English participle allomorphy as inflection classes

Johannes Hein

Based on English participial allomorphy, Embick (2003) proposes a division of vocabulary insertion into an inner cycle targeting root-attached and an outer cycle targeting all other terminal nodes. However, this division leads to (i) a weakening of the notion of syncretism and (ii) a blurring of structural vs. linear locality. In this paper, I propose an account couched in a slightly extended version of Keine's (2013) variant of Distributed Morphology which makes use of 'accessibility relations' between exponents such that only a subset of all exponents competes for insertion. This has two advantages: on the one hand, it correctly accounts for English participial allomorphy but avoids split insertion and its theoretically problematic implications. On the other hand, it is able to deal with inflection classes that have been notoriously problematic for post-syntactic morphology.

1. Introduction

Distributed Morphology usually distinguishes l-morphemes and f-morphemes with insertion of lexical stems applying to the former and insertion of inflectional exponents applying to the latter (cf. Halle 1992; Embick 1997; Marantz 1997; Harley & Noyer 1998, 1999). Marantz (1997) regarded lexical stems to be the part of a word which is not a realisation of morphosyntactic features while nowadays lexical stems are assumed to be themselves composed of a category-neutral root and category-assigning head (Marantz 2001; Embick & Noyer 2007; Embick & Marantz 2008).

The latter hypothesis is what underlies the analysis of English participle allomorphy in Embick (2003). In English, past/passive participles can show different morphological realisations depending on the identity of the lexeme itself (1-a vs. b vs. c) and/or its structural environment, i.e. attributive (1-c-i) or predicative use (1-c-ii).

(1) a. (i) The clos-*ed* window.
(ii) The window was clos-*ed* (by John).
b. (i) The brok-*en* window.
(ii) The window was brok-*en* (by John).

Proceedings of ConSOLE XXIII, 2015, 509-529
http://www.sole.leidenuniv.nl

c. (i) The rott-*en* apple.
(ii) The apple was rott-*ed*.

He proposes two cycles of vocabulary insertion, one into root-attached terminals and the other into all other terminals. The structural difference between attributive and predicative participles then lies exactly in root-attachment vs. non-root-attachment. For both cycles, the identity of the root must be visible in order to determine that *-en* is inserted in attributive participles for $\sqrt{\text{break}}$ and $\sqrt{\text{rot}}$ but that it is only inserted in the predicative participle for $\sqrt{\text{break}}$ not for $\sqrt{\text{rot}}$. Embick is forced to weaken the notion of syncretism considerably if e.g. the *-en* that attaches to $\sqrt{\text{break}}$ and $\sqrt{\text{rot}}$ in the attributive cases is to be regarded as identical to the *-en* that attaches to $\sqrt{\text{rot}}$ only in the predicative cases. Additionally, for the root to influence the insertion into a non-root-attached terminal it has to be linearly adjacent to it (all intervening material has to be phonologically null). However, the actual phonological shape of a vocabulary item should not play a role for its insertion or the insertion of other vocabulary items. These problems will be discussed in detail in section 3. I argue that these drawbacks can be avoided in a variant of Distributed Morphology developed by Keine (2013) that assumes a structured inventory of exponents. At any given point in the derivation of a participle only a subset of the vocabulary items compete for insertion, namely those that are 'accessible' from the vocabulary item inserted in the directly preceding derivational step or from the root itself. In this framework, there is no need for two cycles of insertion and the modifications of the notions of syncretism and adjacency that these entail. A root can influence which participle allomorph it occurs with because only these allomorphs are accessible from it. One and the same exponent (e.g. *-en*) might be accessible from different roots (e.g. $\sqrt{\text{break}}$ and $\sqrt{\text{rot}}$) but its competition is different for each root. This is because other exponents (e.g. *-ed*) are accessible from some of these roots (e.g. $\sqrt{\text{rot}}$) but not from others (e.g. $\sqrt{\text{break}}$).

In section 2 of this article, I will first present the allomorphy pattern of English participles and then give a brief outline of Embick's analysis. I will point out its problematic entailments in section 3 and argue for their implausibility. Section 4 will introduce a new view of the data and some basics of Keine's variant of Distributed Morphology. Subsequently, an analysis of the English participles in this variant of DM will be presented that accounts for the data and avoids the problems identified in section 3.

2. *Embick (2003)*

Embick (2003) presents an analysis of the morphology of English participles in Distributed Morphology where – contrary to the original framework – l-morphemes are regarded as category-free roots that need to be categorised by a particular functional head (v, n, a) in syntax (see e.g. Marantz 1996, 1997, 2001; Arad 2003; Harley 2005; to name only a few). Based on the allomorphy pattern of the participles it is argued that (i) syntactic adjacency has a direct influence on morphological Spell-Out, that (ii) insertion of vocabulary items takes place in cycles, that (iii) due to these cycles the notion of syncretism needs to be refined and that (iv) alongside syntactic adjacency phonological adjacency of vocabulary items plays a role, too.

2.1. The phenomenon

The argumentation is based on the observation that the actual morphological form of a participle is dependent, on the one hand, on the underlying root and, on the other hand, on the status of the participle as 'adjectival' or 'passive'. The first point is exemplified by the pair *broken/closed* in (2).[1]

(2) a. $\sqrt{\text{break}}$
   (i) The broken window.
   (ii) The window was broken (by John).
   b. $\sqrt{\text{close}}$
   (i) The closed window.
   (ii) The window was closed (by John).

In the adjectival as well as the passive environment the participle of $\sqrt{\text{break}}$ is realised by *-en* and that of $\sqrt{\text{close}}$ by *-ed*. As evidence for the second point, Embick (2003) cites roots such as $\sqrt{\text{rot}}$, $\sqrt{\text{sink}}$ or $\sqrt{\text{open}}$ whose adjectival form (i) is different from their passive form (ii) as shown in (3).

(3) a. $\sqrt{\text{sink}}$
   (i) The sunken ship.
   (ii) The ship was sunk.
   b. $\sqrt{\text{rot}}$
   (i) The rotten apple.
   (ii) The apple was rotted.
   c. $\sqrt{\text{open}}$
   (i) The open door.
   (ii) The door was opened.

Embick (2003) deduces two questions from the above:

1. How can the allomorphy between adjectival and passive (verbal) participles of one and the same root be derived (i.e. *rotten* vs. *rotted*)?

2. Are same forms in different roots like *-en* in *rotten* vs. *-en* in *broken* syncretic or accidentally homophonous?

2.2. Embick's (2003) analysis

Embick (2003) argues that the allomorphy mentioned in question 1 can be derived with recourse to structural configurations. Adjectival and passive participles can be assigned different underlying syntactic structures based on their different semantic properties as exemplified by particular tests (Kratzer 1996; Embick 2004). Adjectival participles have no eventive reading (4) and can hence be identified as statives.

[1] Here, potential phonological changes of the root like *break*→*broke* are abstracted away from.

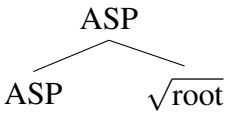
(4) a. *The package remained carefully open. (eventive reading)
b. The door was built open. (stative reading) (Embick 2004)

Passive participles on the other hand have (two different) eventive readings but no stative reading and can thus be identified as eventives.

