HOW TO MERGE A ROOT

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MAIN GOAL OF THIS TALK:
to derive four axioms about roots in a principled way from the theory of Merge, thus reducing them to theorems

THE FOUR AXIOMS:
i) Roots have no grammatical features
ii) Roots have no syntactic category
iii) Roots are defined structurally, not lexically
iv) Roots are merged lower than functional material

THE THEORY OF MERGE:
the very first instance of Merge (Primary Merge) combines a feature (set) from the Numeration with the null derivation, i.e. with the empty set

THE GIST OF THE ANALYSIS:
roots are inserted post-syntactically into the empty slots created by Primary Merge

OVERVIEW

1 The explananda: four axioms about roots

1.1 Roots have no grammatical features (Borer 2005)

functional vocabulary items (FVIs, e.g. plural –*s*, numeral *three*,…): **fixed meaning**

(1) a. **three** stone**s** (obligatorily count NP)
b. They stone**d** her. (obligatorily verb)

→ the meaning of FVIs is fixed because they spell out grammatical features (Number, Tense, etc.)

lexical vocabulary items (LVIs, e.g. *book*, *nice*, *stone*, etc.): **flexible meaning**

(2) a. I've got a **stone** in my hand. (count noun)
b. There's too much **stone** and metal in this room. (mass noun)
c. They want to **stone** this man. (transitive verb)
d. Billy-Bob should lay off the weed; he's always **stoned**. (obligatorily passive verb)

→ the meaning of LVIs is malleable → this suggests that they do not bear any grammatical features

1.2 Roots have no syntactic category

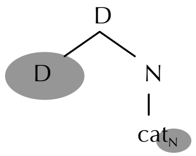
note: if LVIs have no grammatical features, then they have no categorial features either

example: an LVI such as *slick* bears no inherent categorial specification ⇒ it can be used as a noun, verb or adjective depending on the functional context in which it is inserted:

(3) a. Are those **slicks** under your Dodge A-100?
b. While not every man likes to **slick** his hair up every morning, it is wise to have a gel, wax or mousse around just in case.
c. Oh, you're such a **slick** little girl.

advantage: doing away with the categorial specification of LVIs/roots eliminates categorial redundancy from the extended projection:

(4)



→ traditional view: (4) is marked for nominality twice

1.3 Roots are defined structurally, not lexically

1.3.1 Introduction

question: how are roots defined/identified as roots?

two options:
- roots have a special status in the lexicon → lexical definition
- roots correspond to a particular structural position → structural definition

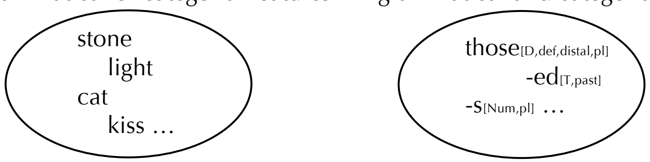
1.3.2 Roots that are inserted early are defined lexically

if vocabulary items are inserted early, i.e. at the beginning of the syntactic derivation

then the featurelessness of LVIs/roots can only be guaranteed if the lexicon contains featureless members, i.e. the lexicon contains two subsets (Borer 2005a):

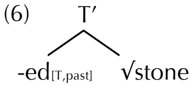
(5)

LVIs: no grammatical or categorial features | **FVIs:** grammatical and categorial features



structure building:

(6)



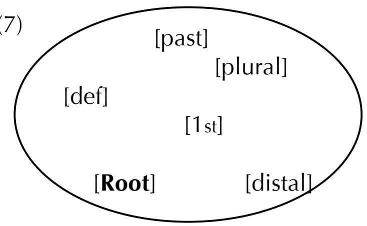
lexical definition of roots: roots are the result of the merger of a featureless vocabulary item; the lexicon contains roots and non-roots

1.3.3 Roots that are inserted late are defined structurally

if vocabulary items are inserted late, i.e. in a post-syntactic module

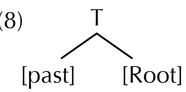
then the featurelessness of LVIs/roots can only be guaranteed if the structural representation contains a position that lacks grammatical features, i.e. apart from *bona fide* grammatical features, the lexicon contains a 'placeholder' Root-feature (Halle & Marantz 1993):

(7)



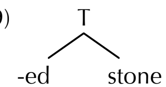
structure building:

(8)



after (late) vocabulary insertion:

(9)



structural definition of roots: root are the spell-out of an empty node in the structural representation

1.3.4 Supporting evidence for the structural account

test to distinguishing between the two accounts:

(10) Can functional vocabulary items occur in root position?

lexical definition of roots: **no** → roots are defined by the merger of featureless vocabulary items and functional vocabulary items have (grammatical and categorial) features ⇒ no functional vocabulary items in root position

(11) D
the$_{[D,def]}$ those$_{[D,def,distal,pl]}$ → this structure contains no roots

structural definition of roots: **yes** → roots are whatever gets inserted into the structural positions designated by the placeholder [Root]-feature ⇒ there is no *a priori* ban on inserting a functional vocabulary item there

(12) D
[D,def] [Root] → can (in principle) be spelled out as either LVI or FVI

the relevant data:

(13) Ik heb het **waarom** van de zaak nooit begrepen.
I have the why of the case never understood
'I have never understood the motivation behind the case.'

(14) In een krantenartikel komt het **wat**/**hoe**/**wie**/**waar**
in a newspaper.article comes the what/how/who/where
altijd voor het **waarom**.
always before the why
'In a newspaper the what/how/who/where always precedes the why.'

(15) De studenten **jij**-en onderling.
the students you-INFINITIVE amongst.one.another
'The students are on a first-name basis with each other.'

(16) Martha is mijn tweede **ik**.
Martha is my second I
'Martha is my best friend.'

(17) Niets te **maar**-en!
nothing to but-INFINITIVE
'Don't object!'

(18) Paard is een **het**-woord.
horse is a the$_{NEUTER.DEF}$-word
'*Paard* takes a neuter article.'

→ functional vocabulary items can occur in root position ⇒ evidence for a structural definition of roots

note: these data are not exceptional/irregular/unproductive:

(19) a. het getik van de klok
the GE-tick of the clock
'the ticking of the clock.'

b. het gefluit van de vogeltjes
the GE-whistle of the birds
'the whistling of the birds.'

→ *ge*-prefixation is a productive derivational word-formation process to form nouns which refer to a pluractional event → this process also productively applies to functional vocabulary items:

(20) a. Ik hoef al dat ge-**maar** niet.
I need all that GE-but not
'I don't like those constant objections.'

b. Ik hoef al dat ge-**alhoewel** niet.
I need all that GE-although not
'I don't like those constant considerations.'
c. Ik hoef al dat ge-**of** niet.
I need all that ge-or not
'I don't like those constant alternatives.'
d. Ik hoef al dat ge-**hé** niet.
I need all that GE-PRT not
'I don't like the constant need for confirmation.'
e. Ik hoef al dat ge-**waarom** niet
I need all that GE-why not
'I don't like the constant need for justification.'
f. Ik hoef al dat ge-**nooit** niet
I need all that GE-never not
'I don't like the constant unwillingness.'
g. Ik hoef al dat ge-**ik** niet
I need all that GE-I not
'I don't like all this egocentricity.'

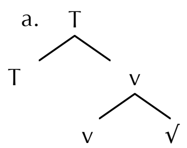
1.3.5 Conclusion

→ roots should be defined structurally: they correspond to whatever is inserted (LVI or FVI) in structural slots that are featureless and hence remain inert throughout the syntactic derivation

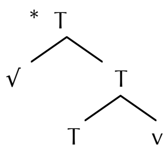
1.4 Roots are merged lower than functional material

→ lexical categories are dominated by functional material rather than the other way around:

(21) a.



b.



1.5 Summary: desiderata for a theory of roots

i) Roots have no grammatical features
ii) Roots have no syntactic category
iii) Roots are defined structurally, not lexically
iv) Roots are merged lower than functional material

note: all current theories of roots have to state (i)-(iv) as axioms; as it stands, they do not follow from any independent properties of roots

2 PREREQUISITE FOR THE ANALYSIS: ASYMMETRIC PRIMARY MERGE & THE NULL DERIVATION

2.1 Asymmetric Merge

Chomsky (1995): Merge = Set Merge

(22) Merge $(\alpha,\beta) = \{\alpha,\beta\}$

→ this operation is completely symmetric; neither hierarchically nor linearly organized: Merge (α,β) = Merge (β,α)

however: there are reasons to think Merge is *a*symmetric:

(i) labeling

Chomsky (1995): in Merge (α,β), either α or β projects

(23) Merge $(\alpha,\beta) = \{\alpha\{\alpha,\beta\}\}$

→ Langendoen (2003:3): $\{\alpha\{\alpha,\beta\}\} = \langle\alpha,\beta\rangle$, i.e. labeling leads to (asymmetric) Pair Merge rather than (symmetric) Set Merge

