Morphemes in Phonology

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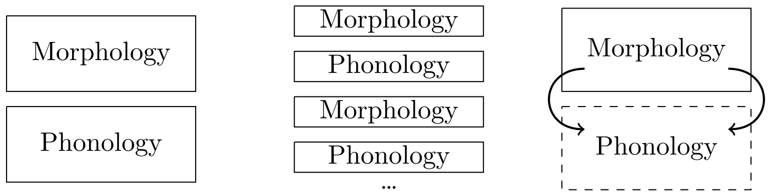
1 Introduction

A canonical morpheme has the same surface form in all of its occurrences, consists of a contiguous string of segments, and does not affect any of its surrounding phonological material in an unpredictable way. This would be ideal from a learner's perspective since a linear string of segments can be easily identified and straightforwardly be paired with some morpho-syntactic information. Looking at real languages, however, it is rather difficult to find such a morpheme. The surface form of most morphemes alternates in different phonological contexts and it often cannot even be described as a linear string of segments. In addition, different morphemes can show contrasting phonological behaviour within the same language or even cause unpredictable behaviour on neighbouring morphemes or the whole word.

It is hence impossible to understand the surface forms of morphemes without a proper phonological study of a language. Vice versa, a phonological account of a language is impossible without a morphological analysis. Although phonology and morphology are hence intricately linked, the question of how phonology and morphology interact is still an open discussion. The conceptual argument that usually accompanies any discussion of this question is modularity: Phonology and morphology are ideally separate modules of the grammar and one applies strictly after the other. In addition, they operate on a different inventory and the phonology receives only phonological elements as its input and derives surface forms exclusively based on this phonological information (1-a). However, there is a plethora of phenomena that seemingly show that every theoretical account has to modify this strictest of modularity views. The many approaches to the phonology-morphology-interface that are not strictly modular can be classified into those where a derivational architecture interleaves morphology and phonology (1-b) and those where it is violated by letting some morphological information seep through into the phonology (1-b).

(1) Modularity of morphology and phonology
a. Strict modularity b. Interleaving c. Information transfer



This chapter collects some of the case studies and argumentations relevant for a better understanding of the role of morphemes in the phonology. Since there are so many different phenomena that are relevant for such an endeavour, this collection necessarily remains incomplete and focusses only on some representative patterns. For each of the views in (1), some exemplary OT-based accounts are discussed and their predictions are compared against the empirical reality of morphemes in phonology. Accounts in the modular spirit of (1-a) are representational ones that aim to predict all seemingly morpheme-specific phenomena by enriching underlying morpheme representations with more phonological contrasts. The classical mechanism for this is underspecification of elements or the assumption of floating material, termed the 'Generalized Nonlinear Affixation' (=GNA) program which is comprehensively discussed in, for example, Bye and Svenonius (2012) or Bermúdez-Otero (2012). A second representational account whose predictions are discussed below is based on Gradient Symbolic Representations and assumes that all phonological elements have a certain gradient activity which is potentially morpheme-specific and directly influences their phonological behaviour (=GSR; Smolensky and Goldrick, 2016; Rosen, 2016). The representative model of type (1-b) that I focus on throughout is Cophonology Theory (for a summary and relevant literature, for example, Inkelas and Zoll (2007)) which assumes that multiple grammars co-exist within a language and are selected by certain morphological constructions. The theory is inherently cyclic since words are built up by optimizing one morphological construction at a time; potentially with different cophonologies. A second model where phonology and morphology interleave is Stratal OT (e.g Kiparsky, 2015; Bermúdez-Otero, 2018), the optimality-theoretic descendant of classical Lexical Phonology. In contrast to cophonologies, not every morpho-syntactic construction can be associated with a cophonology on its own but only a limited number of independently motivated strata (classically: stem, word, and phrase) optimize with their own constraint ranking. All morphemes added within the same stratum are hence subject to the same phonological generalizations. Since this model is discussed in detail in a chapter on its own, I will only briefly mention some predictions of a stratal model throughout. Finally, a representative mechanism of type (1-c) where morphological information is directly accessible in the phonology are indexed constraints. As is discussed below, those exist in a variety of versions: Constraints can be indexed to specific morphemes or to more general information like lexical categories.

This chapter is structured as follows: Section 2 discusses the variety of phonological surface forms that morphemes can have. It focusses on the non-concatenative form of morphemes and hence cases where the application of phonological processes are seemingly the only exponent of a morpheme. The appendix **A2** adds the related discussion of phonologically predictable alternations of morphemes. Section 3 turns to instances where morphemes influence the phonology and unexpected phonological generalizations hold for neighbouring structure or even the whole word. Three different degrees of morphological information are distinguished that potentially result in an exceptional phonological behaviour: Specific morphemes 3.1, independently motivated classes of morphemes 3.2, or the simple presence of different morphemes (appendix A3). Both sections 2 and 3 conclude that a single underlying representation for each morpheme in accordance with a strict modularity view (1-a) can predict more than one might initially expect: Non-concatenative morphemes and morpheme-specific behaviour can all fall out from assuming enriched phonological representations with floating or underspecified phonological material or different gradient activations. However, a few phenomena like root-prominence or non-local regularization patterns remain that seemingly make it necessary that the phonology can refer to at least some minimal amount of morphological information. Section 4 concludes.

2 The phonological form of morphemes

A more elaborate definition of the ideal morpheme alluded to above would specify a morpheme as a fixed set of contiguous, disjoint segments that are added to a base in a fixed linear position while preserving this base faithfully. Such characterizations of an ideal and concatenative morpheme are usually made in order to be able to define its counterpart; namely the heterogenous class of non-concatenative morphemes. Those are usually defined negatively as morphemes that do not conform to this concatenative ideal (e.g. Bye and Svenonius, 2012).