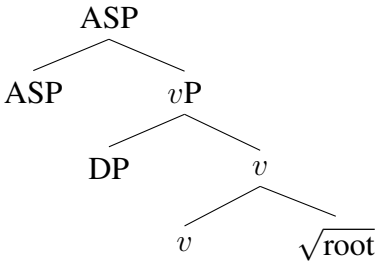
(5) a. The package remained carefully opened.
b. *The door was built opened.

Under the assumption that different interpretations of participles go hand in hand with different underlying syntactic structures, particularly that eventive readings presuppose the existence of a verbalising head v, he can distinguish three participial structures: stative (6-a), resultative (6-b), and eventive passive (6-c)

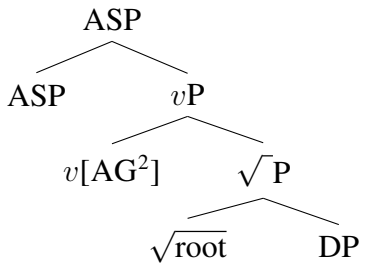
(6) a. *stative*



b. *resultative*



c. *eventive passive*



The ASP head is the locus of insertion of the participial endings. In resultatives and eventive passives the ASP head selects a verbaliser phrase vP containing the root, whereas in statives it is merged directly with the root.[3] The allomorphy between adjectival and verbal participles (v-participles) as exemplified in (5), is hence reduced to the structural property of the ASP head to be 'root-attached' (6-a) and (5–i) vs. 'v-attached' (6-b, c) and (5–ii). From this follows the allomorphy generalisation in (7).

[2]AG = agentive

[3]According to core assumptions of Distributed Morphology, insertion into ASP can only be sensitive to the root if there are no other heads intervening between the two. However, as one can see when comparing the two eventive participles in (2-a-ii) and (2-b-ii), the choice of exponent is in fact dependent on the identity of the root even though v[AG] intervenes. As will be discussed in section 3, this leads Embick to postulate that vocabulary insertion is sensitive to the root not only under structural adjacency (as in (6-a)) but also under linear adjacency (as in (6-c) with a $\emptyset$-realisation of v[AG]).

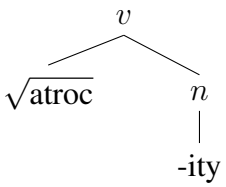
(7) *Allomorphy Generalisation* (Embick 2003:150)
A "stand-out" participial allomorph, like the *-en* in *rott-en* as opposed to perfect and passive *-ed*, is found only in the stative syntactic structure.

This means that a pattern with a resultative participle being different from the respective stative and eventive passive participle of the same root is impossible as only the stative is structurally different in the relevant sense (i.e. it does not have v). This is a generalisation that seems to hold for English.

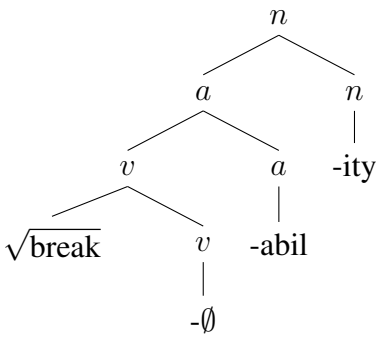
Concerning the second question, whether same forms in different roots are syncretic (i.e. *-en* in *rotten* vs. in *broken*), Embick (2003) follows a principle that is either implicitly or explicitly assumed in many morphological analyses (cf. the Syncretism Principle, Müller 2005:237). This principle states that exponents with the same morphological form have the same morphological function, i.e. are identical, unless there is proper evidence to the contrary. He calls it AVOID ACCIDENTAL HOMOPHONY and argues convincingly that the ASP head in statives is the same syntactic head as the ASP head in resultatives and eventive passives. Its name is arbitrary but importantly, this head is associated with stativity and is present in statives as well as in v participles. This means that both *-en* in the stative participle of $\sqrt{\text{rot}}$ and *-en* in the stative and v-participle of $\sqrt{\text{break}}$ can be regarded as having the same function, i.e. realising the same functional head ASP, thereby being syncretic.

The fact that ASP can attach to roots as well as projections of v is a general property of derivational morphology (Marantz 2001). ASP is comparable to Marantz's n in words like *atrocity* and *breakability* which can also select both bare and already categorised roots as shown in (8) where n merges with a bare root in (8-a) but with an structure labelled a in (8-b).

(8) a. *Structure of* atrocity



b. *Structure of* breakability



A second point evinced by (8) is that one and the same vocabulary item (here: *-ity*) can be inserted into both root-attached and non root-attached nodes.

A very similar situation obtains with participles where one and the same vocabulary item (e.g. *-en* in *broken* or *-ed* in *closed*) can be inserted into a root-attached ASP head (stative) and into a non root-attached ASP head (resultative and eventive passive). One exception is posed by those participles that show different vocabulary items in different environments. In order to derive these under the above mentioned assumptions about structures and syncretisms, Embick (2003) devises a process of insertion that applies cyclically. In the first cycle, insertion happens only to root-attached heads (Root Cycle) and in the second cycle, insertion applies to all the other

heads (Outer Cycle). The inventory of vocabulary items in both cycles is the same, however, the content of the lists (i.e. information about the roots in whose context a certain VI can be inserted) that can be accessed during insertion may vary. Furthermore, information about the root has to be accessible in the Outer Cycle, because v-participles can show root-dependent allomorphy.

An analysis of the English participles adhering to those assumptions leads to the postulation of the following vocabulary items (Embick 2003:161).[4]

(9) a. Insertion into ASP: Root Cycle
ASP ↔ -en/__{$\sqrt{\text{rot}}$, $\sqrt{\text{shrink}}$, … }
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/__{$\sqrt{\text{break}}$, $\sqrt{\text{speak}}$, … }
ASP ↔ -∅/__{$\sqrt{\text{hit}}$, $\sqrt{\text{sing}}$, $\sqrt{\text{shrink}}$, … }
ASP ↔ -t/__{$\sqrt{\text{bend}}$, $\sqrt{\text{bought}}$, … }
ASP ↔ -ed

This gives rise to the question whether vocabulary items such as ASP ↔ -en/__{$\sqrt{\text{rot}}$, $\sqrt{\text{shrink}}$, … } and ASP ↔ -en/__{$\sqrt{\text{break}}$, $\sqrt{\text{speak}}$, … } are actually syncretic or just two accidentally homophonous elements. Embick (2003) argues for the former view because the two are identical and only differ with respect to the content of their lists. He refers to Marantz's (2001) observation that a combination like (10-a) often has an idiomatic interpretation, meaning that a list (the encyclopedia) is consulted, whereas this is not the case in (10-b). Nevertheless, neither the root nor x are different in both cases.

(10) *Abstract structure* (cf. Embick 2003:162)
a. $\sqrt{\text{root}}$-x
b. $\sqrt{\text{root}}$-y-x

From this he derives the general principle in (11).

(11) *Listedness* (Embick 2003:163)
Listed information is cycle-dependent. Whether a list is accessed for insertion, and the particular contents of that list, are determined by whether or not the node to be spelled out is in the Root or Outer Cycle.

