English participle allomorphy as inflection class

Johannes Hein
Universität Leipzig
johannes.hein@uni-leipzig.de

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Intro

General aim:
derivation = inflection = (post-)syntax (Marantz 1997; Baker 1988; Pesetsky 1995)

Aim of this talk:
Give a post-syntactic account of English participle allomorphy without the problems and drawbacks of Embick (2003).

Claim:
Such an account can be provided if one slightly adapts a modified version of Distributed Morphology (DM plus accessibility relations, Keine 2013).

1 Structure

Structure of the talk

1. Background: Distributed Morphology (DM)
2. Data
3. Embick's (2003) analysis and its problems
4. Reanalysis
5. Conclusion

2 Background: Distributed Morphology

Taxonomy of theories of inflection (Stump 2001)

(1) *Taxonomy*

	realisational	incremental
lexical	**DM**	MM[1]
inferential	PFM[2]	hardly attested

- Realisational: Inflection markers realise morphosyntactic features that are independently present on the stem.
- Incremental: Inflection markers add features to the stem that are not present otherwise.
- Lexical: Inflection markers are morphemes and exist as objects in the lexicon.
- Inferential: Inflection markers have no morpheme status and do not exist as separate objects in the lexicon.

2.1 Standard DM

Core assumptions of DM (Halle and Marantz 1993, 1994)

- Late insertion:
  - Morphology after syntax
  - Operates on bundles of morphosyntactic features provided by syntax that lack phonological information (f-morphemes)
  - Features of terminal nodes are realised by insertion of vocabulary items (VIs = exponents/inflection markers)
- Syntactic structure all the way down:
  - Inflected words have internal structure generated by syntax
  - Inflectional affixes realise functional syntactic heads
- Underspecification of vocabulary items and the Subset Principle

Vocabulary items and insertion

- Pair morphosyntactic and phonological information

  (2) /phon/ ↔ [morphosyn]/[morphosyn]

[2]Minimalist Morphology (Wunderlich 1996)
[2]Paradigm Function Morphology (Stump 2001)

- Vocabulary items may be underspecified (contain only a subset of the features of the terminal node)

Subset Principle and Specificity (Halle and Marantz 1993, 1994)

(3) *Subset Principle*:
A vocabulary item V is inserted into a functional morpheme M (a terminal node) iff (a) and (b) hold:
   a. The morphosyntactic features of V are a subset of the morphosyntactic features of M.
   b. V is the most specific VI that satisfies (a).

(4) *Specificity*:
A VI V_i is more specific than a VI V_j iff V_i has a bigger subset of M's morphosyntactic features than V_j.

3 The Data

The data: English past participles

In English past participles, the choice of exponent depends on:

- the identity of the lexical item and
- whether the participle is adjectival or passive

(5) a. The *closed* window. adjectival
   b. The window was *closed*. passive

(6) a. The *written* note. adjectival
   b. The note was *written*. passive

(7) a. The *rotten* apple. adjectival
   b. The apple was *rotted*. passive

Two questions (Embick 2003)

1. How can the allomorphy between the adjectival and the passive participle of the same lexical item be derived?
   ⇒ rott**en** – rott**ed**
2. Is it possible to derive phonologically identical exponents as functionally identical (i.e. syncretic)?
   ⇒ rott**en** – writt**en**

- Morphology must be sensitive to adjectival vs passive environment and different lexical items.
- To derive the phonologically identical exponents as syncretic, we must assume that all participle exponents realise the same syntactic head (i.e. the same morphosyntactic features).

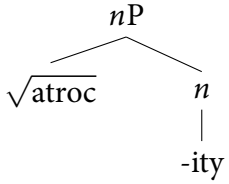
4 Embick (2003)

4.1 The analysis

Background assumptions

- Standard Distributed Morphology (Halle and Marantz 1993, 1994; Noyer 1997)
  - Syntax all the way down
  - Late insertion
  - Underspecification plus Subset Principle and Specificity
- Stems are built in the syntax by combining category-less roots and categorizing heads (Marantz 1997, 2001; Embick and Noyer 2007; Embick and Marantz 2008).
- Categorizing heads are realised by vocabulary insertion like all other functional heads too.

