

Leftward Movement in Morphology

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1.0 Introduction

A strong argument in behalf of the abstract nature of fundamental phrase-structure relations emerges if we can demonstrate that structural principles apply both to syntax and lexical morphology. Historically, phrase-structure was first linked to categories (NP, VP, etc), then to a more abstract X-bar structure, and finally to Feature-oriented "bare" structure linked to the properties of words (Chomsky (1995), (1998)).² Kayne (1994) briefly suggests that the anti-symmetrical architecture of phrase-structure may operate in the lexicon. We show that it does.

The empirical base of this essay lies in the systematic contrast between two kinds of nominal incorporation, leftward outbreak and rightward breakout. Here is a set of minimal pairs of various sorts:

- 1) setup/upset
start-up/upstart
hangover/overhang
passover/overpass
turn-down/downturn
lookout/outlook
payback/backpay

Since each of the existing cases has its own history, we established that a difference exists for novel nominalizations. In a small group of informants, (2a) was always preferred to (2b):

- 2) a. At the fair few people showed up. The "show-ups" were elderly.

¹Thanks to Manfred Bierwisch, Hagit Borer, Noam Chomsky, Rose-Marie deChaine, Marcel den Dikken, Ann-Marie di Schullo, Richard Kayne, Ken Hale, Teun Hoekstra, Anders Holmberg, Kyle Johnson, Alan Munn, Elizabeth Ritter, William Snyder, Michal Starke, Chris Wilder, Joachim Zeller and students in classes at UMass, presentations at GLOW, the "Configurations" conference in Montreal, ZAS in Berlin, and the University of Leiden. The analysis and data went through a fair amount of evolution, and I regret not being able to incorporate in this draft all of the valuable commentary received. Errors of fact and interpretation are mine.

Earlier versions of this paper have circulated with the title of "Anti-symmetry and Leftward Movement" co-authored by S.J. Keyser and me. We are collaborating on an extension of this work, but he felt that his part did not warrant co-authorship on this essay. He was, nonetheless, instrumental in a number of observations, in particular the use of the concept of "rebracketing".

²In early work, it is precisely because morphology exhibited category-changing rules that it seemed to lie outside of phrase-structure. Persistent arguments for transformations within the lexicon (Lees (1960), Vergnaud (1973), Roeper and Siegel (1978)) argued for the presence of syntactic principles within the lexicon, a view which is widely accepted now (see, for instance, diSchullo (1997)).

- b. At the fair few people showed up. *The "upshows" were elderly.
- c. The house slipped down the mountain in the mud. The "downslip" was gradual.

We note that (2b) the "show-ups" refer to human AGENTS.³ In (2c) the leftward affix is perfectly acceptable and an unaccusative, non-agentive meaning is present.

1.1. Summary of Claims

One focus of our essay will provide an extensive demonstration that Spec-Head-Comp structure applies to leftward nominals and their complements (outbreak of disease) in accordance with Kayne's anti-symmetry principle. A variety of further syntactic principles must be engaged to capture the leftward movement derivation of this simple contrast: both Head-movement, by SUBSTITUTION, and recursive Head ADJUNCTION.⁴

We give now a summary of the mechanisms proposed, which we will then re-derive in a fashion that responds to a diverse array of data.

Four fundamental claims will be advanced:

I. Leftward recursion is possible, but not rightward recursion:

- 3) a. re-over-reimbursement
- b.*follow-up-up/*sleepover-over

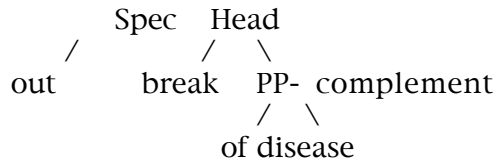
This contrast follows from a productive and iterative rule of leftward movement for prefixes. While forms like re-reread have sometimes been seen as phonological reduplication, a syntactic contrast indicates that we must represent it as syntactic recursion. Therefore, like sentential or adjectival recursion, it represents one of a few points of recursion in grammar and should, therefore, provide a central pivot for grammatical analysis.

II. Leftward moved particles occupy a Specifier position which c-commands a PP complement (Kayne (1994)):

- 4) Word
- / \

³Chomsky (class 1995) argued that all non-maximal projections are incorporated into the verb. Our study of nominals provides an example of where that process is visible. However he suggested that there was no difference between leftward incorporation (meat-eating) and rightward incorporation. A central tenet of this essay is that there is a strong distinction to be made which, moreover, captures an interface between Head-movement and argument structure.

⁴Although we adapt current theoretical apparatus to the description of lexical phenomena, we think that the fact that every element in the traditional lexicon is a Head may ultimately lead to special constraints. It is the lexicon which will prove to be the center of a set of Head Operations. We do not think it would be insightful at this point to integrate our observations fully into Baker's (1988) theory of Head-Movement Constraints.



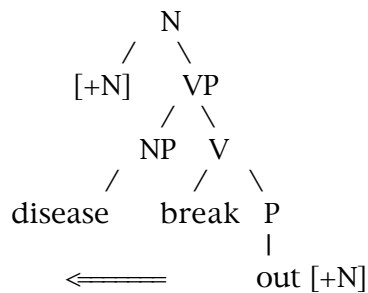
Rightward incorporated particles are REBRACKETED and fail to c-command a PP (5b):

- 5) [hand] V out] Prt] VP => [handout] V=> [[handout]V]N
 a. the outbreak of disease
 b. *the handout of good examples⁵

Because complements require a c-commanding licenser (under Kayne's 1994 anti-symmetry analysis), only preposed particles allow complements:

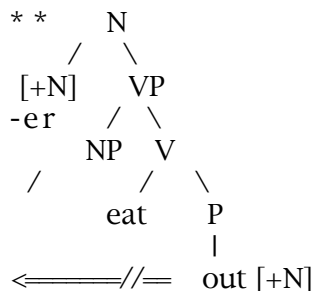
- III. Head-Movement, by SUBSTITUTION, into a higher N-node allows Feature-checking of an N-feature. Preposing turns a Verb into a Noun:

- 6) a. the disease breaks out/*the disease outbreaks
 b. the outbreak



If another N-feature is present, as in -er, the derivation is blocked (7c):

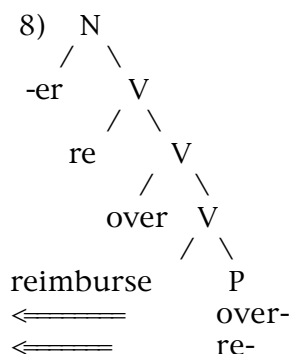
- 7) a. *outbreaker
 b. he eats meat => meat-eater
 c. he eats out => *out-eater



⁵Of course, a gerundive nominalization is quite acceptable, and has a different derivation:

- i. the handing out of good examples

IV. Leftward moved Heads, which do not change category, are ADJOINED, and allow recursion, and -er:



This allows:

9) re-over-reimburse/ re-over-reimburs(er)

This illustrates that Head-substitution and Head-adjunction are both present in the lexical derivation, but have very different consequences.