There are various strategies to classify non-concatenative morphemes into different groups. One example is the distinction into templatic and a-templatic exponence (e.g. Davis and Tsujimura, 2014) or the distinction into morphemes that violate or conform the 'base extension' and 'fixed target' property (Trommer and Zimmermann, 2015). These categorizations, however, only emphasize further what a varied phenomenon non-concatenative morphemes are and that they cannot be understood as a unified class of exponence. One possible list of non-concatenative morphemes with one short illustrating example each is given in (2), roughly following Zimmermann (2023).[1]

The list starts with non-concatenative morphemes that have a fixed target, i.e. result in a base with a certain phonological specification. Tone addition (2-1) is the only non-replacive of these operations: It simply adds a tonal melody to its base without erasing any of the underlying base tones. This contrasts with tone overwriting (2-2) that manifests itself as a novel tone melody that replaces underlying tone specifications. Similarly, C- and V-mutation (2-3) realize a specific consonantal or vocalic specification that potentially overwrites an underlying one. The shortening of a long consonant or vowel (2-4) also has a fixed target, namely a short segment in a specific base position. The fixed target of truncation morphemes (2-5) is a certain prosodic size for the derived word and can result in deletion of a different number of segments, depending on the number of base segments. Stress shift (2-6) can also be understood as a prosodic requirement for the whole resulting word but with less drastic consequences: It simply results in shifting of (main) stress to a designated position. Templatic morphology (2-7) is very similar to truncation in that a prosodic requirement applies to the derived form. However, in contrast to truncation, this requirement can hold for only parts of the base (as in Cupeño (2-7) where the templatic requirement states that two light syllables need to follow the stressed vowel but no requirement holds for the pre-tonic material) and secondly, different processes can ensure that this template is met in the resulting form, not only deletion. Lengthening of a consonant or vowel in a designated position (2-8) is the natural counterpart to shortening (2-4). In contrast to shortening, however, lengthening does not necessarily result in a fixed target because there are chain shifting patterns that lengthen every target vowel by one degree or mora in systems with a three-way length distinction (e.g. North Saami (Bals Baal et al., 2012) or Shilluk (Remijsen and Ayoker, to appear)). This is hence the first morpheme that extends its base but does not have a fixed target. In this sense, it is similar to reduplication (2-9) that adds a prosodically defined portion of copied material to its base but the form of this added material is not fixed since it depends on its base. The final three morphemes in (2) are the least ideal morphemes since they neither extend their base nor do they have a fixed target specification. Subtraction (2-10) deletes a prosodically defined portion of base material – in contrast to truncation, it is hence the non-realized material that has a fixed shape, not the resulting form. Metathesis (2-11) is defined as the reordering of segments that hence surface in a different linear position compared to their base form. Somewhat similarly, polarity reverses a certain phonological specification in its opposite. These two non-concatenative morphemes are discussed in some more detail in the appendix A1.

(2) Non-concatenative morphemes

1.	Tone addition	Iau (Bateman, 1990, 36+37)	
		tai^{3}	tai$^{34.21}$
		pull	pull.on
2.	C/V-mutation	Zoque (Wonderly, 1951, 117-121)	
		pata	p^{j}ata
		mat	mat.3SG
3.	Tonal overwriting	e.g. San Miguel el Grande Mixtec (McKendry, 2013, 45)	
		ki^{1}ku^{2}	ki^{3}ku^{2}
		sew.IRR	sew.IPFV
4.	C/V-shortening	e.g. Anywa (Reh, 1993, 223)	
		riːw^{2}	riw^{2}
		lay.crosswise	lay.crosswise.ANTIP

[1] All glossing in this chapter follows the abbreviations from the Leipzig Glossing Rules (Haspelmath et al., 2008). Additional abbreviations are: ACT=actual, CONT=continuative, C=consonant, DIM=diminutive, FREQ=frequentative, HAB=habilitative, ILL=illative, ICPL=incompletive, PART=partitive, TBU=tone-bearing unit, V=vowel, and VN=verbal noun. Superscripted numbers mark tones where 1 corresponds to the lowest tone of the language. An exception is Horath Franconian where the numbers denote one of two accents (Köhnlein, 2018).

(2) Non-concatenative morphemes, contd.

5.	Truncation	e.g. Italian (Krämer, 2009, 165)	
		bicicletta	bici
		bicycle	
6.	Stress shift	e.g. Upriver Halkomelem (Galloway, 1993, 56+265)	
		ɬəx^{w}ə́ɬtsɛ	ɬə́x^{w}əɬtsɛ
		spit.NCONT	spit.CONT
7.	Templatic effects	e.g. Cupeño (Crowhurst, 1994, 178)	
		tə́w	tə́ʔəʔəw
		see	see.HAB
		páčik	páčiʔik
		leach.acorns	leach.acorns.HAB
8.	C/V-lengthening	e.g. Huallaga Quechua (Weber, 1947, 54+176)	
		uma	umaː
		head	head.1SG
9.	Reduplication	e.g. Lushootseed (Urbanczyk, 2001, 209)	
		bədáʔ	bədbədáʔ
		child	child.PL
10.	Subtraction	e.g. Murle (Arensen, 1982, 40)	
		bawot	bawo
		goat	goat.PL
11.	Metathesis	e.g. Clallam (Thompson and Thompson, 1971, 276)	
		k^{w}sə́-	k^{w}ə́s-
		count.NACT	count.ACT
12.	Polarity	e.g. Anywa (Reh, 1993, 244,245)	
		bil^{1}-	biːlː^{2}-
		soak.sth.	soak.sth.FREQ
		caːn^{1}-	canː^{1}-
		tell	tell.FREQ

This brief collection of non-concatenative morphemes in the languages of the world seemingly implies that morphemes can take any form they want: They can surface as stable or copied segments, as a phonological change affecting base material, or as partial or complete templatic restriction about the size and suprasegmental structure of the word. Though the surface effects of morphemes are indeed varied, there are nevertheless some systematic restrictions about impossible non-concatenative morphemes. Four exemplifying restrictions are discussed in appendix A1: The non-existence of non-concatenative roots, restrictions on 'global' non-concatenative morphemes that affect more base material than is minimally becessary for their realization, and the rarity and restrictiveness of metathesis (2-11) and polarity (2-12).