(8) *Root and categorizing head*



Syntactic structure of participles

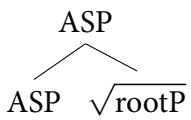
- The participle exponent realises a functional head ASP that acts as a categorizing head.
- Adjectival and passive participles can be assigned different underlying syntactic structures based on their different semantic properties as exemplified by certain tests (Kratzer 1996; Embick 2004).
- Adjectival participles have no eventive reading and are hence identified as statives.

(9) a. *The package remained carefully open.
b. The door was built open. (Embick 2004)

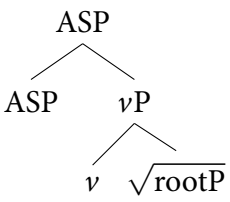
- Passive participles have (two different) eventive readings and are hence identified as eventives.

(10) a. The package remained carefully opened.
b. *The door was built opened. (Embick 2004)

(11) *stative*



(12) *eventive*



Two cycles of vocabulary insertion

- VI takes places in two cycles, an **inner cycle** targeting only root-attached terminal nodes and an **outer cycle** targeting all other nodes.
- Roots with which a given vocabulary item can occur must be listed in its insertion context.

(13) a. *Insertion into ASP: inner cycle*
ASP ↔ -en/__{$\sqrt{\textbf{rot}}$, $\sqrt{\textbf{shrink}}$, …}
ASP ↔ -∅/__{$\sqrt{\text{open}}$, $\sqrt{\text{empty}}$, …}
ASP ↔ -t/__{$\sqrt{\text{bend}}$, …}
ASP ↔ -èd/__{$\sqrt{\text{bless}}$, $\sqrt{\text{allege}}$, $\sqrt{\text{age}}$, …}
ASP ↔ -ed/__{$\sqrt{\text{close}}$, $\sqrt{\text{obstruct}}$, …}

b. *Insertion into ASP: outer cycle*
ASP ↔ -en/__{$\sqrt{\textbf{break}}$, $\sqrt{\textbf{speak}}$, …}
ASP ↔ -∅/__{$\sqrt{\text{hit}}$, $\sqrt{\text{sing}}$, $\sqrt{\text{shrink}}$, …}
ASP ↔ -t/__{$\sqrt{\text{bend}}$, $\sqrt{\text{bought}}$, …}
ASP ↔ -ed

When are two vocabulary items identical (i.e. syncretic)?

Substantive Identity

There are two kinds of syncretism:

- Intra-cyclic syncretism:
Vocabulary items are identical when they pair identical features/nodes with identical exponents.
- Substantive Identity (inter-cyclic syncretism):
Identity of form and function except for the contextual features (i.e. listed roots).

Problem: visibility of the root

- Categorizers such as *v* are usually phases (Marantz 2001).
- The root should therefore not be visible to outer-cycle insertion.
- The lists attached to the VIs in the outer-cycle hence cannot play a role for VI insertion.
- To derive different exponents for different roots in passive structures where *v* intervenes between ASP and the root, the root must nevertheless be visible for the insertion process.