He then goes on to define two types of morphological identity, an intracyclic one corresponding to the common perception of syncretism, and an intercyclic one which he calls Substantive Identity (12).

[4]The present participle exponent *-ing* also realises an ASP head, though one that bears the tense feature [pres]. The vocabulary item ASP[pres] ↔ /-ing/ is not listed here because ASP[pres] would always be realised by *-ing* due to specificity and therefore plays no role in the allomorphy pattern.

(12) *Substantive Identity* (Embick 2003:163)
Two vocabulary items show *substantive identity* when (1) the features responsible for insertion are the same, and (2) these features are paired with identical exponents.

This definition excludes differences in the content of lists as a reason for two otherwise identical vocabulary items to be regarded as different from each other. Under this view, the VIs ASP $\leftrightarrow$ -en/__{$\sqrt{\text{rot}}$, $\sqrt{\text{shrink}}$, ...} and ASP $\leftrightarrow$ -en/__{$\sqrt{\text{break}}$, $\sqrt{\text{speak}}$, ...} in the two cycles in (9) are syncretic. The same holds for other VIs that only differ with respect to their lists.

Lastly, Embick (2003) is concerned with the question of global visibility of the root. Since there is root dependent allomorphy in the Outer Cycle, too, features of the root must be visible even if there is no structural adjacency between the root and the head that is the target for insertion. However, he argues against global visibility of the root based on the observation that whenever there is root dependent allomorphy in the Outer Cycle the head and the root are linearly adjacent. He thus proposes that a linearisation operation applies before each insertion cycle and that a principle of $\emptyset$-transparency holds which states that phonologically empty vocabulary elements are invisible after linearisation. The derivation of the v-participle *broken* according to Embick (2003) looks like (13) (* is the linearisation operator).

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

INPUT:	[[$\sqrt{\text{break}}$ v] ASP]
Linearisation 1:	[($\sqrt{\text{break}}$ * v) ASP]
Insertion 1:	[($\sqrt{\text{break}}$ * -$\emptyset$) ASP]
	$\emptyset$-transparency: ($\sqrt{\text{break}}$ * -$\emptyset$) $\rightarrow$ ($\sqrt{\text{break}}$)
Linearisation 2:	($\sqrt{\text{break}}$ * ASP)
Insertion 2:	($\sqrt{\text{break}}$ * *-en*)

It must then be ensured that the whole sequence $\sqrt{\text{break}}$*-*en* is spelled out as *broken* (possibly by some readjustment rule). To conclude this section, Embick (2003) has succeeded in providing an account of English participle allomorphy that correctly derives the data and regards all form-identical exponents as syncretic.

3. Critique of Embick (2003)

However, in order to achieve the correct derivation of the English participles, Embick (2003) is forced to accept some assumptions and their entailments that are not unproblematic. These will be discussed in what follows.

3.1. Cycles of insertion and substantive identity

By formulating the structure that underlies the participles with recourse to roots and categorising heads, Embick (2003) is able to ascribe allomorphy patterns like that of $\sqrt{\text{rot}}$ to structural configurations, hence avoiding a hardly possible distinction of *rotted* vs. *rotten* based solely on

morphosyntactic feature specifications. Nevertheless, it is exactly those structural differences between stative and v-participles that pose a problem for a standard morphological account of how these structures translate into their surface form. Exponents such as *-en*, which occur as bare stative markers with certain roots (e.g. $\sqrt{\text{rot}}$, $\sqrt{\text{sink}}$), but as stative and v-participle markers with others (e.g. $\sqrt{\text{break}}$, $\sqrt{\text{write}}$), cannot be derived as syncretic under the given conditions. To avoid lists that refer to the property 'root-attached' as a visible morphosyntactic feature and thus are inhomogeneous[5], Embick (2003) has to introduce insertion cycles. Since there are now two cycles of insertion that by and large use the same set of exponents, in addition, he has to introduce the notion of substantive identity (12). Under this definition of syncretism, vocabulary items that differ solely with regard to their contextual features (lists) are deemed identical. However, basically all features of a vocabulary item that restrict its insertion are formulable as contextual features. Consider for instance the two formulations of the VI for the English 3rd person singular agreement affix *-s* in (14). The VI in a. realises the features [−1], [−2], [−plural], [+present], and [+active] directly, while the largely equivalent VI in b. realises an empty set of features in the context of exactly those features.

(14) a. /-s/ ↔ [−1,−2,−pl,+pres,+act]
b. /-s/ ↔ [∅]/[−1,−2,−pl,+pres,+act]

Therefore, this conception of identity undermines the whole notion of syncretism as identity of form and function and diminishes its value in gaining insights into the workings of (universal) grammar.

For both problematic ad-hoc assumptions about insertion and syncretism Embick (2003) presents independent evidence supposedly supporting the exceptionality of direct root attachment: (i) under reference to Fabb (1988) and Plag (1999) (cited in Marantz 2001) it is mentioned that a majority of derivational affixes in English can exclusively be combined with roots. (ii) Only direct attachment of a functional morpheme with a root permits an idiomatic interpretation of the resulting complex (also Marantz 2001).

Point (i) refers to Fabb (1988) who presents an examination of cooccurrence restrictions of 43 English derivational suffixes. For 28 of these – which he classifies as group 1 – he claims that they never attach to already suffixed bases. However, some of the examined suffixes only differ in the category of the stem that they can be affixed to. If, following Marantz (2001) and Embick (2003), the suffixes actually realise categorising heads which can be merged with phrases of different categories or bare roots anyway (see (8)), then these suffixes should be regarded as identical. The suffixes *-age*, *-ful*, *-ify*, *-ly*, and *-y* which are listed twice should thus be counted only once under the given assumptions. Furthermore, the data in Fabb (1988) are actually already weakened by Plag (1999) who argues based on examples from a much bigger corpus than Fabb's that many of the suffixes in group 1 can very well be attached to already suffixed bases or that there are phonological or semantic reasons for their inability to do so. For the suffixes *-hood, -ism, -y*, and *-age*, for example, he lists the grammatical forms *farm-er-hood*, *expans-ion-ism*, *arch-er-y*, and *light-er-age*. Though Plag mentions that these suffixes most often occur directly adjacent to the stem, there is no grammatical condition restricting them to this position. Hence

[5]Here, a list is inhomogeneous if its elements are not of the same type. Therefore, a list containing only roots is homogeneous, while a list containing roots as well as roots combined with the feature 'root-attached' is not.

they do not bear on the above argumentation. "To conclude our review of Fabb's group 1 suffixes we can state that many of Fabb's empirical claims are wrong" (Plag 1999:84).

The proportion of suffixes that never attach to an already suffixed word is actually not as big as it is claimed to be in Fabb (1988), Marantz (2001), and Embick (2003). Furthermore, their cooccurrence restrictions can in many cases be allocated to phonological or semantic properties. There is no need for any exceptionality of insertion into a directly root-attached head.

