Under the approach defended here, this amounts to (10), where the <ref>/<arb> notation is simply a notational variant.

(10) LF: modernize: EVENT<ref> [.. PROPERTY<arb> ..]
shelve: EVENT<ref> [.. REFERENT<arb> ..]

(10) confirms the intuition of Hale and Keyser (1992) and other theories about the referentiality of the elements which are combined. However, this has generally led to the postulation of a difference between levels, the lexicon versus syntax. This is no longer true nor necessary in the formalism I use here: GT can combine these elements, while at LF the embedded variables receive their interpretation dependent on the governor. This is the more detailed impact of the general definition given in (8b): If one shelves one's book, we are not refering to a particular shelf, we are refering to some arbitrary shelf.[3]

[3] I assume that incorporated elements may be doubled by adjuncts: *He shelved his books on the top shelf.*

3.2. Arguments. As now the properties of the embedded head of a derivationally formed word are encoded, I argue that the referential properties of other elements in the government domain are also under the influence of this arbitrarily interpreted head. Let me say that the referential properties of constituents depend on the head of the constituent. The general idea is that if the head is referential, then its arguments must be referential too; a referential head referentially licenses its arguments. Likewise, an arbitrary head does not referentially license its arguments, the licensing of the arguments has to come from elsewhere. This is in general what seems to happen in the 'lexicon' with respect to argument structure: the various operations of deletion, addition, internalization and externalization in Williams' (1981) sense.

First consider the addition of *-ize* to *modern*, as in (11).

(11) He -ize [the house modern]

GT has started with *modern*, and *the house* saturates the one argument it takes. Further computation adds the morpheme *-ize* which takes the existing constituent as its complement. *Ize* has one external theta-role to assign, a role which is discharged on the subject position. With respect to e.g. Williams (1981), there is no 'addition' of a theta-role: the affix just has an external role to discharge. The empirical difference is minor of course, but there is also no internalization in this system. In the way sketched, the internalizing effect is just a consequence of GT. In the configuration given, the subject of *modern* cannot but surface as the object of *-ize*. There is no separate rule needed. As far as LF is concerned, we derive the representation in (12). Next to the already seen head-variables, the representation is based on the idea that the referential head referentially licenses the arguments in its government domain.

(12) NP1<ref> Event<ref> [NP2<ref> Property<arb>]
\-- E R L --/ (Exceptional Referential Licensing)

With respect to the arguments, both NPs are in the domain of *-ize*, under the assumption that the subject of an embedded small clause is governed by the verbal governor. I have called this process 'Exceptional Referential Licensing' In other words, *the house* is inherited in the process of *-ize* affixation because it is the external argument of the embedded predicate. Brief, the process illustrated with *modernize* entails inheritance via internalization and addition of a thematic role as an automatic consequence of GT.

The prediction of a representation like (12) is clear. In the domain of the arbitrarily interpreted Property other NPs than the externally licensed subject will not be referentially licensed. An example of this pattern is found in a rather classical problem for inheritance theory, illustrated in (13).

(13) a NP is bang (voor NP) 'NP is afraid of NP'
b NP is bangelijk (*voor NP) 'NP is "afraidish" (of NP)'

Although the adjective *bang* can be input to a process which is spelled-out via *-elijk*, this process entails the non-inheritance of the original internal argument. The NP which functions as the subject of *bang* is retained as the subject of *bangelijk*. Therefore, in terms of GT, we have a morphematic raising predicate, as illustrated in (14):

(14) NP_i -elijk [t_i [bang NP]]

This means that the internal argument remains in the domain of the non-referentially licensed Property. If non-referential heads spread this property inside the domain they govern, this complement cannot be but non-referential itself. Hence, the LF in (15) is derived:

(15) NP_I Prop<ref> [t_I [Prop<arb> NP<arb>]]

The LF is very close to the exact meaning of the phrase (13b). Someone who is *bangelijk* is in fact *bang* for undefinable arbitrary things. In other words, the process of 'deletion' of a thematic role via a morphological process also is a rather automatic reflex of the system defended.