In order to compare how the different architectures in (1) predict the existence of non-concatenative morphemes, the following gives a brief overview of how a modular and one representative non-modular theory predict the existence of non-concatenative morphemes. A GNA account assumes that all non-concatenative morphemes arise from simple concatenation of phonological material that is potentially supra- or sub-segmental. Since the advent of autosegmental phonology, this is most uncontroversial for tone (Goldsmith, 1976): Unassociated or floating tones in the underlying representation of morphemes naturally predict tonal overwriting or tonal addition. The imperfective tonal morpheme in San Miguel el Grande Mixtec (2-1), for example, that always overwrites the underlying verb-initial tone with the high tone 3[2]. In a GNA model, this follows from assuming that the imperfective consists only of the floating tone 3 that is prefixed to its verb base. Some constraint interaction then predicts a standard overwriting pattern where realization of underlyingly floating material takes precedence over

[2]This is a simplification. The high tone is realized on the second TBU in some phonologically predictable contexts (McKendry, 2013; Zimmermann, 2016).

realization of underlyingly associated material.[3] Since the language does not allow true contour tones, realization of the floating high tone implies deletion of the underlying tone.

This autosegmental view was later generalized to floating segmental features that result in consonant or vowel mutation (e.g. Lieber, 1992; Wiese, 1996) and to timing slots or moras to predict segmental lengthening (e.g. Montler and Hardy, 1988; Samek-Lodovici, 1992). The third person singular morpheme in Zoque (2-2) , for example, would be a floating prefixed palatalization feature and the first person singular morpheme in Huallaga Quechua (2-8) a floating suffixed mora. The idea that reduplication (2-9) follows from affixation of empty prosodic nodes has also been around since pre-OT times (Marantz, 1982; McCarthy and Prince, 1986) but was since then implemented multiple times into OT-models where copying or splitting of input elements can provide the optimal repair to fill otherwise empty prosodic nodes (Pulleyblank, 2009; Saba Kirchner, 2010, 2013; Bye and Svenonius, 2012). Finally, that morphological stress shift (2-6) can fall out from affixation of empty feet is the argument in van Oostendorp (2012) or Zimmermann (2013*a*). That all non-concatenative effects are the result of affixation of sub- or suprasegmental material is less straightforward and in fact cited as a notorious problem for morphemes resulting in deletion of segments or moras ((2-4), (2-5), (2-7), and (2-10)).

It has, however, been argued that the addition of containment indeed allows to predict morphological shortening (2-4) or subtraction (2-10) processes from affixation of prosodic nodes Trommer (2011); Trommer and Zimmermann (2014); Zimmermann (2017). More concretely, the containment assumption which makes any literal deletion of elements impossible predicts patterns where affixed prosodic nodes are partially integrated into the prosodic structure without being phonetically realized. Such defective structures can then result in non-realization of underlying material. Vowel shortening as in Anywa (2-4), for example, follows if a floating affix mora must be integrated under a syllable node but cannot dominate a segment since such a novel association is excluded. For short base vowels, this catalectic mora has thus no phonetic consequence. For a long base vowel, however, this additional mora means that the syllable now dominates too many moras and one underlying mora must remain phonetically invisible (Trommer and Zimmermann, 2014). Another pattern of defective integration is one where an affixed prosodic node cannot be dominated by a higher prosodic node but must dominate some material. The account of Murle subtraction (2-10) in Zimmermann (2017), for example, assumes that the plural exponent is a suffixed mora that must minimally dominate a consonant. Since this mora cannot be integrated under a syllable or foot, both the mora and the dominated consonant remain without a phonetic interpretation on the surface and deletion hence arises. Templatic effects and truncation, finally, can fall out from the affixation of prosodic nodes if some constraint interaction ensures that there cannot be another prosodic node of the same type with a different morphological affiliation:[4] All elements that can't be integrated into the affixed node hence remain unrealized.

In a cophonology account, non-concatenative morphemes follow if a morpheme is associated with a cophonology but does not contain underlying (segmental) material. Vowel shortening as in Anywa (2-4) hence follows if the plural morpheme lacks any segmental exponent but is associated with a cophonology that ranks the standard markedness constraint against long vowels *Vː above the respective markedness constraints. Similarly, stress shift (2-6) easily results from a cophonology demanding a fixed stress position that overrides potential underlying stress. Some non-concatenative morphemes thus clearly result in a less marked structure and fall out from high-ranking of an independently motivated constraint. This, however, is not the case for all of them. Specific tonal melodies (2-1) and (2-3) are one example, the creation of a palatalized consonant (2-2) or the lengthening of a vowel (2-8) are obvious others. In addition, many non-concatenative morphemes are only realized locally and a cophonology also needs to specify the position of the relevant change. A case in hand is morphological subtraction in Murle (2-10).

[3] One possibility is the interaction of *Float with *MaxFloat (e.g. Zoll, 1996; Wolf, 2007); another is a containment-based solution where any association (even an unrealized one) is better than none (e.g. Trommer, 2011).

[4] One constraint family predicting such effects are Contiguity constraints demanding contiguous morpheme representations in case of circumfixation of prosodic nodes (Trommer, 2015).