1.1 Core Data

Rare but systematic data can put theoretical claims into sharp relief. English, alone among Germanic languages, systematically creates hundreds of examples of both left and right incorporated nominal particles as in (1) and (2):

10) breakout
 break-in, sit-in, walk-in
 break-up, lockup, workup

11) outbreak
 intake, inlet, instep
 upgrade, upsurge, uptake

□

The examples in (1,10,11) vary in syntactic origin, particle meanings, and history. Nevertheless the pattern is highly systematic and exclusive to English. All other Germanic languages place particles exclusively to the left (with only a handful of exceptions⁶). Expressions like Ausgang, Ausgehen (out-go = exit) could not possibly be *Gangaus, *Gehenaus.⁷

Two contrasts (with few exceptions) above are critical:

12) 1. Prefixed particles allow complements, but not suffixed:

⁶Informal inquiries among 25 people reveal only a handful of examples like kerr-aus which tend to have highly idiomatic interpretations.

⁷Neologisms are quickly assimilated to the prefix form in German. An issue of Stern contained the expression (derived from English "fucked up"): "upgefueckt"and notably not *gefuecktu.

- outflow of funds/*carryout of food
2. Prefixed particles allow recursion, but not suffixed:
re-over-invest/*followup-up

A third will be justified in due course:

3. Prefixed particles are non-agentive, or UNACCUSATIVE, but suffixed particles occur with agentive verbs⁸:
outbreak of disease (unaccusative)
workout (implied agent) = someone works out
=/= things worked out allright

1.2 Larger Taxonomy

We provide now a taxonomy of the core data in order to keep a potentially confusing set of subcases separate.

- 1, First there are Verbal and Nominal Prefixes:
a. **Verbal Prefix:** to overthrow/*to outlook/*to intake
b. **Nominal Prefix:** the outlook/the intake

A consequence is that verbal prefixes allow -er, but nominal ones do not:
overthrow => overthrower, but intake => *intaker

- 2, Second, it is possible to have a **Two-Step** Derivation: outfitter
a. step one: fit someone out => the outfit
b. step two: outfitN => to outfit

A consequence is: outfit allows -er => outfitter.

3. Third, there are two basic types of **RIGHTHAND NOMINALS**:
a. **Agent/Theme:** knockout/castoff/takeover/pickup/shake-up/fillup
These cases entail both a subject and an object:

NP-ag V NP-Th particle
[NP strike NP out]

- b. **Agent:** referential = dropout/standin/lookout
implied: = sleepover/workout/takeoff

4. Fourth, there are several types of **LEFTHAND NOMINALS**:
a. **Non-agent:** outlook, outcome, outpouring (of grief)
Note that in the case of outpouring the reading means grief poured out and not *we poured grief out.

⁸See den Dikken (1992) who similarly argues that all particles are linked to small clauses which are necessarily Unaccusative. Our argument can, perhaps, be assimilated to the small clause account.

b. **Agency Excluded:** outcry = no intentionality implied although one can get an agentive reading for : John cried out.

c. **Result:** outrage

This case has an historical origin in a verbal form, but the verbal form is no longer present.

1.3 Non Crucial forms of Historical and Semantic Variation

There are also a set of SEMANTIC and HISTORICAL factors which are not perfectly clear, but should ultimately, be related to the left/right contrast we are discussing. These factors will be left on the periphery, since they do not appear to alter the basic claims:

1. Origin of some forms are no longer present:

overbearing [outdated: to overbear]

2. Result meanings are present in both clear and obscure

ways for both prefixes and suffixes:

backpay = result	turnout = result
payback = action	outcome = result

3. A small set of exceptions exist, but never more than 10% of productive cases. all exceptions are drifted. (rollover of funds/*rollover of children)

4. Obscure forms of Drift are present. Consider upstart which has a shadowy argumental structure, with a strong attitudinal quality. An upstart company is seen as obtrusive by others but not by themselves.

5. The lexicon is subject to rules of elimination. This is an important point which is not mentioned in current theoretical work. Many verbs are eliminated from English when relevant rules disappear. On one page (p. 2032) of the OED we find:

overbend	overbloom
overbalance	overbrim
overbar	overbring
overbrow	overcarry

None of these forms exists in modern English, though their meanings are quite broad. Therefore the fact that a word exists historically does not guarantee that it will continue to be present. This has the effect of constantly decreasing the amount of lexical variation that historical factors impose upon the modern language. In other words, the language seeks to maintain the applicability of abstract principles to the lexicon.

6. Finally, we acknowledge, but do not address the fact that an interesting historical story should be told. In brief, the origin of righthand nominal particles must be related to their presence in verbal structures like: look up the information, which are not found in German, but which make rebracketing possible.⁹ It is, we argue, only the

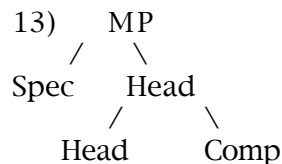
⁹See den Dikken (1992) and Neeleman (1991) for discussion of particles in Germanic languages. These works articulate both a small clause perspective and a complex predicate perspective on these constructions. If we can state just when incorporation occurs, then we may be able to explain why parts of both of these incompatible perspectives are correct.

antisymmetric configurational constraint which blocks a nominalization of the form: *the lookup of information, although terms like lookup exist elsewhere and can be used in compounds (information lookup procedure)¹⁰

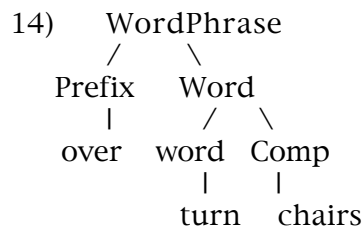
The diversity of these facts does not change the fundamental claim that there is a structural FILTER on possible particle compounds: only the Spec-Head-Comp structure shows recursive productivity with complements, as Kayne suggested, and therefore it filters out variations in syntactic, semantic, and historical sources that would not conform to the Spec-Head-Comp asymmetry. Where the facts are confusing, we will invent new cases or focus upon compositional cases (e.g. how did things come out => outcome in a compositional sense), in order to show how the principles work in pure cases.