Finally consider a more complex example:

(16) a The readability *0 / of the book.
b -- ity [NP_i [able [NP [read t_i]
c R<ref> <Ref>(ERL) [P<arb> <arb> E<arb>]

D licenses the referential reading of the R-variable of *-ity*. As a consequence the external argument of the property *readable* is licensed referentially via ERL. The property *readable* itself is arbitrary, while the *read* event is arbitrary too. The object of *read* ultimately is referentially licensed, as NP-movement has brought this NP in the domain of the referential head *-ity*. The subject of the embedded *read* event is interpreted arbitrarily also, most likely because *able* is not an ERL-licenser (that is, ERL is like ECM dependent on the element).

In conclusion, in the government domain of referentially licensed heads the arguments are referentially licensed. Arguments outside this domain are not referentially licensed and receive arbitrary interpretation.

We basically maintain the same approach for adjunct and modifiers, for *He made the house very modern* versus **He very modernized the house*. Adjuncts are also dependent on the referentiality of the head they are supposed to modify.

3.3. Conclusion. The notion referential island is a notion relevant at the level of LF. Derivation creates 'new concepts' because the affixes introduce new variables of the E,R,P type, while the making of 'new concepts' as a process is a GT-operation leading to a specific LF interpretation.

Arguments and adjuncts are directly dependent on the properties of the head, with the exception of the Subject, which in a number of cases can be referentially licensed by an external governor.

With respect to minimalism, we answer the question 'at which interface does referential islandhood play its role' with 'at LF'.

4. One illustration and some additions

As an illustration, compare derivations with *-able* with verbal passives. In the theory presented the following generalizations and differences obtain for the two examples in (17).[4]

(17) Y is read (by X) / Y is readable (for X).
(i) the computation uniting heads generalizes: Head-movement.
(ii) the higher position of the object generalizes: NP-movement.
(iii) the lower position of the subject generalizes: adjunct.
(iv) the syntactic category change generalizes: PASS and ABLE are A.
(v) the semantic category change gives the difference:
PASS : Op + E<ref> versus ABLE: P + E<arb>

This leaves us with other empirical differences, differences beyond the fact that allegedly 'verbal' passives have licensed Event-variables (but bear category A). They are essentially three-fold. First, there are impersonal passives in Dutch, but no impersonal *-able* derivations, as shown in (18).

(18) a Er wordt gelachen. 'There is laughed'
b *Het/er is lachbaar. 'There/it is laughable'

The difference is encodable at LF. In (18a) we have an E-variable which by itself has no predication requirement, the predication requirement in sentences being connected to T or AGR. In (18b) on the contrary we have a Property which by itself has his own predication requirement. (18) simply translates 'A has one

[4] The intuition that *-able* derivations and verbal passives share a number of properties has been around. Some other generalizing properties are **The stone has been fallen / is fallable* and **The house has been possessed / is possessable.*

predication index', while 'V has none' as 'P has one predication index' while 'E has none'.

Next consider the contrast in (19).

(19) a John is believed to be intelligent.
b * John is believable to be intelligent.
ABLE [NP believe [IP]
Prop<ref> Event<arb> *Ref.licensing

In (19a) the passive morpheme is an operator of the inflectional class, which makes the E-variable of *believe* licensed. Once *believe* is licensed, it in turn licenses its complement. Once the IP is licensed, the licensing procedure is continued inside the clause, which entails that the subject is referentially licensed. With *-able* however, we have a derivational affix, which does not license the E-variable of believe. If BELIEVE now is <arb>, it cannot license its complement, the IP. Although one can pick out the subject and move it to a position where referential licensing is possible (subject of ABLE), the rest of the complement remains unlicensed. So (19b) essentially is out for lack of Referential licensing of the complement IP, a consequence of the argument structure approach given for objects with the example *bangelijk*. The same analysis can be used for the contrast between *John has been given a book* and **John is giveable a book*, once one accepts a SC hypothesis for datives.

The third difference between *-able* derivations and verbal passives is the possibility of agent-oriented adverbials, as illustrated in (20):

(20) a The paper was cited delibarately.
b * The paper is delibaretely citeable.