For at least a sub-class of nouns, the plural is marked by deleting a final coda consonant (2-10). In a cophonology account, this receives a seemingly easy explanation: The plural morpheme is associated with a cophonology that ranks NoCoda above Max-S and hence results in deletion of a coda consonant. This simple account, however, is insufficient for polysyllabic nouns that contain more than one coda (e.g. [koloktec] 'intestine' – [kolokte] 'intestines' (Arensen, 1982, 41)). The cophonology hence has to specify the single deletion-site as well to avoid a global deletion pattern *[kolote]. That such global patterns are seemingly unattested is discussed in more detail below.

How these two accounts fare in predicting the four possible restrictions about unattested nonconcatenative morpheme types is discussed in more detail in appendix A1. It is, for example, argued that a GNA account predicts the absence of systematically unattested global non-concatenative morphemes whereas a cophonology account derives these as the expected default. On the other hand, the absence of non-concatenative root morphemes falls out from the architecture of a cophonology account whereas it remains a coincidence under a GNA approach.

3 The phonological effect of morphemes

The last section was concerned with the variety of phonological surface forms that morphemes have in the languages of the world. This section now takes a closer look at the ways in which morphemes influence phonological processes within in language. It focusses on phonological generalizations that cannot be formulated without reference to specific morphemes 3.1 or morpheme classes 3.2. The appendix **A3** adds a discussion of phonological processes that are sensitive to the least general type of morphological information; namely the presence of morpheme boundaries. From a theoretical point of view, the most interesting question is how many of these phenomena can be captured in a purely representational account that remains modular and does not allow any reference to non-phonological information in the phonology. And for those where such a phonological account fails, what type of morphological information needs to be minimally accessible for the phonology?

3.1 Morpheme-specific phonology

Instances where single morphemes or an idiosyncratic subclass of morphemes within a language show phonological behaviour that is unexpected or exceptional given the general phonology of the language are often referred to as 'morpheme-specific' phonology. One example for such a pattern are so-called latent segments (e.g. Archangeli, 1991; Zoll, 1996), illustrated in (3) with data from Ahousaht Nuu-chah-nulth (Kim, 2003). Several suffixes in this language begin with a consonant that only surfaces if it is preceded by a vowel (3-i) but not if it is preceded by a consonant (3-ii); notated with brackets in the underlying forms in (3). Although the appearance of these consonants is phonologically predictable, there is no general consonant deletion process in the language which would explain this alternation. In contrast, Ahousaht Nuu-chah-nulth happily allows the creation of large consonant clusters by other morphemes (3-c). In addition, these latent consonants have contrasting qualities and thus cannot easily be regarded as epenthetic. The conclusion is hence that an idiosyncratic class of suffixes in the language contain consonants that undergo exceptional deletion to avoid 1) a coda consonant (3-a-ii) or a 2) complex coda (3-b-ii).

(3) Exceptional suffixes with latent consonants (Kim, 2003, 178)

a.	i.	V_	ʔatɬa–(q)umɬ two–round	ʔatɬaqumɬ ‘two dollars’
	ii.	C_	tɬ’is–(q)umɬ white–round	tɬ’isumɬ ‘sth. white and round’
b.	i.	V_	ʔu–(k)ɬaː–siʃ Eun-Sook it–to.be.called–1SG.IND Eun-Sook	ʔukɬaːsiʃ ‘My name is Eun-Sook’
	ii.	C_	kʷis–(k)ɬaː–k’uk–ʔiʃ different–to.be.called–1SG.IND	kʷisɬaːk’ukʔiʃ ‘It seems like he has a different name’
c.		C_	waʔitʃ–swi–ʔiʃ to.sleep–beyond.normality-3SG.IND	wa.ʔitʃs.wi.ʔiʃ ‘S/he slept in’

Latent segments can hence be regarded as morpheme-specific exceptional undergoers of a deletion process. A classical four-fold typology of morpheme-specific processes going back to Lakoff (1970) is the one into exceptional triggers, exceptional undergoers, exceptional non-triggers, and exceptional non-undergoers. Some examples for each of these patterns are listed in (4).

(4) A symmetrical typology of morpheme-specific phonology

a. Exceptional triggers
   (i) only some suffixes trigger deletion of a preceding V in Yine (Matteson, 1965; Pater, 2010)
   (ii) only some suffixes trigger deletion/mutation of a preceding V (Anttila, 2002)

b. Exceptional non-triggers
   (i) only some vowels do not trigger otherwise regular ATR-harmony in Classical Manchu (Smith, 2017)
   (ii) only some H-tones in Molinos Mixtec don’t trigger H-spreading (Hunter and Pike, 1969)

c. Exceptional undergoers
   (i) only some vowels undergo V-harmony in Yucatec Mayan (Krämer, 2003)
   (ii) only some consonants are deleted to avoid a marked structure in Nuuchahnulth (Kim, 2003)

d. Exceptional non-undergoers
   (i) only one suffix is an exceptional non-undergoer of vowel deletion in Yine (Matteson, 1965; Pater, 2010)
   (ii) only some morphemes are non-hosts for floating tones in San Miguel el Grande Mixtec (Pike, 1944; McKendry, 2013)

The list in (4) gives a symmetrical picture of exceptional morphemes. However, the typology of patterns across languages reveals an asymmetry in that exceptional undergoers and especially exceptional non-triggers are seemingly more rare. On the other hand, the characterization of a morpheme as either an exceptional undergoer/trigger or an exceptional non-undergoer/non-trigger depends on the assumption one makes about the base-line phonology of the language. If, for example, ATR-harmony is taken to not be a regular process of Classical Manchu, the pattern of exceptional non-triggers (4-b) would turn into a pattern of exceptional triggers (4-a). From the empirical perspective of being able to predict all attested patterns, there might hence be no reason for a four-way-typology.