2.0 Theoretical Background

The core of the asymmetry notion is that a structure of the form Spec-Head-Complement is universal [We revert to the traditional structure and not the algebraic structure used in Kayne's exposition for convenience.]



If we extend the notation to the lexicon, we generate:



The Prefix now functions precisely as a Spec node in syntax. Kayne briefly but explicitly suggests an extension of his theory to the lexicon. He observes that "a complex verb like overturn must be an instance of over adjoining to turn". He goes on to observe:

- 15) "The idea that all sub-word structure is of the adjunction type appears to be too strong when certain types of compounds are taken into account:
ouvre-boite (open-can)"

He then observes that such compounds have no complements,¹¹

¹⁰Typically, compound structure allows precisely the relations blocked in syntax. See Roeper (1993) for discussion of the contrast: stewcook/*the cook of stew. Likewise, information lookup is possible. Root compounds allow a range of interpretations which include thematic object, but this interpretation is achieved without a projection through argument structure (see Roeper and Siegel (1978)).

Indeed it is very clear that complements are blocked, as predicted:

- 16)a. *the showdown of Bill
- b. *the pushdown of a button
- c. *the knockdown of Fred
- d. *the letdown of people¹²

However, when the particle is attached to the left, then complements are almost always possible. We will argue, in concert with Hale and Keyser (1994), Keyser and Roeper (1994), and particularly Ferguson (1997) that the concept of inner complement can elucidate the contrast.

3.0 Productive Prefixation

A large class of lefthand particles occur.

- 17) upgrade of our tickets (upgrade =verb)
- downfall of the government
- undercurrent of dissent
- onrush of summer
- intake of refugees

These particles are relational in character.¹³ Other types fail to occur with regularity and with complements. For instance, we have a recent coinage: throughput. But we do not have:

- 18) *betweenfall (note: go-between)
- *among-go
- *around-walk (note: walkabout)
- *from-come

These may seem inherently implausible, but reflection reveals that they are not. We could imagine that the question: Where do you come from could turn into *He has a strange from-come. While throughput is a recent computational term, onrush has the flavor of 18th century poetry.¹⁴ Non-productive examples are non-productive precisely because they fail to meet a syntactic requirement.

¹¹In his terms: "the argument....that a head cannot have internal structure of a non-adjoined sort, depends on the head in question having a complement."

¹²Kayne provides one counter-example, which we argue does not generalize (as his theory predicts):

- i. Bill's putdown of John

¹³Relational prepositions are the kind which are implied in compounds. For instance,

made in a factory => factory-made

We can examine the contrast in terms of one particle out- which has a rich selection of both righthand and lefthand cases. We see precisely the contrast we found with down above:

- | | |
|----------------------------------|--------------------------|
| 19) outflow of funds | output of energy |
| outburst of invective | outbreak of cholera |
| outcry of the public | outlay of money |
| outlook of the group | outplacement of patients |
| outpouring = outpouring of grief | |

While the forms: burnout, fadeout, dropout, walkout, blowout, handout, knockout, strikeout, carryout, takeout all exist, none allows a complement:

- | | |
|------------------------|--------------------------------|
| 20) *burnout of people | *fadeout of interest |
| *dropout of school | *walkout of GM |
| *blow-out of tires | *the handout of examples |
| *work-out of muscles | *knockout of the enemy |
| *strikeout of a batter | *carry out of food |
| *lookout of danger | *takeout of food ¹⁵ |

Many of these examples get a similar meaning with an oblique preposition (dropout from school), but crucially not with the argument-marker of.¹⁶

¹⁴While lefthand affixes are productive, righthand affixes are definitely createable, as we recently heard the novel expression from a child "that's a do-over".

¹⁵There are a small set of counter-examples which exist in both directions

- i. the buyout of CBS
- ii. the bailout of S&L's
- iii. the blackout of the city
- iv.*outfit of Bill (≠/≠outfit of Bill's)

We note that the cases in (i-iii) are rare, and very idiomatic. In addition, we believe that the adjuncts like those found with agents. The extraposition test can be used (Roeper (1993)):

- a. a book appeared by Chomsky
- b. *the destruction of the city occurred by the enemy
- c. *the destruction occurred of that city
- d. ?a blackout occurred of the city
- d.? the author arrived of a wonderful new book

In general, the of-relation as an adjunct can sometimes include the object reading. For a true nominalization, the argument reading appears and does not allow extraposition. Further into argument structure may make the set of exceptions predictable.

We have examined: out, under, over, down, up, in, on via computer searches. Patterns with in- or up- are similar: standin, walkin, sit-in, or lockup/holdup/walkup. We usually find 3 counterexamples and 30 cases which follow the generalization. If we multiply by this set of half a dozen affixes, then the results are roughly 180 examples which fit and 18 counter-examples. This is typical for the morphological domain where idiosyncratic constructions can easily produce counter-examples to deeper generalizations.

What remains stunning is that a gross overview shows a sharp contrast:

- 21) Leftward Prefix Generalization:
 Prefix+complement are widely acceptable
 Suffix+complement is ungrammatical. ¹⁷.

3.1 Case Study of over-

It is useful to begin with a case study of over-, where both verbal (overstate) and nominal (overview) forms take complements:

- | | |
|-------------------------------|--------------------------|
| 22) a. overdraught of money | overview of our affairs |
| overexposure of film | overseer of our affairs |
| overhang of the cliff | oversight of our affairs |
| overflow of immigrants | |
| overreach of the elders | |
| overstatement of our concerns | |

Comparable righthand affixes, all of which are related to verbs (hold over), block complements in almost all cases:

- | | |
|-----------------------------------|---------------------|
| b) *blow over of the problem | *holdover of money |
| *leftover of food | *pushover of people |
| *sleepover of children | *stopover of home |
| *turn over of money ¹⁸ | |

¹⁶See Roeper (1987), (1993) for discussion of this distinction in terms of the contrast between implicit arguments and implicit roles and the argument-taking by. We find, for instance, that it is possible to say (i) but not (ii), while a similar (iii) is possible:

- i. observable by Bill
- ii. *visible by Bill
- iii. visible to Bill

It is argued that the implicit role of agent is picked up by the preposition, but no argument projection of agent is possible.

¹⁷See Fabb (1988) for discussion of rules of this kind.