Solution: ∅-transparency and linear locality

- Allomorphy in passive participles only ever occurs under linear adjacency of root and exponent.
- Linearization applies before VI-insertion in each cycle (marked with *)

- ∅ exponent of *v* is transparent for VI-insertion (by stipulation)

(14) *Derivation of* broken (Embick 2003: 166)

Input:	[[$\sqrt{\text{break}}$ *v*] ASP]
Linearisation 1:	[($\sqrt{\text{break}}$ * *v*) ASP]
Insertion 1:	[($\sqrt{\text{break}}$ * -∅) ASP]
	∅-transparency: ($\sqrt{\text{break}}$ * -∅) → ($\sqrt{\text{break}}$)
Linearisation 2:	($\sqrt{\text{break}}$ * ASP)
Insertion 2:	($\sqrt{\text{break}}$ * *-en*)

- No non-default (i.e. non *-ed*) ASP exponent after overt realisation of *v* (e.g. by verbaliser *-ise*)

Summary of analysis

- Participle exponent realises ASP head.
- Adjectival participles are statives: direct root-attachment of ASP.
- Passive participles are eventives: *v* intervenes between ASP and the root.
- Vocabulary insertion is two-cycled: inner cycle for root-attached, outer cycle for all other terminal nodes.
- VIs come equipped with lists of root as contextual features.
- Linearisation applies before VI-insertion in each cycle.
- Null-exponent of *v* is transparent for further VI-insertion.

4.2 Problems and drawbacks

The Syncretism Principle (Müller 2005):
Identity of form implies identity of function within a given domain unless there is evidence to the contrary.

- Two phonologically identical morphemes are assumed to realise the same set of morphosyntactic features.
- This assumption is well established as a means of gaining insights into the structure and functioning of grammar.

Substantive Identity = homophony

- Substantive Identity = identity up to the contextual features/lists
- In principle, all features that restrict the insertion of a given VI can be formulated as contextual features.

(15) a. /s/ ↔ [−1,−2,−pl,+pres,+active]
b. /s/ ↔ [ ]/[−1,−2,−pl,+pres,+active]

For two items to show Substantive Identity (i.e. inter-cyclic syncretism) they must be identical up to the contextual features, which means that they must have the same phonological form.

Syncretism (or at least Substantive Identity) then is merely homophony!

Locality

- A distinction of ASP heads is made based on structural locality but this distinction is neutralised by linear locality.
- The actual phonological form of an exponent should play no role for insertion (of itself or of other exponents).
- PF-transparency (needed by Embick for the ∅-transparency) usually plays no role in the syntax/morphology module of grammar.

5 Reanalysis

A different view on the data

- **Allomorphy**: a set of exponents (realising the same features) whose choice is not predictable from phonological properties of the stem/root.
⇒ In a given grammatical domain, one set of exponents is used for one set of lexemes while a different set of exponents is used for a different set of lexemes.
- An **inflection class** "is a set of lexemes whose members each select the same set of inflectional realisations" (Aronoff 1994).
⇒ In a given grammatical domain, one set of exponents is used for one set of lexemes while a different set of exponents is used for a different set of lexemes.

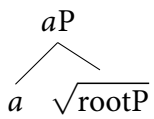
Inflection classes of English participles

(16) *Inflection classes of English participles*

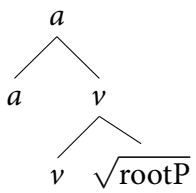
class	1	2	3	4	5	6	7	8
ADJ	ed	en	∅	t	èd	en	∅	en
PASS	ed	en	∅	t	ed	ed	ed	∅
	close	write	hit	bend	allege	rot	open	shrink

- ASP is an adjectivizer *a* (and behaves like a categorizing head).

(17) *stative*



(18) *eventive*



- Categorizing heads *c* bear a respective feature [c] that is realised by an exponent.

Possible DM analysis 1

(19) *Inflection classes of English participles (repeated)*

class	1	2	3	4	5	6	7	8
ADJ	ed	en	∅	t	èd	en	∅	en
PASS	ed	en	∅	t	ed	ed	ed	∅
	close	write	hit	bend	allege	rot	open	shrink

- Exponents in row ADJ realise the *a* head.
- Exponents in row PASS realise the intervening *v* head.

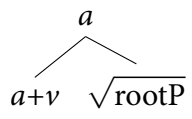
Problem:

- 4 of 5 exponents are identical in both conditions (*-ed, -en, -t, -∅*).
- Agglutinative morphology of *v*+*a* is expected but not found (e.g. rott-en-ed).