Although morpheme-specific phonology is discussed here as a separate phenomena, it is closely connected with non-concatenative morphology discussed in section **??** and more or less identical empirical patterns can be observed in both areas (formulated as ‘Inkelas’s generalization’ in Sande et al. (2020); cf. especially (Inkelas, 2014, §3.4)). In many cases, both phenomena are in fact a-priori indistinguishable since the classification into one or the other depends on the specific morpheme segmentation. An example discussed in Zimmermann (2023) comes from Aymara where several of the person-specific future markers are described as exceptional triggers of vowel lengthening for a preceding vowel (e.g. FUT.1>2 ↔ /-ːma/, Hardman (2001):112, Coler (2015):529). Alternatively, a reasonable morpheme segmentation can assume that there is a general default marker for the future that only consists of the non-concatenative morpheme of vowel lengthening /-ː/[5] and specific segmental person markers that are bound to the context of future (e.g. 1>2/__FUT ↔ /-ma/).

Expectedly, the two possible approaches discussed above for predicting non-concatenative morphemes have the same explanation for both phenomena. Cophonologies predict morpheme-specific phonology from assuming that the exceptional morphemes are associated with a special cophonology; the only difference is the presence of additional segmental material that surfaces as an exponent for the morpheme in question. Similarly, a representational GNA account predicts morpheme-specific phonology from assuming floating or underspecified material in the underlying representation of these morphemes, in addition to segmental material. Within GNA accounts, exceptional undergoers are usually taken to lack certain features or phonological specifications which makes them more prone to changes. An example is the underspecification analysis for Yucatec Mayan in Krämer (2001): Only suffixes with underspecified suffixes undergo 'exceptional' vowel harmony with the root whereas fully specified suffix vowels remain stable. Similarly, underspecification can also predict exceptional non-triggers: The phonological element in the exceptional morpheme simply happens to lack the triggering feature or property in its underlying representation. Exceptional triggers, on the other hand are taken to contain additional floating material that needs realization. An example is the analysis of exceptional vowel harmony triggers in Assamese as morphemes that contain floating vocalic features in Tebay and Zimmermann (2020). The 'overspecification' or presence of floating material can also account for exceptional non-undergoing. A case in hand is the GNA account of exceptional vowel deletion in Yine presented in Zimmermann (2013*b*). In this account, vowels are deleted since certain suffixes that lack a mora underlyingly usurp an adjacent mora – the vowel deprived of its underlying mora then remains unrealized. A suffix immune to this vowel deletion process is one with an additional floating mora that can be usurped without any fatal consequence for a segment.

In contrast to a cophonology account, such representational accounts are restricted by phonological locality. A floating feature, for example, can not skip over other associated features of the same type and hence dock to a segmental host adjacent to its sponsoring morpheme. That such a locality restriction for morpheme-specific phonology is borne out is argued for in, for example, Pater (2006). The theoretical argument there, however, is not for a GNA approach but for a model based on constraint indexation and hence for a model where the phonology has direct access to specific morphological information. Indexed faithfulness constraints are inherently locally restricted: They only scope over phonological material indexed to the morpheme in question. The exceptional non-undergoer suffix /-wa/ in Yine that exceptionally fails to undergo (morpheme-specific) vowel-deletion would hence be subject to an indexed constraint MAX-V_{wa} that only protects vowels of this exceptional morpheme (Pater, 2006, 2010). That indexed markedness constraints are also locally restricted is argued for in, for example, Pater (2006, 2010) or Finley (2009). It is assumed that an indexed markedness constraint is only violated if the penalized structure *X_L contains at least some phonological element which is affiliated with the relevant morpheme. A case study analysed along these lines in Pater (2010) is the exceptional triggering of certain /i/-initial suffixes in Finnish that cause vowel mutation or deletion on a preceding /a/. The relevant markedness constraint is taken to be the indexed markedness constraint *ai_L which is only violated if any of the two segments that form this illicit sequence is affiliated with the exceptional morpheme L. In an input /taitta-i_L/ 'break-PST' (Anttila, 2002, 6) where the plural suffix is an exceptional trigger, an output *[taittai] hence only violates *ai_L only once although the offending [ai] sequence is present twice. The choice of repairing this marked structure by deleting or changing the underlying /a/ (i.e. /a-i_L/ –> [i]/[oi]) is predicted by independent constraints that make these particular repairs cheaper in specific contexts. In principle, however, the exceptional morpheme could also be the one un-

[5] Which can be blocked by more specific person markers like FUT.3>1.INCL ↔ /-istani/ to account for the fact that long vowels are not observable in all future contexts.

dergoing a repair to satisfy the $*ai_L$ constraint (i.e. /a-i$_L$/ –> [a]). This means that indexed markedness constraint can also predict exceptional undergoers. This is shown in (5) for the Nuuchahnulth latent consonants. Although MAX dominates *CC and the language thus happily tolerates complex codas in principle, the indexed $*CC_L$ is higher-ranked and consonant deletion applies in the context of an L-suffix. The choice of deleting this particular consonant could be made by constraints penalizing the deletion of root segments (*[kʷik.ɬaː]) and a CONTIGUITY constraint penalizing deletion within morphemes (*[kʷis.kaː]).

(5) Exceptional undergoer of deletion: Indexed constraints

kʷis-kɬaː$_L$	$*CC_L$	MAX-C	*CC
a. kʷisk.ɬaː	*!		*
☞ b. kʷis.ɬaː		*	

However, an account based on locally restricted indexed markedness constraints fails to correctly predict the deletion of latent consonants that applies to avoid coda consonants in Nuu-chah-nulth. Recall from the data in (3) that there are also suffixes starting with a /(C)V/ that loose their consonant after another consonant. Intuitively, this deletion also avoids a markedness problem, namely an additional coda ([tɬ'i.sumɬ], not *[tɬ'is.qumɬ]). This intuition, however, can not readily be translated into indexed constraints since the coda that is avoided is not part of the exceptional morpheme. As is shown in (6), an indexed constraint NOCODA$_M$[6] is not violated in the relevant candidate (6-a) that realizes the latent consonant after another consonant, simply because the coda-[s] is not part of an M-morpheme. Since the general NOCODA is outranked by MAX-S, candidate (6-a) is wrongly predicted to be optimal instead of the empirically correct deletion candidate (6-b), marked by ☛.