¹⁸Other arguments are excluded as well:

- i) *holdover by Bill
- *a pushover by the enemy

Exceptions exist where the by-phrase functions as an adjunct as in (ii):

- ii) a book by Chomsky

- c)?*carry over of extra funds
 ?*changeover of the guard
- d) takeover of the bank
 roll over of funds

The same analysis can be produced for in- and other prefixes.

3.2 Prefix as Predicative

Is there evidence that points to a direct connection between prefix and complement? We have isolated a set of structures where grammaticality depends upon the prefix alone. While there are many bare nouns that take a complement, wherever a contrast exists, it is only the prefixed form that works:

- 23) a. John graded Bill => *the grade of Bill (grade = action and not letter)
- b. John upgraded Bill => the upgrade of Bill

There are many examples of both types, but no instances where the prefixed case is bad and the non-prefixed case is good. We abstract away from meaning changes that may result from prefixation:

- 24) a. *the take of refugees c. *the break of a wall
- b. the intake of refugees d. the outbreak of problems
- e.*the come of the war
- f. the outcome of the war
- g. *the put of energy
- h. the output of energy
- i. *the throw of a ball
- j. the overthrow of second base
- k. *the shot of the situation/*the shot of a boy
- l. the upshot of the situation

This evidence suggests a direct relation between Spec and Complement. How can such a connection be expressed? We argue that the same "small clause" connection we find in:

- 25) a. wipe [the table clean]
- b. wipe [the mess up]

holds between Spec and Comp in these structures¹⁹ While the structural claim is very clear, its semantic correlate is plausible, but less clear. We argue that it is essentially a predicative relation, which den Dikken (1992) has argued is always UNACCUSATIVE.

turnovers by the Chicago Bulls

Where an action-result exists, then an adjunct is possible.

¹⁹ See den Dikken (1992) and references therein, which connects the small clause analysis to earlier work by Kayne and Hoekstra..

3.3 Further Evidence of the Constraint on Rightward Adjunction

The constraint against rightward adjunction makes a broader range of empirical predictions, which we will now lay out. The rebracketing analysis of breakout allows the assimilation of such forms to all lexical operations, like root compound formation, in which the complement is no longer directly governed by the verb. In (16b) complements are impossible with a non-verbal righthand heads:

- 26) a. observation of the people
b. observation tower
=/ \Rightarrow *observation tower of the people²⁰

The complement of observation is blocked by the additional head. We find that the same constraint blocks any further affixation on the sort of right-complement compounds noted by Kayne (ouvre-boit = open can):

- 27) a. pickpocket
b. *pickpocketer
c. heartache
d. *heartacheful
e. *heartache-er
[note: dreadful]

The non-existent compound pocket-picker is still more grammatical than the form based on the existent pickpocket. Another example reveals the same fact: the event reference in heartache does not allow a natural extension to *heartache-er (neither as causer nor victim).

The constraint here is so profound that we do not notice that it applies to identical affixes. the * -er-er sequence is blocked, while the same meaning is achieved with leftward movement (coffee-maker-maker):

- 28) a. *coffee-maker-er/*make-coffee-er
[note: coffee-maker-maker]
b. *rejection-tion [= rejection rejection =reject rejections]
c. *substitution-tion
d. *toaster-er
e. *oddness-ness

Each of these terms could be given a natural embedded interpretation (oddness-ness = the oddness of too many odd situations).

²⁰Toman (1982) made this observation for German. He also points out that there are lexically controlled exceptions:

- a. Beschleunigungsgrad des Autos
(*acceleration degree of the car = ungrammatical in English)
b. Beschleunigung des Autos
(acceleration of the car)

These exceptions are then the equivalent of cases like buyout of CBS.

In addition we find that complements are blocked for non-particle righthand affixes:

29) *payee of money

We find that lefthand affixation on words with righthand affixes is excluded as well:

30) a. *repayee
b. *re-employee
c. *re-throwback

Internal and zero affixes, which are argued to be on the righthand side, also exclude re-affixes²¹:

31) a. John rethought the question => *a good rethought
b. He reclaimed his rights => *a worthy reclaim = [re [claim] \emptyset]

In sum addition of nouns, particles, deverbal affixes on the right side, are equally effective.

We conclude:

32) Righthand-adjunction: a) blocks argument structure
b) blocks further affixation²²

²¹These observations are not without precedent. Keyser and Roeper (1992) argue for complementary distribution of particles and affixes, including invisible affixes. Pesetsky (1995) has argued that there exists complementary distribution for zero affixes and other affixes, including invisible affixes. Roeper (1993, to appear) observes that complements are blocked just where thematic control is possible: *the push of John and John needs a push (John is interpreted as object of push). DiSchullo (1992) observes that non-headed structures block complementation in Romance. Grimshaw (1990) argues that the semantics of process/result determines the presence or absence of arguments. All of these accounts are insensitive to structural asymmetry. If leftward asymmetry holds in the morphology, then a deeper, more principled account is available.

²²This suggests that Myers' Zero-Affix rule and Pesetsky's (1995) extension have radically understated the generality of the phenomenon. See Roeper (1993, to appear) for extensive discussion of bare nouns which a) do not project arguments syntactically, but permit argument control semantically. For instance, we find:

i) John needs help => John = object of help

But forms like:

ii) *the help of John

receive only a subject reading, and the object reading is excluded, therefore, as we said, the syntactic projection is excluded while the semantic one remains.

Consider the contrast between:

i) the presidency needs thought
ii) the presidency needs thoughts

In sum, the observation about affixes is a subcase of the general prohibition of complements on compound forms.²³

4.0 Leftward Adjunction

If leftward adjunction is a structure-building operation, then we should look for the primary characteristic of principled grammars: recursion or iterativity. We find that prefixes exhibit a variety of iteration:

- 33) a. over-overreact/over-overspend/
- b. sub-substandard/sub-sub-substandard
- c. re-reinvent/re-re-rewrite
- d. under-underestimate
- e. pre-pre-record
- f. out-outwit

Iteration occurs with different prefixes:

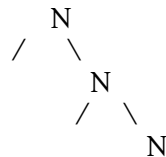
- 34) a. pre-re-record
- b. over-prepay
- c. sub-over-prepay
- d. re-up end
- e. re-overture
- f. re-overplay/re-over-invest

There is clear evidence of a broad-based iteration. A set of minimal pairs reveals that it is precisely the structural position of the affix which is the source of ungrammaticality (abstracting away from semantic differences that are also present):²⁴

- 35) a. re-overture
- b. *re-turn over
- c. re-upend
- d. *re-end up
- e. re-over write
- f. ?*rewrite over

²³Adjunction, even within the lexicon, must be to the left. Therefore we can have:

city finances officer



We will not explore Root compounding further although it promises to fall within the same set of abstract principles.