(ii) Derivational Asymmetry

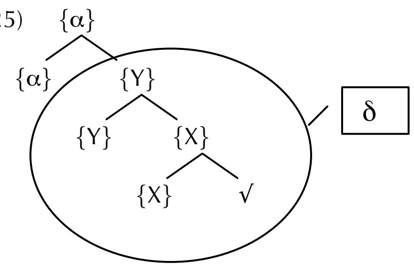
Jaspers (1998): for every Merge operation one element is derivationally prior to the other, i.e. derivation creates asymmetry (cf. also Epstein 1999:337)

(iii) conceptual simplicity

Zwart (2009b): Merge applying to two elements is a divergence from the simplest possible—and hence preferable—scenario: why not one?

alternative: Unary Merge

(24) **Unary Merge** (adapted from Zwart 2009a, 2010)
Merge selects a single subset from a resource (e.g. {α}), includes it in the derivation under construction (δ), and yields an ordered pair (e.g. <{α}, δ>, assuming {α} projects).

(25)


2.2 Primary Merge

question: how does the very first Merge operation take place, when there isn't yet a "derivation under construction", i.e. when δ = ∅?

traditional (often implicit) answers:

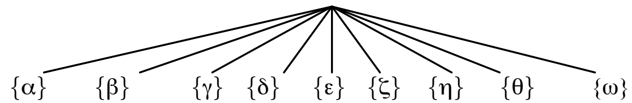
(i) Select can exceptionally take two elements from the resource

(26) Select (α,β)
Merge (α,β) = {α,β}

problems:

- if 2, why not 3 or 4 or …?

(27) Select (α,β,γ,…,ω)
Merge (α,β,γ,…,ω) = {α,β,γ,…,ω}



- how to restrict this to Primary Merge?

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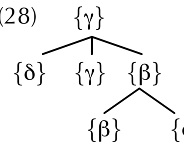


(ii) Select need not (directly) feed Merge

(29) Select α
Select β
Merge (α,β) = {α,β}

problems:

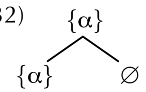
- same overgeneration issues as solution (i)

- involves lookahead

alternative: Unary Merge α with the empty workspace (see also Zwart 2009b, 2010, Fortuny 2008)

(30) δ = ∅

(31) Merge (α,∅) = <α,∅>

(32)


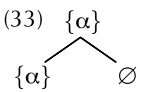
interesting side-effect: labeling the output of Primary Merge now becomes trivial: given that Ø by definition cannot project, Merge (α,Ø) will always/automatically be labeled α

3 QUICK RECAP

section 1: 4 root axioms

- i) Roots have no grammatical features
- ii) Roots have no syntactic category
- iii) Roots are defined structurally, not lexically
- iv) Roots are merged lower than functional material

section 2: asymmetric Primary Merge

(33)


next section: derive (i)-(iv) from (33)

4 THE ANALYSIS: DERIVING THE PROPERTIES OF ROOTS

gist of the analysis: the empty position created as a side-effect of asymmetric Primary Merge serves as the insertion site for roots

4.1 A (simplified) sample derivation

(34) the books

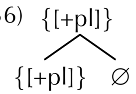
(i) Numeration/Resource:

(35) R = {[+def], [+pl]}

recall: Late Insertion ⇒ R contains no actual vocabulary items, only grammatical features (and no placeholder feature for roots)

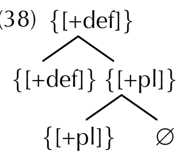
(ii) syntactic derivation:

step one: (Primary) Merge of [+pl]

(36)


(37) R = {[+def]}

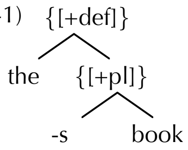
step two: Merge of [+def]

(38)


(39) R = { }

(iii) (late) Vocabulary Insertion:

(40) /ðə/ ↔ [+def]
/s/ ↔ [+pl]
/buk/ ↔ ∅

(41)


4.2 Deriving the four root axioms

i) Roots have no grammatical features
→ ∅ is radically empty ⇒ the root position does not play any active role in the syntactic derivation and root meaning is malleable

ii) Roots have no syntactic category
→ ∅ is radically empty ⇒ it does not contain any categorial features

iii) Roots are defined structurally, not lexically
→ the empty position is a mechanical by-product of the operation Merge; it is completely dissociated from whatever vocabulary item gets inserted into that position at a post-syntactic stage

iv) Roots are merged lower than functional material
→ only in the case of the very first Merge operation (Primary Merge) is the derivation null ⇒ only at the very foot of the structure does Ø show up