Possible DM analysis 2

- Postsyntactic Fusion of *a* and *v*.
- Fused head *a*+*v* is (structurally) local to the root.

(20) *Fused a and v*



Problem:

- Bidirectional syncretism of *-en* and *-ed*
- /**ed**/ ↔ [a, 1, 6] and /*en*/ ↔ [a, v, 2, 6]
  ⇒ /en/ blocks /ed/ in class 6
- /**ed**/ ↔ [a, v, 1, 6] and /*en* / ↔ [a, 2, 6]
  ⇒ /ed/ blocks /en/ in class 6

class	1	6	2
a	**ed**	*en*	*en*
a+*v*	**ed**	**ed**	*en*
	close	rot	write

General problems

- Stems are assumed to be marked with inflection class features in the lexicon. They must pass through syntax to the postsyntactic morphology thereby violating the Legibility Condition (Chomsky 2000, 2001).
- Roots are assumed to be category-free. Hence, they cannot bear inflection class features because these would presuppose a category (Acquaviva 2009).

⇒ Lists (of roots) must be accessed at some point in morphological derivations in order to derive inflection classes.

5.1 Keine (2013)

Accessibilities between VIs (Keine 2013)

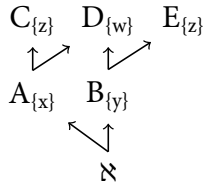
- There exists a (language specific) accessibility relation R on the inventory I of VIs that is a set of ordered pairs of VIs ($R \subset (I \times I)$)
- A VI V_i is accessible from another VI V_j if the ordered pair $\langle V_j, V_i \rangle$ is contained in R.
- A VI can only be inserted at step *n* of the derivation if it
  1. fulfills the Subset Principle and
  2. fulfills Specificity and
  3. is accessible from the VI that was inserted at step $n - 1$
- Vocabulary insertion is modelled as transition from one state to another similar to a finite state automaton.
- Transition (i.e. VI-insertion) adds the phonological information of the VI to the root and deletes the morphosyntactic information of the VI from the root (Strict Feature Discharge, no contextual features possible)
- Initial state א is conceived of as insertion of the root.

An abstract example

(21) *Inventory of vocabulary items*:
I = {/A/↔[x], /B/↔[y], /C/↔[z], /D/↔[w], /E/↔[z]}

(22) *Accessibility relation*:
R = {⟨א,A⟩, ⟨א,B⟩, ⟨A,C⟩, ⟨A,D⟩, ⟨B,D⟩, ⟨B,E⟩}

(23) *Visualisation of accessibilities*:



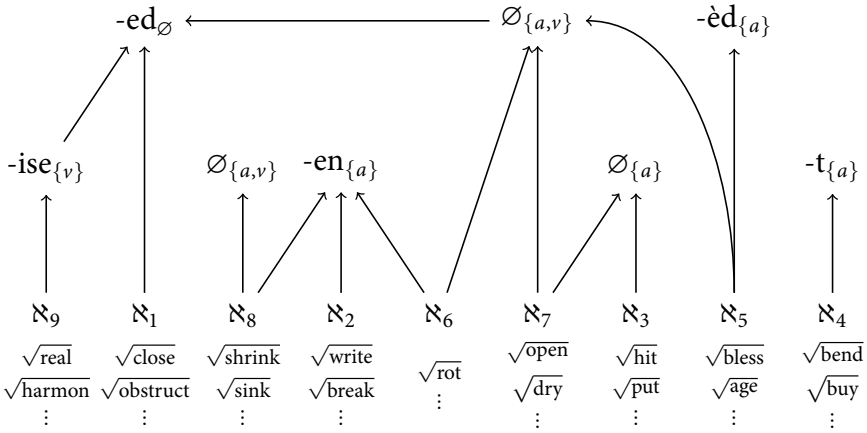
- $A_{\{x\}}$: the morphosyntactic features {x} that a VI A realises are written as subscripts.