²⁴The incompatibility of prefixes and particles (*repick up) is a classic observation traceable back to Fraser (1974), Carlson and Roeper (1981) and are extensively discussed in Keyser and Roeper (1992) and Ferguson (1997).

And iteration occurs with the creation of verbal compounds, which can recursively incorporate to the left:

- 36) a. coffee-maker-maker
 b. home-builder-organizer
 c. chocolate-lover-seeker

The facts of leftward recursion are clearly very general. While one might think that they are odd pragmatically, it is not difficult to create a context in which they are totally natural:

- 37) The old man kept reimbursing us too much money. After he over-reimbursed us three times, we realized that his constant re-over-reimbursement revealed that he could not add.

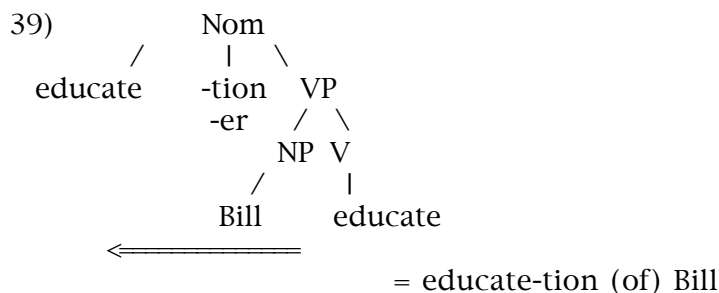
We take the fundamental claim of anti-symmetry that leftward iteration is possible to be well-established by these facts (re-over-reimbursement). In a sense, then, our explanation is complete. Linguistic principles define asymmetry and where asymmetry is not achieved, the derivation crashes.

4.0 An Apparent Counter-example

Before we develop a system to account for the derivations of leftward morphology, we should address an apparent counter-example. A righthand affix (-tion, -er) takes a complement:

- 38) a. the education of Bill
 b. the player of the game.

These forms are clearly among the most productive in the language. However an independent tradition, originating with Lees (1960), then Lebeaux (1986), Pesetsky (1985), Borer (forthcoming), Fu (1993), (Fu, Roeper, and Borer (1995)), argues that nominalizations have a hidden VP. Another tradition, well-articulated by Giorgi and Longobardi (1990), see also Borer (to appear), Johnson (1994)) argues for leftward movement of the verb to a higher nominalization affix, instead of righthand adjunction of NOM (-tion, -er, -ment, -ing etc).



We therefore have precisely the same leftward movement analysis in these cases that the anti-symmetry theory predicts.

Independent evidence (Fu, Roeper, and Borer (1995)) for a hidden VP has recently been developed by showing an anaphoric connection to do so and to adverbs, which directly supports the claim that there is a hidden VP involved:

- 40) a. John's destruction of the city and Bill's doing so too
 b. John destroyed the city and Bill did so too
 c. *John's trip to Hawaii and Bill's doing so too
 d. John's resignation so suddenly surprised us.
 e. The patient's examination so suddenly surprised us
 f. *The patient's exam so suddenly surprised us

Although some speakers regard (40a,b,d) as deserving a question-mark judgment, there is no doubt about the contrast in grammaticality between (40e, f). Therefore the hidden VP analysis receives independent support. The behavior of adverbials also shows just the same distinctions::

- 41) a. the everyday massacre of civilians
 b. the massacre everyday of civilians

In (41a) we find the meaning of "usual" while in (41b) there is the adverbial meaning associated with VP. In addition the appearance of an adverbial between the nominalization and the object suggests that nominalization involves raising to a higher predicate.²⁵

There is subtle phonological evidence in behalf of the presence of a VP as well:

- 42) a. a PHOtograph-er of weddings
 b. *a photOGrapher of weddings

The verbal stress pattern is preserved under raising, but if stress shifts as in (b), then it is an indication that the term has been lexicalized without verb-raising. Then the complement is eliminated. Notably the productive -er affix and much less productive -or and -eer affix reveals the same contrast:

- 43) a. *actor of the play²⁶ (note: actor in the play)
 b. *inquisitor of prisoners
 c. *engineer of small bridges
 d. *Disney imagineer of clowns
 e. *auctioneer of small objects

These forms, which have the same semantics but a different syntactic morphology, are presumably generated in the X⁰ part of the morphology.²⁷

²⁵See van Hout and Roeper (1997) for a discussion of the contrast between the mower of the lawn and the lawn-mower where the former involves the presupposition of a telic Event. The Event presupposition is in turn derivable from the assumption of a VP.

²⁶And predictably there are fixed counter-examples (author of a book), which we shall show, should be analyzed as adjuncts when examined more closely.

²⁷The subtlety of interaction here is suggested by a thought experiment. We can say (a) (b), and (c):

a. a collector

Now we make a further prediction: those leftward verb-movement cases do not compete with, hence tolerate, prefixation. We predict the following contrast, while rightward affixes do not allow prefixation (44b), leftward nominals do:

- 44) a. repayment/reconstruction/rebuilding
b. *repayee/*a refund/*rewalkout

The -ment is generated as a higher nominalizer, while re- originates in a different position, the Abstract Clitic (or inner complement) position, as we show directly.

As noted above, each of these affixes prohibit complements, We argue below that these nominalizations are not created by leftward movement, but by REBRACKETING as we discuss below.

- 45) a. *the payee of money
b. *the find of money
c. *the walkout of the company
(compare: he walked out of the company)

4.1 Further Affixation Blocks Complementation

The complement status of the PP is evident because it presupposes adjacency. If we attempt further derivation, then arguments are blocked:

- 46) a. *educational of Bill
b. *correctional of mistakes
c. *professional of medicine
d. *developmental of problems

It is not the case that adjectives inherently block complements (although they are quite restricted):

- 47) a. appreciative of his mother
b. resentful of homework

We assume that there is another adjectival node above the nominal node which receives the next step of the derivation. Thus the category-changing affixes are reflections of leftward movement. The question now becomes why a chain to the original verb is blocked:

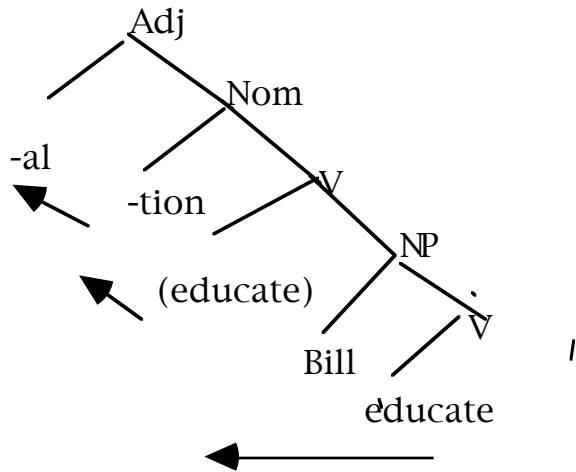
- 48)

-
- b. a collector of waste
c. re-collect waste

But we predict a shift from -or to -er in the following form:

- d. re-collector of waste

The prediction is that if we asked subjects to generate (d), they would be more likely to insert -er, than in (b).