5 THEORETICAL CONSEQUENCES OF THE ANALYSIS

5.1 Dealing with multiple roots: layered derivations

previous section: the root position (i.e. Ø) is the mechanical by-product of the very first Merge operation only

consequence: structures containing multiple roots must be the result of multiple derivations, each with its own instantiation of Primary Merge

(42) **One derivation one root**
For every derivation there is exactly one root, and for every root there is exactly one derivation

implementation: **layered derivations**: derivations are layered when "the output of a previous derivation [appears] as an atom in the numeration for the next derivation" (Zwart 2009b:161)

supporting evidence (Ackema & Neeleman 2004:122-129)

(43) a. a sit-on-the-guidelines Euro policy
b. animal-to-human transplant experiments
c. go-anywhere-at-any-time-access
d. I feel particularly sit-around-and-do-nothing-ish today.

a sample derivation

(44) The boy eats the cookie. → three roots ⇒ three derivations

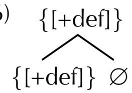
(i) Numeration/Resource (abstracting away from Tense):

(45) R = {[+def], [+def], *v*}

(ii) syntactic derivation:

step one: Primary Merge of [+def]

(46)



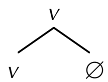
(47) R = {[+def], *v*}

step two: readmittance of (46) to R

(48) R = {[+def], *v*, <{[+def]},Ø>}

step three: Primary Merge of *v*

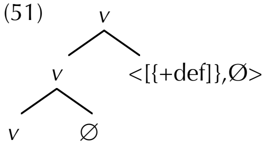
(49)



(50) R = {[+def], <{[+def]},Ø>}

step four: Merge of <{[+def]},Ø>

(51)



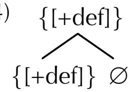
(52) R = {[+def]}

step five: readmittance of (51) to R

(53) R = {[+def], <<*v*,Ø>,<{[+def]},Ø>>}

step six: Primary Merge of [+def]

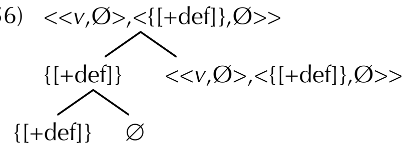
(54)



(55) R = {<<*v*,Ø>,<{[+def]},Ø>>}

step seven: Merge of <<*v*,Ø>,<{[+def]},Ø>>

(56)



(57) R = { }

(iii) (late) Vocabulary Insertion:

(58)

/ðə/	↔	[+def]
/bɔj/	↔	Ø
/kuki/	↔	Ø
/it/	↔	Ø

(59) The boy eats the cookie.

problem: if readmittance to R entails spell-out and concomitant opacity (Uriagereka 1999, Zwart 2009b), the derivation in (46)-(58) wrongly predicts objects are islands and subjects are not

proposal: derivations proceed left-to-right across subderivations (i.e. subject-verbal complex-object), but bottom-up within each subderivation (cf. Uriagereka 1999, Drury 2005)

5.2 A unified vocabulary insertion mechanism

5.2.1 Introduction

DM-view on Vocabulary Insertion:

- functional vocabulary items (FVIs): inserted based on competition (Subset Principle)
- lexical vocabulary items (LVIs): inserted based on free choice

DM-view on insertion sites:

- FVIs spell out functional terminal nodes, i.e. grammatical features
- LVIs spell out root terminal nodes, i.e. the [Root]-feature

however: recall that FVIs can also spell out root terminal nodes:

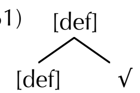
(60) Ik heb het **waarom** van de zaak nooit begrepen.
I have the why of the case never understood
'I have never understood the motivation behind the case.'

ergo: we need a new insertion mechanism that can handle data such as (60)

5.2.2 Vocabulary Insertion in Distributed Morphology

LVIs: free choice

(61)



(62) a. the dog
b. the cat
c. the house
d. …

FVIs: insertion through competition

(63) **The Subset Principle**
The phonological exponent of a Vocabulary item is inserted into a morpheme in the terminal string if the item matches all or a subset of the grammatical features specified in the terminal morpheme. Insertion does not take place if the Vocabulary item contains features not present in the morpheme. Where several Vocabulary items meet the conditions for insertion, the item matching the greatest number of features specified in the terminal morpheme must be chosen (Halle 1997:428).