Concerning point (ii) it should be mentioned that there are also idiomatic interpretations of structures larger than the first root attachment (see e.g. Nunberg et al. 1994; McGinnis 2002; Svenonius 2005). Following the argumentation in Panagiotidis (2011), the impression that idiomatic interpretation is restricted to root attachment is given because there is no compositional meaning possible in this step. If roots only have a radically underspecified, if any, semantic content, a compositional meaning can simply not arise when a head is merged with a bare root. Hence it must be the case that accessing a list is possible whenever a head is merged with a phrase or a root, but it is due to the special semantics of bare roots that the system is forced to do so in root-attachment structures. *Listedness* (11) in the formulation of Embick (2003) thus cannot hold.

Since the independent evidence brought forward is, in my view, quite weak I regard bicyclic insertion and substantive identity as ad-hoc assumptions due alone to the analysis presented by Embick (2003).

3.2. Linear adjacency

A further concession that Embick has to make which results from reducing allomorphy to structural configurations is that linear adjacency plays a role for vocabulary insertion. It must be guaranteed that the identity of the root is visible when insertion into a non root-attached ASP head takes place because that head shows root controlled allomorphy. Compare, for instance, the v-participle of $\sqrt{\text{close}}$ in (15-a) with that of $\sqrt{\text{break}}$ in (15-b).

(15) a. The window was clos-**ed** (by John).
b. The window was brok-**en** (by John).

In both participles, the ASP head that is realised by the exponent in boldface is separated from the root by v and thus undergoes Outer-Cycle insertion. Since categorizers, such as v, are usually phases (Marantz 2001) the identity of the root should not be visible to this insertion process. Nonetheless, a different exponent is chosen for each root. Hence, while in one case – *rotten* vs. *rotted* – allomorphy is controlled by structural locality (root-attachment), it has to be independent of exactly this locality. In a sense this undermines the whole account which Embick himself notices: "The analysis [...] is based directly on a notion of locality [...]. [...] the patterns of allomorphy found in English participles seem to display some apparently non-local properties." (Embick 2003:165). To avoid the problem he reduces the Outer Cycle root-controlled allomorphy to linear instead of structural adjacency. For this he needs a linearisation operation that is not further specified to apply cyclically and before insertion. Stative vs. v-participle allomorphy is thus dependent on structural adjacency to the root while root-controlled allomorphy is dependent

on linear adjacency to the root. Absurdly enough, first, a distinction of ASP heads is made based on structural locality to the root while this very distinction is neutralised by linear locality.

Embick himself calls this an "apparently negative result" (Embick 2003:167) because linear adjacency as a concept of the PF module of the classical Y model of grammar should not play a role in the morphology/syntax module. I agree with this view and develop an alternative analysis of the English participle allomorphy in the next section that avoids the problems discussed above.

4. An alternative analysis

The concept of root has been used and discussed in many recent works on morphosyntax as well as semantics. The structures proposed by Embick (2003) are well suited to account for the different semantic (eventive vs. non-eventive interpretation) and syntactic (external argument possible vs. not possible) properties of the English participles. An analysis of their morphology based on these structure thus seems desirable. Hence in what follows I will adopt Embick's proposal that stative vs. v-participles have the underlying structures in (6) where v-participles are characterised by a v head intervening between the head that is the locus of participle morphology and the root while stative participles are characterised by v's absence.

Also, I will concur with Embick in that this structural difference is the reason for stative vs. v-participle allomorphy. I will, however, differ in the treatment of root-controlled allomorphy. Vocabulary insertion will be understood as a finite state automaton with the exponents constituting different states. Different groups of roots will then represent different initial states of the automaton and only certain transitions will be possible from those different initial states. Basically, insertion of a root determines a subset of all exponents (namely those that are accessible from this root's initial state) which compete for insertion. This subset will then be different for e.g. $\sqrt{\text{close}}$ and $\sqrt{\text{break}}$.

4.1. Participle allomorphy as inflection classes

If one takes a fresh look at the English participles unburdened by a certain theoretical mindset about underlying structures, one can take note that besides the *-ing* form, which will not be discussed further here, each participle exhibits at least one, maximally two different forms. For those participles that show only one form, there is lexeme-dependent variation between the exponents *-ed, -en, -t*, and $\emptyset$. For those with two forms, one would assume that each distinct form of the same lexeme realises different morphosyntactic features. Apart from the four exponents already mentioned there is a fifth one *-èd*. The participles thus choose a subset of exponents from these five which realises some kind of participle feature. This subset is different for each participle although groups of participles can be formed that choose the same subset (as already partly noted by Embick 2003). An inflection class is according to (Aronoff 1994:64) "a set of lexemes whose members each select the same set of inflectional realizations." In this sense, the English participles can be assigned to the eight inflection classes in (16).

(16) *Inflection classes of participles (with sample verb)*

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

Classically, however, participle formation is not inflection but derivation since a change of category from verb to adjective occurs. The exponents in (16) are thus not inflectional but derivational affixes. Participle formation should accordingly happen in the lexicon (cf. Levin & Rappaport 1986)

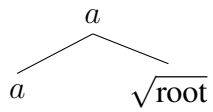
Marantz (1997), Baker (1988), Pesetsky (1995), among others, argue against such a distinction between inflection and derivation and for a unified (syntactic) word formation. The concept of root is quite closely connected with these approaches because it allows the treatment of classical derivational morphology in the syntax (see Marantz 1996, 2001).

At this point, we again consider Embick's proposed structures which explicitly contain roots. Roots allow for the treatment of derivation as inflection in the syntax. Hence, provided the structures are correct, the difference between derivation and inflection plays no role for English participle allomorphy and a treatment of the allomorphy patterns as inflection classes is unproblematic.

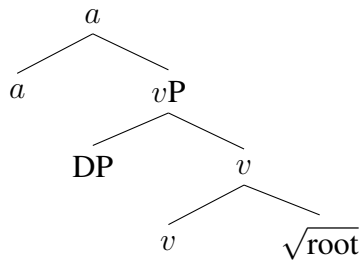
The structures further provide the feature that is responsible for the occurrence of different exponents in the first place: the little v head. For example, it distinguishes ADJ from PASS in the table in (16). An analysis regarding the exponents in the PASS row as realisations of v and those in the ADJ row as realisations of ASP, however, seems implausible. On the one hand, four of the five exponents show up in both rows and on the other hand there is no agglutinative morphology in any of the eight classes even though there are two realisable heads v and ASP in the PASS row. As already mentioned by Embick (2003), all exponents seem to realise the same syntactic node which he arbitrarily called ASP. In the following, I will regard this head as an adjectiviser a which has no deeper consequences ("It [the ASP head] could equally well be labelled a for adjective' [...].", Embick, 2003:157) but makes the subsequent argumentation more transparent. I will further assume that categorising heads bear a corresponding morphosyntactic feature $[a]$ for adjectiviser, $[v]$ for verbaliser, and $[n]$ for nominaliser that is realised upon insertion.