(6) Exceptional deletion and indexed constraints: Coda avoidance

tɬ'is-qumɬ$_M$	NOCODA$_M$	MAX-C	NOCODA
☞ a. tɬ'is.qumɬ			*
☛ b. tɬ'i.sumɬ		*!	

The locality restriction for indexed markedness constraint is hence seemingly too restricted for this pattern. On the other hand, there are also arguments that it is too unrestricted and that exceptionality is not a property of a whole morpheme but only of single phonological elements (for a different conclusion and a succinct summary of the relevant literature see, for example, Gouskova (2012)). Usually, this hypothesis that exceptionality is a property of phonological elements rather than morphemes is taken as an argument for a representational account where exceptional behaviour follows from under- or overspecification of phonological structure. However, such a view is not per se incompatible with lexical indexation as is argued in Martínez (2010) or Round (2017) where single segments are lexically indexed, not whole morphemes.

A final note about indexed constraints as a means to predict morpheme-specific effects is that they can't predict exceptional non-triggers since neither a high-ranked markedness or faithfulness constraint can block the expected triggering of a process on a non-exceptional morpheme. As was discussed above, this does not mean, however, that the pattern as such can't be predicted; it simply implies that the putative non-trigger is in fact predicted by the regular phonology and all triggers become exceptional.

Tableau (6) illustrated that the locality restriction of an indexed constraint account can't predict the exceptional undergoers of consonant deletion in Nuu-chah-nulth. Since a representational account was argued above to be restricted by phonological locality, it is an interesting

[6] I use a different index than L that was used in $*CC_L$ above since NOCODA can in fact not be indexed to an exceptional suffix starting with /(C)CV/, otherwise the latent consonant in those suffixes would never surface. An indexed constraint account hence has the additional problem that a purely phonological distinction between /(C)V/ and /(C)CV/ exceptional morphemes must also be encoded as a lexical difference between different arbitrary exceptionality classes L and M.

question whether a GNA can correctly account for this pattern. The general logic of such an account has to be that latent consonants are underspecified and hence easier to delete. In contrast to fully specified consonants, they are deleted in order to avoid consonant clusters (for /(C)CV/-suffixes) or codas (for /(C)V/-suffixes). The problem with this generalization is that /(C)CV/-suffixes happily create the marked structure that is avoided for /(C)V/-suffixes, namely codas. Quite parallel to the claim that an indexation account has to rely on different indexations for these suffix types, a classical underspecification account has to rely on two different degrees of underspecification. More concretely, an underspecification account would need to rely on an abstract ranking like (7). If the initial consonants of type /(C)CV/-suffixes are underspecified for a feature F1, these consonants are deleted in order to avoid a consonant cluster since this deletion would only induce violations of Max-F2 and the general Max-S which are both outranked by *CC. A fully specified consonant whose deletion induces a violation of higher-ranked Max-F1 as well, on the other hand, would always surface. The suffixes of type would /(C)V/ would then be underspecified for both feature F1 and another feature F2 to predict that they are the only consonants in the language that are ever deleted to avoid a violation of NoCoda. This follows since deletion of these consonants only induces a violation of general Max-S whereas deletion of any other consonant induces violations of at least Max-F2 as well. This account would hence rely on the lexical restriction that /(C)CV/ and /(C)V/ suffixes must contain different underspecification degrees. And it is not clear what independently motivated consonant representation for the language actually allows these different underspecification degrees given that latent suffixes show contrastive specifications.

(7) Exceptional deletion and degrees of underspecification
Max-F1 ≫ *CC ≫ Max-F2 ≫ NoCoda ≫ Max-S

A representational GSR account allows to solve both of these problems. As Zimmermann (2019) argues, the assumption of a single underlying weak activity for all latent consonants in the language suffices to correctly predict the interaction with the two markedness constraints *CC and NoCoda. Within GSR, gradient activities of phonological elements are expressed as numbers: Whereas a 'normal' consonant would have the full activity of 1, a latent or weak consonant could have a reduced activity of only 0.5. This weak activity implies that, firstly, these consonants are easier to delete since they only induce -0.5 Max-S violations if they remain unrealized. They are thus deleted to avoid additional consonant clusters. The second crucial consequence of weak activity in Nuu-chah-nulth is that codas formed by latent segments are easier to tolerate and are never avoided even though their deletion is cheaper for Max-S. This follows since consonants retain their weak activation in the output and thus violate markedness constraints only gradiently. More concretely, a coda in [$\text{ʔ}_1\text{u}_1\text{k}_{0.5}.\text{ɬ}_1\text{aː}_1.\text{s}_1\text{i}_1\text{ʃ}_1$] is tolerated since it is formed by a latent segment and violates NoCoda only by -0.5 but the one in *[$\text{tɬ}_1\text{'i}_1\text{s}_1.\text{q}_{0.5}\text{u}_1\text{m}_1\text{ɬ}_1$] needs to be repaired since it induces a full -1 violation of NoCoda.

A third possible way to predict morpheme-specific effects are scaling factors within a model with weighted constraints (Coetzee and Pater, 2011; Coetzee and Kawahara, 2013). As indexed constraints, this model assumes that the constraint system can be sensitive to specific morphological information. More concretely, the weight of certain constraints is increased for specific morphemes. Gouskova and Linzen (2015) make an interesting argument for scaling factors based on the observation that exceptional morphemes can also become regularized if certain other morphemes are added. In Russian, for example, some prepositions exceptionally loose their vowel (=VD) in specific phonological contexts (e.g. before a CV but never before [st]) but this process is systematically excluded before certain morphemes starting with a consonant cluster (8-a). This is a lexically arbitrary property of roots like /dvor/ since vowel deletion is optionally possible before other roots like /dver^{j}/ with an identical cluster (8-b). If now certain suffixes like /-ov/ adj are added to these exceptional non-triggers of vowel deletion, the process becomes possible again (8-c). Certain suffixes hence regularize the exceptional property of their stem. Gouskova and Linzen (2015) argue that this follows best in a scaling factor model where affixes can be associated with a constraint-specific regularization factor that can minimize or even neutralize any scaling factor for this constraint.