Proposal:
In Keine's system, allow for more than one initial state. These initial states come equipped with lists of roots that are allowed in these states. In effect, these states provide different entries into the network of accessibilities, one for each inflection class.

- Fusion (and subsequent Fission) of *a* and *v* (if applicable).

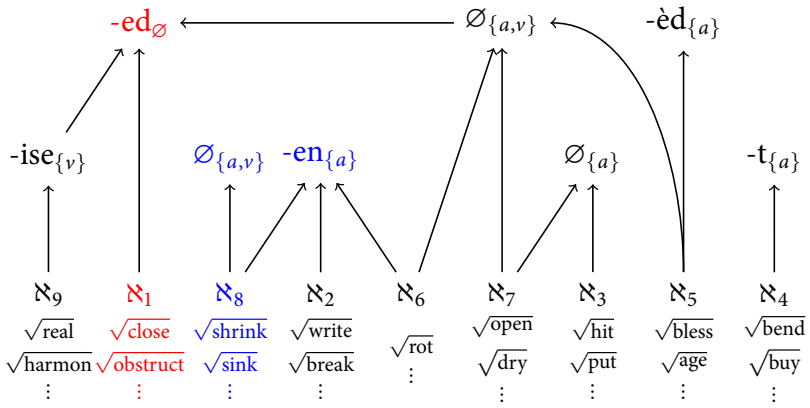
- Fusion of all heads relevant for insertion and multiple insertion into the created head is a prerequisite for Keine (2013) anyway. This removes the optionality of application of the post-syntactic operations Fusion and Fission: they just always apply.

Accessibility analysis

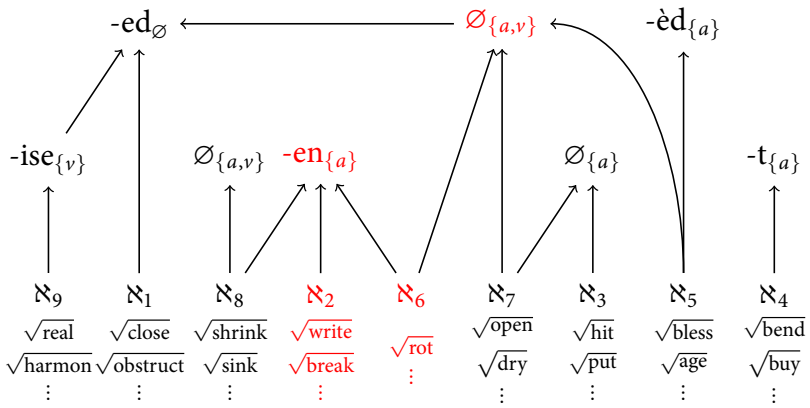


Properties of the analysis

- Different roots show different participle exponents because only subsets of exponents are accessible from the different initial states.



- An exponent (such as *-en*) can occur in both environments for one root but only in one environment for another root because it partakes in different competitions. It may be blocked by another exponent that is accessible (and thus competes for insertion) from one root but not from the other.



Advantages & disadvantages

Advantages:

- Avoids problems with Legibility Condition.
  ⇒ class information is stored in the morphological system
- Strictly local influence of the root on insertion.
  ⇒ only the VI inserted in the directly preceding step matters
- No Substantive Identity needed.
  ⇒ all phonologically identical exponents are syncretic
- Linear information plays no role for insertion.

Disadvantages:

- Three zero exponents are needed.
- What constrains the (up to now quite powerful) accessibility relations?

6 Conclusion

Conclusion

- Embick's (2003) account of English past participle allomorphy requires some conceptually problematic changes of DM.
- Nevertheless, a postsyntactic account of the data can be given if one adopts accessibility relations among VIs and several initial states.
- Accessibilities independently account for further problematic phenomena including extended exponence, obligatory co-occurrence and (possibly) paradigmatic gaps.
- Furthermore, the system provides a true unification of derivation and inflection that is compatible with both roots and inflection classes.