This difference can also be accounted for. As the Event embedded under the passive operator is referential, the external argument of this Event is referential too (PASS [NP<ref> E<ref> NP-trace]); As the Event embedded under the *-able* functor is not referential, the external argument of this event is nonreferential too (ABLE [NP<arb> E<arb> NP-trace)). In the one case, the external argument is 'visible' for other rules, in the other case 'invisible'.

Finally, let us go back in history and consider the cases Fodor (1970) gave.

(21) a Floyd caused the glass to melt on Sunday by heating it on Saturday.
b * Floyd melted the glass on Sunday by heating it on Saturday.
c Floyd caused the glass to melt and it surpised me that it did.
d * Floyd melted the glass and it surprised me that it did.
e TENSE_i [X<ref> CAUS $<\text{Ev}_i>$ [Y<ref-ERL> melt$<\text{Ev}_{arb}>$ (t_y)]]
f TENSE_i [cause$<\text{Ev}_i>$ $[_{IP}$ Y<ref> to$<\text{Op}_i>$ melt $<\text{Ev}_i>$ (t_y)]]

The clauses (e) and (f) are simply an application of what I proposed so far. They are sufficient to rule out the ungrammatical examples; the basic difference is that the abstract CAUS head is an element of the derivational class with an arbitrary Event-variable in its complement, while the *cause* verb takes a fully licensed complement. The arguments of Fodor can thus be explained with our formalism.

Note that the basic issue Fodor addressed was the nature of D-structure. If however D-structure is non-existent in the minimalist program, we claim that her arguments are valid, but only bear on LF.

To conclude, we have successfully explained the differences between 'derivation' and 'inflection' and developed a formalism which is able to account for the most prominent arguments for a difference between 'lexical' and 'syntactic' computations (category changes in syntax, referential islandhood of derivation, derivational argument structure changes, Fodor). This leaves us with the issue of lexicalism announced in section 1.

Recall the two models given in (3). The theory sketched above corresponds directly to the syntacticist one. With the lexicalist one, the theory sketched above is easily convertable. As I declared the inflectional class to consist of Operators, one might ask how these Operators are licensed themselves. I could simply say that these Operators are the ones that must be licensed independently in the other box. With this type of model the formalism I developed can be looked upon as a specification of the algorithm Hale and Keyser (1992) have in mind (globally: put the elements with <ref> in the extended lexicon). The basic question I want to ask however is: Which one of the two models is the more economical?

I take economy as an evaluation measure for several competing derivations taking the fewest/shortest steps as the decisive criterion. Now simply take V, T and AGR. In the syntacticist model there are two steps. With the lexicalist model there are two steps in the first box (the building of the morphological complex), while there are also two steps in the second box (the syntactic checking of the morphological complex). From this point of view, the lexicalist model essentially does a double job. The double job property is present all over: e.g. freely assign Case and checking of Case. Doing double jobs does not look very economical to me. The variant of economy I have in mind is 'economy of the model'.

Economy of the model has empirical effects. As an example, consider again verbal passives and *-able* derivations. As shown above, they share a number of properties, while the differences are treatable at LF. A notion of economy of the model encodes the intuition that externalization with *-able* in Williams' sense is a type of operation similar to NP-movement with verbal passives. If economy of the model holds, this 'promotion' to subject of an object should indeed be treated by the same computation.

5. *Conclusion*

In this paper I have developed a syntacticist theory for affixation. The differences between 'derivation' and 'inflection' are real, but do not bear on differences in GT-computation, they bear on LF. I developed a formalism based on the referentiality of variables of the E,R,P type, suggesting that inflectional affixes license them. Derivational affixes on the other hand do not license these variables, they assign them arb. In addition, I have argued that the arb/ref property of the head directly influences the other constituents in the government domain.

I add that the old generative semantics debate does not come back under the type of approach defended here. One of the attractive properties of the formalism I propose here - I feel - is that the bifurcation between lexical decomposition and derivation on the one hand and inflection on the other hand is encoded at LF, thus supporting a real large difference between a generative semantics enterprise and an LF enterprise of which the basics are sketched here.

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