(8) Affix regularization in Russian (Gouskova and Linzen, 2015, 428)

a.	No VD before exceptional CC-non-trigger	sə dvaróm	'with the yard'
b.	VD before CC-trigger	z dvér^{j}ju	'with the door'
c.	VD before suffixed non-trigger	z dvaróvɨm	'with the yard'-ADJ

Their account of the Russian facts in (8) is based on the assumption that exceptional non-triggering morphemes like /dvor/ have a scaling factor for *#CCC, the constraint penalizing initial three-consonantal sequences. This scaling factor makes vowel deletion impossible before /dvor/ since it would result in a violation of this upscaled constraint. A regularizing suffix like /-nik/, on the other hand, has a regularization factor of 0 for *#CCC and thus neutralizes any scaling factor in the same morphological construction. This account correctly predicts that there can be partially regularizing suffixes with a regularization factor of 0.5 and that multiple of those suffixes will accumulate their effect. This model adds an interesting intermediate perspective to the locality discussion from above: Whereas the scaling factors are still locally restricted (=only a *#CCC violation created by material belonging to a root like /dvor/ will be subject to the scaling factor), regularization can apply across long distances since the scaling factor for a root is multiplied by the regularization factors of all affixes.

These non-local regularization effects remain mysterious under a representational account based on GNA. That certain CC-initial morphemes disallow vowel deletion preceding them can receive a number of representational accounts. These morphemes could contain an initial underspecified vowel (e.g. /ədvarom/) that needs to be realized via coalescence with an adjacent vowel – this coalescence makes VD impossible. In contexts without any preceding vowel, this underspecified element would be deleted and hence remain without a surface effect. And within a model with gradient representations, the initial consonants of those morphemes could be exceptionally strong (e.g. /$d_3v_1a_1r_1o_1m_1$/) which results in a more severe violation of *CCC in a vowel deletion candidate if this higher activity makes it to the phonological surface. However, in neither of these two possible accounts is there a reasonable phonological representation that could non-locally cancel out the effect of these special representations.

This subsection showed that morpheme-specific phonology is not a separate phenomenon and intricately connected to non-concatenative morphology **??** (and patterns that might be described as phonologically predictable allomorphy, cf. appendix A2). In contrast to non-concatenative morphology, additional segmental realizations of a morpheme make it easier to discuss one crucial property of morpheme-specific phonology, namely its locality restriction. As was discussed above, both an indexed constraint account and a representational account are restricted by locality, in contrast to a cophonology account. This locality restriction makes the theories more restricted and in line with the vast majority of evidence. The non-local regularization pattern, however, would remain mysterious under both a representational and a standard indexation account.

3.2 Class-specific phonology

In cases of morpheme-specific phonology, the exceptional phonological behaviour is a purely idiosyncratic property of single morphemes or phonological elements. The question discussed in this subsection is whether the theoretical accounts discussed in section 3.1 for this phenomenon can be extended to predict that structurally or lexically defined classes of morphemes behave exceptional. I want to discuss this question with two well-established examples of class-specific behaviour, namely the contrasting phonological behaviour often found for roots and non-roots and the one found for different lexical categories like noun and verb. Other examples for class-specific behaviour are the contrasts between prefixes and suffixes (e.g. White et al., 2018; Elkins, 2020), derivational and inflectional affixes (e.g. Siegel, 1974; Kiparsky, 1982), or loanwords and native words (e.g. Itô and Mester, 1995; Jurgec, 2010).

Although it was already emphasized above that it might not be trivial to properly define roots in a theory-neutral way, most phonologists would agree that phonological asymmetries between roots and non-roots are abundant in the languages of the world (for excellent overviews cf., for example, Urbanczyk (2011) or Gouskova (2023)). Most of these asymmetries can be summarized as the surfacing of more contrasts or marked structures within roots that are excluded for non-roots within the language. Interestingly, roots are usually taken to show the opposite behaviour morpho-syntactically in lacking many features like category or gender (Gouskova, 2023). That roots allow more contrasts than non-roots is most pervasive for inventory restrictions: Roots can often contain a superset of the elements that non-roots can contain. Examples are that only roots can contain pharyngeals in Arabic (McCarthy and Prince, 1995) or glottalized and aspirated stops in Cuzco Quechua (Parker and Weber, 1996). Similarly, size or templatic restrictions are usually described as being asymmetric: If a language employs a minimality restriction on morpheme forms, it holds for roots. Roots in Quechua, for example, are argued to be minimally bisyllabic (Gouskova and Gallagher, 2020). In contrast, syllable structure restrictions are reported for either roots or affixes. Tibetan is an example where complex onsets are only allowed in roots but not affixes (Urbanczyk, 2011) whereas Lakhota allows codas only in affixes but not in roots (Albright, 2004).