We will not investigate this question in depth, but simply suggest that with the addition of -al, then the complement is not directly in a Spec-Head-Comp configuration.

This claim, in turn, predicts the second piece of evidence that of-PP's are true complements. True complements cannot undergo extraposition:

Note that we do not find:

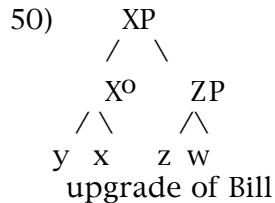
- 49) a. *the destruction occurred of the city
- b. a book appeared by chomsky

Where the PP is an adjunct it can be moved (b,), but where it is an argument, it cannot (See Roeper (1993)).

We conclude that the apparent counter-examples fall within the theory of leftward movement if we assume the presence of a VP and if we assume that nominal affixes are generated in a higher leftward position. In effect, this assumption also follows from phrase-structure principles because the Nom Affix can then select a VP complement.

5.0 Leftward Recursion and the Abstract Clitic Hypothesis

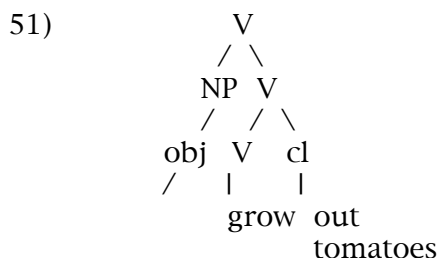
We turn now to the core question: how to represent the input whose output is a leftward recursive structure, which permits complements? In Kayne's system, segments do not count in the determination of c-command. Therefore in the following tree we find that the terminal y c-commands ZP but the terminals z,w fail to c-command y. This relation obtains just in case ZP is a Maximal Projection, and X⁰ is not. Therefore if we have an output in which the particle occupies the y position, then it will fulfill asymmetric c-command:



[y c-commands z,w, because first category that dominates y = XP also dominates ZP. y c-commands x as well. X⁰,X are just segments so they do not count]

Once again, a form like carry-out cannot arise in this system, since if the prefix c-commands the verb, then it should precede it. Kayne comments that "the argument...that a head cannot have internal structure of a non-adjoined sort, depends on the head in question having a complement". This assertion actually suggests that non-complement-taking word-formation must disobey the asymmetric c-command, as we have discussed above.

Under what analysis would the righthand particle be different? In particular, if it is the remnant of an MP itself, then it would not c-command the complement and therefore we would predict the grammaticality of carry out but not *carry out of food. It would in fact be different if it were a complement itself. This is the position that has been advocated by Hale and Keyser under the terminology inner complement. Ferguson (1997) has provided extensive arguments precisely in behalf of the view that the abstract clitic should be seen as an inner complement with the object in a higher Larsonian structure²⁸:



This structure allows incorporation: tomato-grower and outgrowth.

Keyser and Roeper (1992) provide an account of righthand complementary distribution in terms of an Abstract Clitic (=Inner complement) which can be filled by Heads of all categories. This accounts for the following contrasts:

- 52) bare N: John played ball
 adjective: John played cute
 dative: John played me a game
 particle: John played up the game

a. adj + particle: *John played cute up

²⁸There is an interesting shift in concepts over time. The First Sister Principle of Roeper and Siegel (1978) essentially argued that compounds were formed from lexical versions of VP structure. The Abstract Clitic hypothesis asserted that a special position was involved. The inner complement concept recaptures part of the spirit of the notion that a VP is present. Lebeaux (1988) argued in behalf of a related notion of a lexical VP in which only Heads are present. He argued that children's early utterances of the form "eat cookie" reflected a lexical VP rather than the adult form where a DP is involved. From a minimalist perspective, we would expect children to seek the minimal allowable structure, which in this instance is the V+inner complement structure. Thus rather diverse arguments lead to the current conceptualization.

- b. adj + dative: *John played me cute
- d. adjective + prefix: *John replayed cute
- e. dative + prefix: *John replayed me a game
- f. dative + particle: *John played me up his cuteness
- g. particle + prefix: *John replayed up his cuteness
- h. generic + adj: *John played ball cute
- i. generic + particle: *John played ball up
- j. generic + dative: *John played me ball
- k. generic + prefix: *John replayed ball

In addition the incompatibility of re- with these forms was easily captured by assimilating re- to other particles:

- 53) use up
- 54) a. *overuse up
- b. *reuse up/*re-end up
- c. re-upend

These facts are captured if we assume that there is a single node which permits a single Head entry (of any X^0 type):

- 55) $V \Rightarrow$
- ```

V1
 / \
NP V
 / \
V +cl
 {cute
 up
 re-
 me
 ball
 (dative)
 (caus)
 (middle)
 (generic obj)

```

A set of invisible affixes has the same blocking effect: dative, middle, causative, generic object markers<sup>29</sup>:

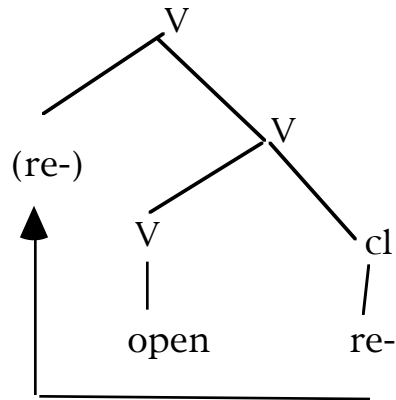
- 56) \*I regave (dat) money
- 57) \*face loses (middle) easily (but: face-losing remark)
- 58) a.\*I worried (caus) up my family  
[note: I screwed up my family]
- b. \*don't rethink (obj)  
[don't think]

---

<sup>29</sup>Pesetsky (1995) in the same vein extends this kind of analysis to include these and other thematically-oriented (such as Target of emotion) invisible affixes in a complementary distribution relation