- It is a possible solution to problems of accomodating derivational and inflectional morphology in a post-syntactic module.

7 Appendix: Formalisation of accessibility relations

Morphological inventories consist of a set of exponents Γ and an accessibility relation R defined over it ($R \subset (\Gamma \times \Gamma)$).

(24) *Morphological inventory* (Keine 2013: 3)
Morphological inventories are ordered pairs $\langle \Gamma, \Delta \rangle$ with Γ a set of exponents and Δ an accessibility relation defined over Γ.

a. *Exponent*
An exponent $\mathcal{A}$ is an ordered pair $\langle \sigma, \pi \rangle$, where σ is a set of morpho-syntactic features and π is a phonological string.

b. *Accessibility relation*
The accessibility relation is a set of ordered pairs of exponents. If $\langle \mathcal{A}, \mathcal{B} \rangle \in \Delta$, then $\mathcal{A}, \mathcal{B} \in \Gamma$. $\langle \mathcal{A}, \mathcal{B} \rangle \in \Delta$ will be notated as '$\mathcal{A} \rightarrow \mathcal{B}$' for convenience.

The insertion process is a somewhat adapted finite state automaton.

(25) *State* (Keine 2013: 3)
A state is an ordered triple $\langle \mathcal{A}, \Sigma, \Pi \rangle$ such that $\mathcal{A}$ is an exponent, Σ is a set of morpho-syntactic features, and Π is a phonological string.

(26) *Insertion* (Keine 2013: 4)
Given a morphological inventory $\langle \Gamma, \Delta \rangle$,

a. *initial state:*
$\langle \aleph, \Sigma, \Pi \rangle$, with Σ being some syntactically well-formed set of morpho-syntactic features and Π being some lexically determined phonological string;

b. *transition '$\triangleright$':*
given some state $\langle \mathcal{A}, \Sigma, \Pi \rangle$ and an exponent $\mathcal{B} = \langle \sigma, \pi \rangle$ fulfilling the Subset Principle, $\langle \mathcal{A}, \Sigma, \Pi \rangle \triangleright \mathcal{B} \equiv \langle \mathcal{B}, \Sigma \backslash \sigma, \Pi \oplus \pi \rangle$.

c. *final state:*
a state $\langle \mathcal{A}, \Sigma, \Pi \rangle$ is final if for all exponents $\mathcal{B} \in \Gamma$ with $\mathcal{B} = \langle \sigma, \pi \rangle$, either $\mathcal{A} \nrightarrow \mathcal{B}$ or $\sigma \notin \Sigma$ or both.

The Subset Principle is modified to make reference to the accessibility relation.

(27) *Subset Principle* (Keine 2013: 3)
An exponent $\mathcal{A} = \langle \sigma, \pi \rangle$ is applied to stage $\Omega = \langle \mathcal{B}, \Sigma, \Pi \rangle$ if

a. $\mathcal{A}$ is accessible from $\mathcal{B}$: $\mathcal{B} \rightarrow \mathcal{A}$,

b. the morpho-syntactic features of $\mathcal{A}$ are a subset of the morpho-syntactic features of Σ: $\sigma \subseteq \Sigma$,

c. there is no exponent $\mathcal{C} = \langle \sigma', \pi' \rangle$, such that $\mathcal{B} \rightarrow \mathcal{C}$, $\sigma' \subseteq \Sigma$, and $\mathcal{C}$ is more specific than $\mathcal{A}$.

- the initial state comprises the insertion of the root which is governed by different principles than insertion of inflectional/derivational exponents
- insertion terminates if and only if a finite state is reached
- all heads bearing features that are to be realised must undergo Fusion
- contextual features cannot play a role in determining insertion

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