Obviously, both heads a and v (through their features $[a]$ and $[v]$ respectively) affect the choice of exponent of the participle. This situation is far from exceptional in morphological systems (see e.g. Müller 2005; Alexiadou & Müller 2008). This kind of inflection is called fusional inflection and is accounted for in Distributed Morphology by a postsyntactic operation 'Fusion' which takes two terminal nodes and melts them into one node that contains the features of both. An analogous approach is imaginable for the English participles. After syntax has generated the structures in (6) repeated below as (17), Fusion applies before vocabulary insertion and fuses a and v into one terminal node that is root adjacent structurally. The root would hence be visible for insertion in both stative and v participles leading to root-controlled allomorphy while the distinguishing $[v]$ feature still accounts for the stative vs. v participle allomorphy.

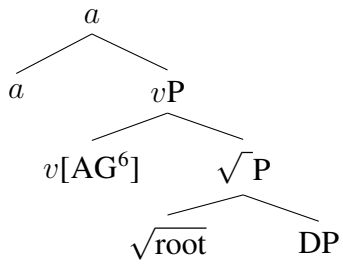
(17) a. *stative*



b. *resultative*



c. *eventive passive*



Unfortunately, such an approach is suboptimal for two reasons. First, the problem that nearly all exponents show up in both environments [a] and [a,v] is left unaccounted for. Also, an analysis that only makes use of decomposed (binary) inflection class features (as in Alexiadou & Müller 2008) and the two (privative) category features [a] and [v] runs into the problem that some of the syncretisms are overlapping, so-called bidirectional syncretisms. In Distributed Morphology these are (if at all) only derivable if one accepts a group of additional (problematic) modifications (see the discussion of one such problem in Bonan, Baerman et al. 2005).

And second, there are participles of roots whose verbaliser is realised by its own vocabulary item as in *categor-is-ed, real-is-ed, ...*. In these participles the v head is realised separately from the a head by *-is(e)*. Assuming that the v realised by *-is(e)* is different from the v head in the structures in (6), i.e. that there are two adjacent verbalising v heads, seems unattractive for conceptual reasons. The reason for postulating a categorising head is that it assigns a category to its complement (complement = root) or changes its category (complement = categoriser phrase). A complex that is already categorised as a verb by a verbalising head should not be selected by yet another verbalising head. Another peculiarity of participles with an overt verbaliser is that they only ever show *-ed* as their participle exponent. This is accounted for by linear adjacency in Embick (2003): an overt realisation of the v head intervening between the ASP head and the root results in them no longer being linearly adjacent which is a prerequisite for root-controlled allomorphy. Hence, only the default exponent *-ed* can be inserted into ASP.

Accordingly, an analysis of the participles as syntactic word formation in Distributed Morphology does not seem to be possible without non-trivial modifications as Embick (2003) has rightly recognised. However, in what follows, I will present a variant of DM that diverges from the standard in only a small way, namely the assumption of a structured inventory of exponents, and that is able to derive correctly the forms of the participles and resolve the majority of syncretisms without encountering the problems of Embick's analysis. The view of participle allomorphy as inflection classes will be taken up in the analysis after a short presentation of the basics of the framework.

4.2. Syntagmatic constraints

Keine (2013) develops a variant of Distributed Morphology based on the idea that not all vocabulary items are available for insertion at any given time in the derivation even if they fulfill the subset and specificity principle. The set of available exponents is constrained by accessibility relations defined between the single exponents. A morphological inventory then consists of a set of exponents Γ and an accessibility relation R defined over this set ($R \subset (\Gamma \times \Gamma)$) where the relation itself is a set of ordered pairs of exponents.

(18) *Morphological inventory* (Keine 2013:203–204)
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 exponents themselves are defined as states by Keine (2013).

(19) *State* (Keine 2013:204)
A state is an ordered triple $\langle \mathcal{A}, \Sigma, \Pi \rangle$ such that $\mathcal{A}$ is an exponent, Σ is a set of morphosyntactic features, and Π is a phonological string.

An abstract example of an inventory of exponents is given in (20) where '/…/' denotes a phonological string and '[…]' a set of morphosyntactic features.

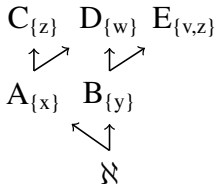
(20) *Inventory of vocabulary items*:
Γ = {⟨[x],/A/⟩, ⟨[y],/B/⟩, ⟨[z],/C/⟩, ⟨[w],/D/⟩, ⟨[z],/E/⟩}

Over this inventory, the following accessibility relation R is defined (ℵ denotes the initial state to be defined below).

(21) *Accessibility relation*:
R = {⟨ℵ,⟨[x],/A/⟩⟩, ⟨ℵ,⟨[y],/B/⟩⟩, ⟨⟨[x],/A/⟩,⟨[z],/C/⟩⟩, ⟨⟨[x],/A/⟩,⟨[w],/D/⟩⟩, ⟨⟨[y],/B/⟩,⟨[w],/D/⟩⟩, ⟨⟨[y],/B/⟩,⟨[v,z],/E/⟩⟩}

The inventory with its accessibility relation can be visualised as in (22). Vocabulary items are written in the format 'Phonological string$_{\{\text{Morphosyntactic features}\}}$'. An ordered pair ⟨⟨[x],/A/⟩,⟨[y],/B/⟩⟩ of exponents that is part of the accessibility relation is then notated as $\text{A}_{\{\text{x}\}} \rightarrow \text{B}_{\{\text{y}\}}$.

(22) *Visualisation of accessibilities*:



Using a modified finite state automaton, vocabulary insertion is modelled as transition from one state to another with the initial state representing the stem with all its morphosyntactic features. Upon insertion, the morphosyntactic features of the initial state that are realised by the inserted exponent are deleted and the phonological string associated with the exponent is added to that of the stem. The resulting state contains the morphosyntactic fetaures of the initial state modulo those of the exponent and the phonological string of the initial state plus that of the exponent.

(23) *Insertion* (Keine 2013:204, 206)
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 '$\rhd$':*
given some state $\langle \mathcal{A}, \Sigma, \Pi \rangle$ and an exponent $\mathcal{B} = \langle \sigma, \pi \rangle$ a well-formed transition into $\mathcal{B}$ substracts σ from Σ and adds π to Π: $\langle \mathcal{A}, \Sigma, \Pi \rangle \rhd \mathcal{B} \equiv \langle \mathcal{B}, \Sigma \backslash \sigma, \Pi \oplus \pi \rangle$.

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 $\sigma \nsubseteq \Sigma$ or both.

By slightly adapting the subset principle it is guaranteed that at step n of the derivation only those exponents compete for insertion that are directly accessible from the exponent inserted at step $n-1$.

(24) *Wellformedness Restriction on Transitions* (Keine 2013:205)
Given a state $\Omega = \langle \mathcal{B}, \Sigma, \Pi \rangle$, transition into an exponent $\mathcal{A} = \langle \sigma, \pi \rangle$ is wellformed 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. for all exponents $\mathcal{C} = \langle \sigma', \pi' \rangle$, such that $\mathcal{B} \rightarrow \mathcal{C}$ and $\sigma' \subseteq \Sigma$, $\mathcal{A}$ is more specific than $\mathcal{C}$.