In order to derive the correct surface order a leftward-movement rule was proposed:

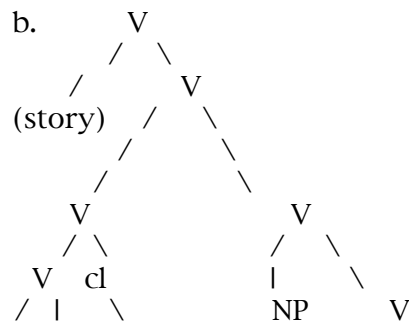
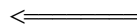
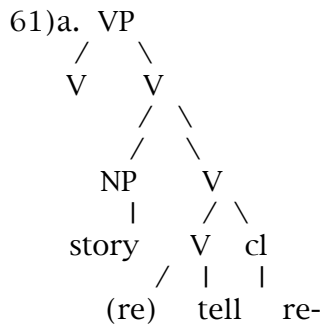
59)

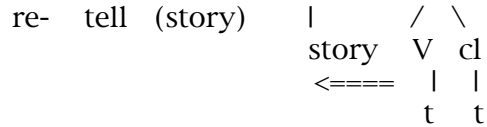


We have argued above that this operation must be a form of HEAD-ADJUNCTION, since no category change is involved. As argued in Keyser and Roeper (1992), see also Hale and Keyser (1997), it is necessary to allow objects to move into the clitic position, and then further to be adjoined. The rule captured one possibility for recursion, namely with compounds:

- 60) a. home-rebuilding
- b. coffee-maker-maker
- c. story-retelling

all require => two steps





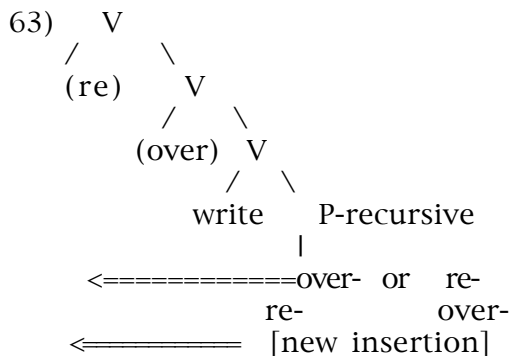
This structure entails an additional connection. The external-object must move into the clitic position from which it can incorporate to the left to create a second prefix. This makes the origin of all HEAD-ADJUNCTION incorporation uniform and captures the fact that only Heads can incorporate. The clitic position then operates as a filter on incorporation.<sup>30</sup> This movement is possible if we adopt Chomsky's (1995) claim that multiple adjunction should be permitted. The attachment at a higher position entails the claim that there are scope relations involved, such that it is possible to have home-rebuilding but not \*rehome-building.

The system also allows multiple prefixes with independent scope relations:

- 62) a. re-overinvest            b. over-reinvest

These two have quite different meanings depending upon the order of prefixes. Only the first means that someone overinvests twice.

However recursive prefixation requires that the abstract clitic system must be enriched to represent this possibility. We will not discuss the matter in depth here, but make two brief observations. First, if the notion of limited argument structure advocated in Hale and Keyser (1998) is correct, then any form of recursion must fit within the existing structure (see Juarros (1999)). Therefore we argue that lexical insertion after movement occurs for the clitic position:



This will generate two forms: over-rewrite and re-overwrite, both legitimate, but with quite different meanings. The possibility of repeated insertion into the same position is predicted by Distributed Morphology (Halle and Marantz (1992)). Failure to move the particle leads to a block, but after leftward movement the position can be re-occupied, and then must move again (possibly to prevent scope ambiguities).<sup>31</sup>

<sup>30</sup>See Chomsky (1995) for discussion of clitic languages where the clitic is ambiguous between being a Maximal Projection and being a Head.

<sup>31</sup>Scope problems arise for affixes that are potentially phonologically sensitive. Dischullo (1997) argues for lower attachment of prefixes in Romance (em-). We take the assimilated prefix (im-) as in impossible to be lower than



If -er is not present, then out- can move.<sup>32</sup> This predicts exactly the complementary distribution of prefix and -er. Now it can be noted that non-moved particles are better, allowing a phonological requirement that -er connect directly to verbs to be fulfilled:

- 70) a. the taker in of refugees
- b. \*the intaker of refugees/\*to intake  
      (note: the intake of refugees  
      also: the pond's intake of fresh water => no agent needed)

So we predict this subtle variation as well.

What is the formal characterization of this movement?

Why are multiple prefixes possible on verbs, but when the prefix shifts the structure to a noun, then complementary distribution arises, then only one element is possible? This state of affairs fits perfectly into an analysis where the operation is SUBSTITUTION. And this in turn assimilates naturally to a Feature-Checking account where an N-Feature is selected from the Numeration, justifying an N-projection, and likewise an N-feature is present on the verb particle. Leftward movement is then obligatory in order to carry out Feature-checking.

## 5.2 Abstract N

The concept that an [N-feature] is involved, rather than an N or noun itself, is dramatically illustrated in the fact that we can say:

- 71) meat-eater

The noun meat is a Noun but does not carry an abstract Formal Feature of N, and therefore it is adjoined rather than participating in Nominal Feature-checking. If adjoined, we make the prediction that it will tolerate recursion. This is precisely what we illustrated with the example above, story-retelling, and with these novel ones below:

- 72) textbook-over-rereading

One could in fact interpret this argument to be evidence for the claim that meat is not a noun, but a root, as briefly suggested in Roeper and Siegel (1978)'s concept of root compound, and significantly expanded in recent work by Marantz (1997).

## 5.3 Rightward Incorporation and Argument Structure

Now we return to two questions:

- a) how do we block leftward movement?

---

<sup>32</sup>The reader might ask if there is a systematic connection between this representation and the notion that AGENT<sub>i</sub> is introduced by a small v in a v-VP configuration. We have not developed the rules of conversion necessary for a derivation, but it is possible that there is significance in configurational stability across nominal and verbal representations (v-VP, N-VP).





we predict that righthand particles are not Heads. Thus an expression like hangover is not a kind of over-. On the other hand, overhang is a variety of hanging.<sup>33</sup> Recent work by Chomsky (1998) suggests that a form of Merge, namely Set-Merge, may provide a formal basis for non-headed concatenation. However the guiding image for Set-merge is complementation where selectional restrictions apply. Our use of the concept would involve an extension to meet interface requirements of morphology. It is not yet clear what invites rebracketing (especially as this kind of rebracketing is not found in other languages). We suspect that properties of argument structure are involved, but current theories do not, as far as we can tell, make direct contact with the concept of rebracketing. We will not explore the issue further here, except to observe that we think such an enrichment of the concept of Set-Merge should be welcome.