an abstract example

(64) feature specification of a terminal node: {a,b}

(65) possible vocabulary items:
a. /ta/ ↔ {a}
b. /plo/ ↔ {a,b}
c. /stu/ ↔ {a,b,c}
d. /du/ ↔ {k,z}

step 1: select all those vocabulary items the feature specification of which matches a subset of that of the terminal node:

(66) a. /ta/ ↔ {a}
b. /plo/ ↔ {a,b}

step 2: select from this group the closest matching vocabulary item:

(67) /plo/ ↔ {a,b}

problem: FVIs in root position

(68) Ik heb het **waarom** van de zaak nooit begrepen.
I have the why of the case never understood
'I have never understood the motivation behind the case.'

(69) feature specification of the terminal node: ∅

(70) the to-be-inserted vocabulary item:

/warɔm/ ↔ {wh}

→ given that {wh} ⊄ Ø the vocabulary item *waarom* 'why' can never be inserted in (68), contrary to fact

5.2.3 Unified insertion through competition

goal: a single, unified insertion mechanism that applies to both FVIs and LVIs and that regulates insertion in both functional and root terminal nodes

intuition: the feature specification of a terminal node acts as a ***filter*** for the vocabulary items that can be inserted in that position:

- if the terminal node contains grammatical features, only vocabulary items matching those features can be inserted;
- if the terminal node contains no grammatical features, the filter is vacuous and *all* vocabulary items are candidates for insertion

formalization: the Revised Subset Principle

(71) **The Revised Subset Principle**
Given a terminal node A with feature set F_0 and vocabulary items (VIs) $/B_{1,2,\ldots,n}/ \leftrightarrow F_{1,2,\ldots,n}$:
$/B_i/$ is inserted in A if $F_0 \times F_i \subseteq F_0 \times F_0$. When several VIs meet this condition, the one for which $F_0 \times F_i$ most closely matches $F_0 \times F_0$ is chosen.

an abstract example:

(72) list of vocabulary items:

a.	/bik/	↔	Ø	(LVI)
b.	/ta/	↔	{a}	(FVI)
c.	/plo/	↔	{a, b}	(FVI)
d.	/stu/	↔	{a, b, c}	(FVI)

option #1: a terminal node (F_0) with grammatical features:

(73) $F_0 = \{a, b\}$

(74) $F_0 \times F_0 = \{a,b\} \times \{a,b\} = \{<a,a>, <a,b>, <b,a>, <b,b>\}$

(75)
$F_0 \times F_{/bik/} = \{a,b\} \times \varnothing = \varnothing$
$F_0 \times F_{/ta/} = \{a,b\} \times \{a\} = \{<a,a>, <b,a>\}$
$F_0 \times F_{/plo/} = \{a,b\} \times \{a,b\} = \{<a,a>, <a,b>, <b,a>, <b,b>\}$
$F_0 \times F_{/stu/} = \{a,b\} \times \{a,b,c\} = \{<a,a>, <a,b>, <b,a>, <b,b>, <a,b>, <b,c>\}$

→ /plo/ is inserted in F_0, exactly as was the case with the traditional Subset Principle

option #2: a terminal node (F_0) without grammatical features:

(76) $F_0 = \varnothing$

(77) $F_0 \times F_0 = \varnothing \times \varnothing = \varnothing$

(78)
$F_0 \times F_{/bik/} = \varnothing \times \varnothing = \varnothing$
$F_0 \times F_{/ta/} = \varnothing \times \{a\} = \varnothing$
$F_0 \times F_{/plo/} = \varnothing \times \{a,b\} = \varnothing$
$F_0 \times F_{/stu/} = \varnothing \times \{a,b,c\} = \varnothing$

→ all vocabulary items (both FVIs and LVIs) end in a tie, and so all vocabulary items as possible realizations of F_0

6 CONCLUSIONS

(a) the following four properties of roots can be derived as theorems from the theory of Merge:
  i) Roots have no grammatical features
  ii) Roots have no syntactic category
  iii) Roots are defined structurally, not lexically
  iv) Roots are merged lower than functional material

(b) Merge is unary and asymmetric, and the first Merge operation in each derivation appends an element from the Numeration to the null derivation

(c) the empty position thus created serves as the post-syntactic insertion site for roots

(d) expressions containing multiple roots are the output of multiple (layered) derivations

(e) there is no separate vocabulary insertion mechanisms for functional and lexical vocabulary items: all insertion is based on competition, with the feature specification of the terminal nodes acting as filters on the vocabulary items that can be inserted

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