Coming back to the abstract example from above, assume we start with a stem /Π/ that has the morphosyntactic feature set {x,v,z}. This situation is the initial state ℵ in (22). Now, insertion proceeds from the initial state (23-a) via 'transition' (23-b). The two VIs $A_{\{x\}}$ and $B_{\{y\}}$ compete for insertion since they are the only two VIs accessible from the initial state, hence fulfilling condition a. of the Subset Principle (24). Of these two, only $A_{\{x\}}$ fulfills condition b. and, trivially, c. Therefore, by (23-b), its morphosyntactic feature x is removed from the stem's set

of morphological features, and its phonological string is attached to that of the stem, yielding a new string /ΠA/ with the morphosyntactic feature set {v,z}. Insertion continues because no final state (23-c) is reached yet. In this step, the VIs $C_{\{z\}}$ and $D_{\{w\}}$ compete due to their being accessible from the exponent $A_{\{x\}}$ that has been inserted in the previous step. Of these two, only $C_{\{z\}}$ fulfills all conditions of the Subset Principle and is thus inserted, i.e. its morphosyntactic feature z is removed from the feature set of /ΠA/ and its phonological string is attached to it yielding /ΠAC/. Note that even though, globally, there is a more specific exponent $E_{\{v,z\}}$, it is not inserted because it is not accessible from $A_{\{x\}}$. With /ΠAC/, a final state is reached: there are no further exponents accessible from C and the derivation terminates.

The influence of an exponent on the choice of an exponent in the next step of the derivation is strictly local. It also follows from the above definitions that feature that have already been realised by insertion of an exponent cannot be realised again in the same derivation because they have been deleted (theorem of strict feature discharge Keine 2013:5). As Keine (2013) shows, this variant of Distributed Morphology is able to account, in a simple and transparent way, for morphological systems whose analysis hitherto either made necessary the introduction of additional operations such as feature introduction/change and impoverishment or were not analysable at all (extended exponence).

4.3. English participles in Keine's 2013 variant of DM

4.3.1. Syntagmatic constraints and 'derivational' morphology

Although Keine (2013) is concerned exclusively with inflectional morphology, the way the dependencies between exponents are modelled in his system seems to be optimally suited to capture the selectional restriction of derivational morphemes like *-ity* or *-ness* in a system that makes use of roots. (Keine 2013:4) mentions that the √ in the definition of initial state can be understood as insertion of the root which is governed by different constraints than that of other vocabulary items. Under the above assumption that categorising heads bear a respective feature [a], [v], or [n] that is available for realisation, one could implement possible selectional restrictions of derivational affixes as accessibility relations. For example, there would exist an accessibility from the vocabulary item [a] ↔ *-(i)ous* zu [n] ↔ *-ness* but not to [n] ↔ *-ity* which would derive *gloriousness* but not **gloriousity* (from Marantz 2001). Whether all selectional restrictions of derivational affixes are implementable as easily is of course to be shown and needs more research. Nevertheless, there is no question that 'derivational' morphology is derivable in Keine's variant of DM.

4.3.2. Fusion and inflection class features

The basic idea of the analysis is to derive root-controlled allomorphy as a consequence of inflection class membership and stative vs. v participle allomorphy as that of absence vs. presence of a v head (entailing a [v] feature) in the structure. In section 4.1 it was already suggested to fuse both heads a and v in v-participle structures leading to problems for standard Distributed Morphology. In Keine's DM, however, all relevant features that are distributed over several heads

need to be present on one single head that is the target of insertion in order for accessibility relations to have an effect at all (cf. Keine 2013:footnote 9). Hence, an operation of fusion or head movement is necessary anyway. Also, insertion applies to a head as long as no accessible exponent fulfills the subset principle anymore. Therefore, the targeted head needs to be fissioned in the sense of Noyer (1997). Fusion of a and v turns from being a problem for a successful analysis of English participle allomorphy to a prerequisite of it.

Keine (2013) makes no statement about inflection classes. He only states that contextual features are excluded by the system as it is formalised now. Formulating the root dependency in the form of a list that is a contextual feature of a vocabulary item is therefore not possible.

Generally, there is a problem when trying to combine the concept of root with the phenomenon of inflection classes. Usually, inflection class membership is encoded by (possibly decomposed) features on the stem of a lexeme and is hence, just like gender, an idiosyncratic property and part of its lexical entry. The different exponents of a morphological system must then be specified for the various inflection class features. However, inflection class features on stems are problematic in a postsyntactic model of morphology like DM if the syntax is assumed to be modelled according to the Minimalist Program (Chomsky 1995) because they violate the legibility condition (Chomsky 2000, 2001) and the inclusiveness condition (Chomsky 1995, 2000, 2001). (For a detailed discussion of this problem see Alexiadou & Müller 2008.) Furthermore, there is yet another problem as Acquaviva (2009) points out. In most cases where the form of a morphological exponent is dependent on features of the root the latter is equipped with a diacritic class feature (cf. Harris 1999; Embick & Halle 2005; amongst others). But "if a root has a feature that presupposes a category, then it is not really category-free. Positing an invisible class marker on a root in order to make sure that it ends up in the right nominal or verbal inflectional class simply states the observed correlations (if noun, class X, if verb, class Y), treating them as part of the root itself. But then the root has nominal or verbal information, which is precisely what the lexical decomposition hypothesis is meant to exclude" (Acquaviva 2009:2).

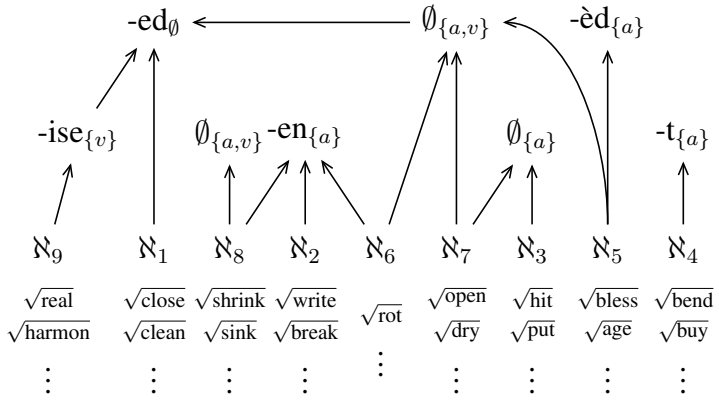
A simple solution for combining roots and inflection classes presents itself, if one unites Keine's idea that at any given point in the derivation there is only a subset of all exponents available for insertion with the definition of an inflection class as being a set of roots that each select the same subset of exponents. One has to make sure that from certain roots only certain exponents are accessible while from other roots other exponents are accessible. In detail, one needs several initial states that differ with respect to (i) the roots that can be inserted into the l-morpheme and (ii) the exponents that are accessible from them. Nonetheless, the set of morphosyntactic features of these initial states has to be identical. Also, each initial state has to contain a list of roots of which it is allowed to be the initial state. Under these assumptions, the idiosyncratic information about inflection classes is neither encoded on the root nor does it have to be present in the syntax. It is entirely contained within the morphological system alone.

4.3.3. Final analysis

Now everything is in place to analyse English participle allomorphy in Keine's variant of DM enriched by plurality of initial states. Since eight inflection classes have been identified (16), eight initial states are needed which I will distinguish with numerical indices on their אs. The analysis is shown in (25) where accessibilities are represented by arrows pointing to the vocabulary

item that is accessible from the vocabulary item at the base of the arrow. Vocabulary items are represented as their phonological string with their morphosyntactic features subscripted.