### 5.5 Abstract Role of Agency

If we examine the list of rightward affixes, a clear generalization emerges: some notion of Agency<sub>is</sub> present. These fully transitive cases are typical:

78) knockout/cookout/lockout

We can account for the restriction on preposing (\*outknock/\*outlock) by observing that there is a block on prefixation not only when there is an object present but when there is an AGENT present, but no object, and no -er (holdout):

|     |                        |                         |
|-----|------------------------|-------------------------|
| 79) | *an upwalk (walkup)    | *an out-turn (turn out) |
|     | *an outdrop (dropout)  | *an in-sit (sit in)     |
|     | *an outsing (magazine) | *an outtry (tryout)     |

These cases, once again, systematically differ from the numerous prefixed cases which have no agent, to choose a new set:

80)    downpour            downfall  
           downdrought        downshift

There is a straightforward method to extend our system to capture these facts. We assume that there is an invisible Agent present, an unexpressed (-er) which blocks the movement of the particle

81)

```

 N
 / \
 (-er) VP
 / \
 drop out
 lookout
 standin
 standout

```

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<sup>33</sup>The meaning parallel to \*handout of examples is, as always, achievable then indirectly through sentences like: there are examples on the handout.

## holdout

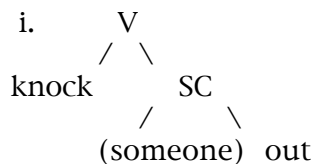
If the (-er) carries the following features, then we obtain a full explanation:

- 82) ([-er] \_\_V,  
+N,  
+\_AGENT)

The -er phonologically subcategorizes for an immediate V, but the re bracketed form fails to allow the expression of -er, since the pure V is inside. Therefore it can remain implicit. Nevertheless it carries the FF [+N] and therefore Feature-checking is satisfied. Because the unexpressed (-er) can remain implicit, the meaning of the whole expression can but must not refer to AGENT. <sup>34</sup>

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<sup>34</sup>Transitive cases are presumably ruled out in another fashion as well. If they form a small clause, then the particle is not in a position to incorporate.



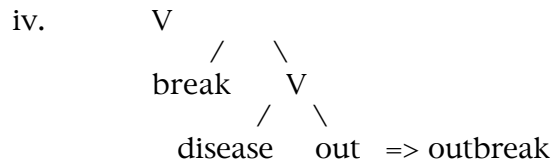
Here the particle is not in a position to incorporate because it does not satisfy the requirement of adjacency, a traditional characteristic of incorporation. One could attempt to assimilate the pure agent cases to the small clause cases by assuming the presence of a hidden reflexive, much like hidden cognate objects:

- ii. someone walk [himself] up

This approach was explored in earlier versions of this paper. The same analysis extends to agents, by imagining that they are inner objects:

- iii. walk (John) up

raising would then leave a trace which would block incorporation. The problem with this account is that it is traditionally the unaccusative elements which are projected as objects, and precisely these elements permit incorporation:



Various reformulations of Small Clause analysis are possible (den Dikken (1992), Hale and Keyser (1997)) but unless they are able to capture the Agent/Non-agent distinction they will not be able to capture the difference between outlook and lookout. Therefore we prefer the implicit -er analysis because of its essential simplicity. This leaves open the possibility that a subtler theory of argument structure might force a more elaborate derivation.

In addition the interpretation of the derived form can drift toward: Action, Result, Agent or Patient. Consider the expression strikeout:

- 83) a. John's strikeouts = batter or pitcher results  
b. the strikeout was great to watch = action

We do not yet have a theory of argument structure which expresses the labile nature of the results. Once again, since there is a sharp difference between rightward and leftward particles, one cannot say that the argument structure is simply "free".

We are, in a sense, building an interface between morphology and argument structure. We have followed the path of formal simplicity, deriving our results with a straightforward use of Feature-checking and Substitution. However what remains to be achieved is a transparent interface with argument structure. We do not have a full vision of how Results/Patients/Unaccusativity/and implicit roles function in the system beyond the -er projection. The subtlety and simplicity of our configurational claims are not matched by an equally intricate theory of argument structure. For instance, a theory of Events(see van Hout ( 1996), Kratzer (1994, to appear)) may ultimately reveal a precise way to predict what meanings REBRACKETED nominals may have.<sup>35</sup> If as Chomsky has suggested "modes of execution" should eventually be resolved into "leading ideas", then we think that interface transparency should be the goal.

## 6.0 Conclusion:

Our analysis is anchored in the simple observation that derivational morphology obeys anti-symmetry. Where righthand adjunction occurs , both prefixation (\*a reworkout) and complementation (\*workout of muscles) are impossible. Where lefthand prefixation occurs, both are possible (re-outflow of funds). The prefixation case fits the asymmetric account straightforwardly.

We have advanced our argument in three parts. First there is a straightforward demonstration that the logic of anti-symmetry applies within morphology. Second there was an effort to integrate the derivation of those structures with the theory of inner complement clitics. And third there was an exploration of how Head-movement of two kinds, SUBSTITUTION and ADJUNCTION can capture a wide range of facts.

What vision of the interface between morphology and syntax emerges from this essay? We have argued that the Spec-Head-Comp structure when it applies at the interface between morphology and syntax functions as a Filter on both syntactic and morphological derivations. This supports the intuition behind the concept of an interface: that it should be a point of minimal contact between independently complex systems. One result of this filter effect is that numerous semantically plausible derivations are excluded, though much remains to be understood about those which are possible.

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<sup>35</sup>Very subtle features of bare nominals and tense may be involved. For instance, one can say:

- i. he went in for the kill  
But it seems odd to have kill refer to a past event.  
ii. ?\*the kill had been fun.

The fact that the same principles apply in both syntax and morphology implies that fundamental principles are deeper than the modules in which they function. A child therefore does not have to determine if some representation belongs to the correct domain before a principle applies. Instead, we believe, the principle participates in the organization of the child's data in the first place.<sup>36</sup> This then moves toward the level of explanation that linguistic theory has always promised.

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<sup>36</sup>Snyder (1995) shows that UG-variation is pertinent to this domain in his discussion of how children acquire particle and compound structures. The absence of rightward incorporation in German is further evidence that basic decisions in addition to Head-direction must be recognized by the child as part of the distribution of Heads in a language.

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