(25) *Marker specifications and accessibilities of English participles*



In this analysis nearly all form-identical exponents can be derived as syncretic. Only with the zero markers in classes 3, 7, and 8 this was not possible. However, it is debatable in what sense zero markers can be homophonous at all. The verbaliser *-ise* is included in order to show that there is actually a ninth inflection class containing the verbs with overtly realised [v] feature. Since only *-ed* is accessible from *-ise* those participles never show allomorphy.

Different roots show different participle exponents (root-controlled allomorphy) because only subsets of exponents are accessible from the different initial states. Consider the different participle allomorphs for the roots $\sqrt{\text{close}}$ (class 1) and $\sqrt{\text{break}}$ (class 2) from example (2), repeated below as (26).

(26) a. $\sqrt{\text{break}}$
   (i) The broken window.
   (ii) The window was broken (by John).
   b. $\sqrt{\text{close}}$
   (i) The closed window.
   (ii) The window was closed (by John).

The root $\sqrt{\text{close}}$ can only ever form its participle with *-ed* because this is the only exponent that is accessible from the initial state of class 1 roots. Whether the participle is stative with only the feature [a] or passive with [a, v] it is always the exponent *-ed*$_{\emptyset}$ that is attached because it is the only exponent that fulfills all conditions of the Subset Principle: (i) it is accessible, (ii) its morphosyntactic feature set is a subset of the morphosyntactic feature set of the initial state (i.e. [a] for statives, [a,v] for v-participles), and (iii) there is no other exponent that fulfills (i) and (ii) and realises more features than it. The same holds for $\sqrt{\text{break}}$. Only *-en*$_{\{a\}}$ is accessible from the initial state of class 2 roots. Since [a] is part of the morphosyntactic feature set of both participles, it fulfills all conditions of the Subset Principle and is thus inserted in stative and v-participles of $\sqrt{\text{break}}$. The difference between $\sqrt{\text{close}}$ and $\sqrt{\text{break}}$ is that only *-ed*$_{\emptyset}$ is accessible from the former and only *-en*$_{\{a\}}$ is accessible from the latter.

We can now turn to cases where one and the same root takes two distinct allomorphs depending on the underlying structure as in example (3) repeated below as (27).

(27) a. $\sqrt{\text{sink}}$
   (i) The sunken ship.
   (ii) The ship was sunk.
   b. $\sqrt{\text{rot}}$
   (i) The rotten apple.
   (ii) The apple was rotted.
   c. $\sqrt{\text{open}}$
   (i) The open door.
   (ii) The door was opened.

Consider first (27-a-i) whose initial state is $\aleph_8$ with the feature set $[a]$. Accessible exponents are $\emptyset_{\{a,v\}}$ and *-en*$_{\{a\}}$ of which only the latter fulfills condition b. and c. of the Subset Principle because the former is specified for the feature $[v]$ in addition to $[a]$ which is not part of the initial state's feature set. Hence, the output form is *sunken*.[7] In (27-a-ii), however, the initial state contains $[v]$ and thus $\emptyset_{\{a,v\}}$ wins the competition which results in the output *sunk*. The derivations (27-b-i) and (27-c-i) proceed in parallel to the derivation of (27-a-i). From both roots, $\sqrt{\text{rot}}$ and $\sqrt{\text{open}}$, there are two different exponents accessible, *-en*$_{\{a\}}$ and $\emptyset_{\{a,v\}}$ for $\sqrt{\text{rot}}$; $\emptyset_{\{a\}}$ and $\emptyset_{\{a,v\}}$ for $\sqrt{\text{open}}$. When only $[a]$ is present on the respective initial state $\aleph_7$ or $\aleph_6$, $\emptyset_{\{a,v\}}$ can never fulfill the Subset Principle due to the additional $[v]$ feature. Therefore, the respective other exponent wins the competition in stative participles and the output forms are *rotten* and *open*, respectively. The derivations of (27-b-ii) and (27-c-ii), however, are a bit different from that of (27-a-ii). When $[a]$ and $[v]$ are present on the initial state of each of the two roots, it is $\emptyset_{\{a,v\}}$ that wins the competition over *-en*$_{\{a\}}$ and $\emptyset_{\{a\}}$ respectively because it is more specific than them. However, $\emptyset_{\{a,v\}}$ is not a final state since there is a further exponent *-ed*$_{\emptyset}$ accessible from it which realises a subset of the morphosyntactic feature set that is left after insertion of $\emptyset_{\{a,v\}}$. Although the feature set after insertion of $\emptyset_{\{a,v\}}$ is empty because the features $[a, v]$ have been removed upon its insertion *-ed*$_{\emptyset}$ fulfills the Subset Principle since it realises an empty set of features which is a subset of every set. The derivations of the v-participles for $\sqrt{\text{rot}}$ and $\sqrt{\text{open}}$ thus proceeds through $\emptyset_{\{a,v\}}$ to *-ed*$_{\emptyset}$. The outputs of these derivations therefore are *rotted* and *opened*, respectively.

One and the same exponent (e.g. *-en*) can occur in both environments (stative and v-participle) for one root (e.g. $\sqrt{\text{break}}$) but only in one environment for another root (e.g. $\sqrt{\text{rot}}$) because it partakes in different competitions. It may be blocked by another exponent (e.g. $\emptyset$) that is accessible (and thus competes for insertion) from one root but not from the other. Due to its underspecification it occurs in both environments if it is not blocked by a higher specified competing exponent. In this approach, all form-identical exponents are also identical with regard to the morphosyntactic features that they realise. There is no need for an additional notion of *substantive identity* as Embick employs it because the different combinations of syncretic exponents with different roots are not encoded directly with the exponent (i.e. as different lists which made the identical exponents different in the first place in Embick's approach). Rather,

[7] Recall that phonological changes of the stem, such as /sink/ → /sunk/, are abstracted away from.

this information is encoded in the initial states and the accessibility relation of the overall morphological system of English. The influence of the root on vocabulary insertion is modelled by the different initial states. It is passed on in every step of the derivation by the accessibilities. Thus, the choice of initial state directly affects only the choice of exponent in step 1 of the derivation but it indirectly influences all following steps as well even though information about the root itself is not accessible at this point anymore. This obviates the need for linear adjacency.[8]

All in all it should be kept in mind that the above analysis is in this variant of DM understood to be only a little part of a much larger network of accessibilities. For example, there should be an accessibility from *-ise* to the nominaliser *-ation* and probably also to the third person singular marker *-s*. However, ideally, this analysis should effortlessly fit into a complete anaylsis of accessibilities between the classically derivational affixes of English.

5. Summary and conclusions

The presented analysis of English participle allomorphy regards it as basically a system of inflection classes. It is based on a variant of Distributed Morphology that assumes an exponent inventory that is structure by accessibilities between single exponents. Not only does it avoid postulating a bicyclic insertion process with an exceptional status for direct root attachment which as argued above is not supported by the independent evidence presented in Embick (2003), it also obviates the need for a second notion of syncretism called substantive iddentity. Furthermore, it does not make reference to linear information at all. The problems of the analysis given in Embick (2003) which were discussed above thus do not present themselves here.

In addition, the analysis is able to solve a long standing problem of inflection class features and roots. First, inflection class information (in the form of diacritics or features) does not show up in the syntax but is exclusively containted in the morphological module which circumvents problems with the legibility and inclusiveness condition. Second, the inflection class is not encoded on the roots themselves which would undermine their categorilessness but rather the roots are listed at the respective initial state of each inflection class. Also, it is a step in the direction of true unification of word building and inflectional morphology as envisaged in Marantz (1997).

A minor drawback is the need for three zero exponents that basically mimic the effects of impoverishment rules. An overall issue for Keine (2013) in general which carries over to this analysis is the question of what actually restricts the accessibilities. This is most definitely a guiding question for future research in this particular framework.

References

Acquaviva, Paolo. 2009. Roots and Lexicality in Distributed Morphology. In *York-Essex Morphology Meeting (YEMM)*, ed. A. Galani, D. Redinger, & N. Yeo, volume 10 of *York Papers in Linguistics Series 2 (YPL2)*, 1–21. University of York.

[8]Since all information of the functional heads has to be collected on the root anyway, i.e. by the abovementioned Fusion, in order for Keine's accessibilities to have an effect, adjacency in the structural sense does not play a role at all anymore. Structural intervention by v between the root and a has been translated into the presence vs. absence of the feature $[v]$ in the present analysis.

Alexiadou, Artemis, & Gereon Müller. 2008. Class Features as Probes. In *Infelctional Identity*, ed. A. Bachrach & A. Nevins, 101–155. Oxford: Oxford University Press.
Arad, Maya. 2003. Locality constraints on the interpretation of roots: The case of Hebrew denominal verbs. *Natural Language and Linguistic Theory* 21:737–778.
Aronoff, Mark. 1994. *Morphology by Itself*. Cambridge, Mass.: MIT Press.
Baerman, Matthew, Dunstan Brown, & Greville Corbett. 2005. *The syntax-morphology interface. A study of syncretism*. Cambridge: Cambridge University Press.
Baker, Mark. 1988. *Incorporation*. Chicago, IL: University of Chicago Press.
Chomsky, Noam. 1995. *The Minimalist Program*. Cambridge, Mass.: MIT Press.
Chomsky, Noam. 2000. Minimalist Inquiries: The Framework. In *Step by Step*, ed. R. Martin, D. Michaels, & J. Uriagereka, 89–155. Cambridge, Mass.: MIT Press.
Chomsky, Noam. 2001. Derivation by Phase. In *Ken Hale. A life in Language*, ed. M. Kenstowicz, 1–52. Cambridge, Mass.: MIT Press.
Embick, David. 1997. Voice and the interfaces of syntax. Doctoral dissertation, University of Pennsylvania.
Embick, David. 2003. Locality, Listedness, and Morphological Identity. *Studia Linguistica* 57:134–169.
Embick, David. 2004. On the structure of resultative participles in English. *Linguistic Inquiry* 35:355–392.
Embick, David, & Morris Halle. 2005. On the status of stems in morphological theory. In *Romance Languages and Linguistic Theory 2003*, ed. T. Geerts, I. van Ginneken, & H. Jacobs, 37–62. Amsterdam, Philadelphia: John Benjamins.
Embick, David, & Alec Marantz. 2008. Architecture and Blocking. *Linguistic Inquiry* 39:1–53.
Embick, David, & Rolf Noyer. 2007. Distributed Morphology and the Syntax-Morphology Interface. In *The Oxford Handbook of Linguistic Interfaces*, ed. G. Ramchand & C. Reis, 289–324. Oxford: Oxford University Press.
Fabb, Nigel. 1988. English suffixation is constrained only by selectional restrictions. *Natural Language and Linguistic Theory* 6:527–539.
Halle, Morris. 1992. Latvian declension. In *Morphology Yearbook 1991*, ed. G. Booij & J. van der Marle, 33–47. Dordrecht: Kluwer.
Harley, Heidi. 2005. How Do Verbs Get Their Names? Denominal Verbs, Manner Incorporation and the Ontology of Verb Roots in English. In *The Syntax of Aspect*, ed. N. Erteschick-Shir & T. Rapoport, 42–64. Oxford: Oxford University Press.
Harley, Heidi, & Rolf Noyer. 1998. Licensing in the non-lexicalist lexicon: nominalinominal, Vocabulary Items and the Encyclopedia. In *Papers form the UPenn/MIT Roundtable on Argument Structure and Aspect*, ed. H. Harley, volume 32 of *MIT Working Papers in Linguistics*, 119–137. Cambridge, Mass.: MIT Press.
Harley, Heidi, & Rolf Noyer. 1999. Distributed Morphology. *GLOT International* 4:3–7.
Harris, James. 1999. Nasal Depalatalization *no*, Morphological Wellformedness *sí*; the Structure of Spanish Word Classes. In *Papers on Syntax and Morphology, Cycle One*, 47–82. Cambridge, Mass.: MIT Working Papers in Linguistics 33.
Keine, Stefan. 2013. Syntagmatic constraints on insertion. *Morphology* 23:201–226.
Kratzer, Angelika. 1996. Severing the external argument from its verb. In *Phrase structure and the lexicon*, ed. J. Rooryck & L. Zaring, 109–138. Dordrecht: Kluwer.
Levin, Beth, & Malka Rappaport. 1986. The formation of adjectival passive. *Linguistic Inquiry* 17:623–661.
Marantz, Alec. 1996. 'cat' as a phrasal idiom: Consequences of late insertion in Distributed Morphology. Ms., MIT, Cambridge, Mass.
Marantz, Alec. 1997. No Escape from Syntax: Don't try Morphological Analysis in the Privacy of your own Lexicon. In *UPenn Working Papers in Linguistics*, ed. A. Dimitriadis, volume 4, 201–225. Philadelphia: University of Pennsylvania.
Marantz, Alec. 2001. Words and Things. LOT Summer School handout, from "words".
McGinnis, Martha. 2002. On the systematic aspect of idioms. *Linguistic Inquiry* 33:665–672.
Müller, Gereon. 2005. Syncretism and Iconicity in Icelandic Noun Declensions: A Distributed Morphology Approach. In *Yearbook of morphology 2004*, ed. G. Booij & J. van Marle, 229–271. Dordrecht: Springer.
Noyer, Rolf. 1997. *Features, Position and Affixes in Autonomous Morphological Structure*. New York: Garland.
Nunberg, Geoffrey, Ivan Sag, & Thomas Wasow. 1994. Idioms. *Language* 70:491–538.
Panagiotidis, Phoevos. 2011. Categorial Features and Categorizers. *Linguistic Review* 28:325–346.

Pesetsky, David. 1995. *Zero Syntax*. Cambridge, Mass.: MIT Press.
Plag, Ingo. 1999. *Morphological Productivity: Structural Constraints in English Derivation*. Berlin: Mouton de Gruyter.
Svenonius, Peter. 2005. Idioms and domain boundaries. Ms., CASTL, University of Tromsø.