The second exemplifying asymmetry I want to discuss in some more detail is contrasting behaviour for different categories (e.g. Smith, 2011). The most common instantiation of this is a contrast between the phonological generalizations for verbs and nouns. Similarly to the root asymmetry, it most commonly singles out one of the morpheme classes, namely nouns, to be the phonologically more privileged one. In addition, there is the interesting restriction that the vast majority of noun-verb asymmetries concerns suprasegmental phenomena like stress, tone, or templates. In Mono, for example, tone is contrastive for nouns but predictable from the inflectional features for verbs (Olson, 2006). Similarly, long vowels can only appear in nouns but never in verbs in Mbabaram (Dixon, 1991). There are also several languages with a minimality restriction for nouns but not for verbs, an example is Chuukese (Davis and Torretta, 1998; Muller, 1999; Davis, 2017). An interestingly different example can be found in Sinhala where a vowel hiatus is avoided both within nouns and verbs but via different strategies: Whereas consonant epenthesis can be observed at a root-suffix boundary for nouns (9-a)[7], vowel deletion applies for verbs (9-b) (Letterman, 1997).

(9) Vowel hiatus avoidance in Sinhala (Letterman, 1997, 54,55,98)

	Underlying	Surface	
a.	ge-ə	gejə	house-SG.DEF
	aːsaː-ə	aːsaːwə	desire-SG.DEF
b.	teːre-ili	teːrili	understand-VN
	beda-e-nawaː	bedenəwa	deliver-PASS

Similarly, Yun (2008) argues that Korean nouns and verbs behave differently in the phonology but neither category can clearly be characterized as more privileged than the other. And finally, Ewe is cited as an example for more verb privilege in Smith (2001). Only in nouns, tones of syllables starting with a voiced obstruent are neutralized to L whereas verbs may freely contrast H and L on those syllables.

A theory that immediately allows that the phonology is sensitive to non-phonological classes like lexical categories is constraint indexation. The privileged position of roots over non-roots is standardly taken to follow from faithfulness constraints indexed to the category 'root' (McCarthy and Prince, 1994, 1995). That such positional faithfulness constraints should be extended to the category 'noun' is argued in Smith (2001). All the effects where roots or nouns show more phonological privilege and hence more marked structures are hence a consequence of ranking these special faithfulness constraints above certain markedness constraints that trigger neutralization of these contrasts outside of roots and nouns. This model also predicts different phonological behaviour for different classes that is not immediately an instance of more contrasts in the privileged position. An example is the account for Sinhala in Smith (2001). It is based on a grammar

[7] The quality of the semi-vowel is predictable given the phonological quality of the first vowel.

that predicts vowel deletion to be the default repair to avoid vowel hiatus (9-b). A high-ranked MAX$_{\text{Noun}}$, however, excludes this repair for nouns where the less preferred alternative repair of epenthesis surfaces. Indexed faithfulness alone, however, can't predict markedness reversal cases like the ones cited above for Lakhota or Ewe. For those patterns, the indexation of markedness constraints is necessary, often implied in a theory of constraint indexation (Pater, 2000; Flack, 2007). An indexed NOCODA$_{\text{root}}$, for example, correctly predicts the Lakhota pattern (Albright, 2004). The adoption of indexed markedness constraints, however, implies that the theory has no inherent explanation anymore for the overwhelming tendency of root and noun privilege.

The second class of accounts I want to briefly discuss are those of type (1)-b where phonology and morphology are interleaved and potentially different grammars optimize morphologically more complex structure. Similarly to an indexed constraint approach, a cophonology model is argued to be able to store different cophonologies for different categories and hence predict different phonological behaviour for nouns and verbs. An example where this mechanism is used is the account of Finnish exceptionalities in Anttila (2002). However, within the cyclic cophonology model where every morpheme addition results in one phonological evaluation, such cophonologies associated to lexical categories are seemingly a restriction that all morphemes of a certain category are necessarily associated to a specific cophonology; it is not the effect of a single cophonology. In the absence of a general construction 'root', cophonology also does not allow any systematic explanation for root and non-root contrasts.

In a stratal model, on the other hand, category-specific effects can follow from assuming that all verb affixes are added in one stratum and all noun affixes are added in a later stratum. That such an assumption can predict the interesting asymmetries between different opaque and transparent process interactions in Korean is argued for in Yun (2008). All verbal inflectional markers are taken to be stem affixes whereas all noun inflection are taken to be particles that are added at the word stratum (and optionally even at the phrase stratum). It is clear, however, that such an account is not easily extendable to patterns where verbs are seemingly subject to more neutralizations than nouns, simply because all words are optimized at every stratum. Even if, for example, all Mbabaram verb suffixes are added in an earlier stratum than all noun suffixes, the restriction against long vowels will affect both noun and verb roots, irrespective of the stratum it is associated to. And root-specific effects would imply that every root is optimized on its own in a designated root-stratum. As was already discussed above, such a stratal architecture is not assumed in standard stratal models

In a representational GNA account, category-specific effects can only arise as an epiphenomenon of affixed category-morphemes that realize a *v*- or *n*- head and induce a special phonological effect. For the Sinhala contrast that nouns repair a hiatus via epenthesis and verbs via deletion, a representational account could – again – rely on the assumption of latent segments. More concretely, the epenthetic glides would not be analysed as epenthetic but would be the exponent of *n*. If this segment is latent and only appears if it can solve the markedness problem of a vowel hiatus (cf. the accounts of latent elements discussed above in sections **??** and 3.1), putative 'epenthesis' for nouns is predicted as a hiatus repair. For verbs, the default repair of vowel deletion applies instead. This asymmetry in the underlying exponents is sketched in (10) for the examples from (9).

(10) Noun-verb asymmetry as a difference in underlying exponence

	UNDERLYING	SURFACE
a.	ge-j$_{\text{latent}}$-ə	gejə
	house-*n*-SG.DEF	
b.	teːre-ili	teːrili
	understand-VN	

Such an account, however, cannot straightforwardly be extended to inventory contrasts or minimality effects simply because nonlinear affix representations cannot readily encode the avoidance or preservation of marked structures. And in the absence of a 'root'-morpheme, a GNA approach does not offer any interesting explanation for root-affix asymmetries.

Before an argument for or against a certain theoretical account should be made, however, one should consider the possibility that a putative class-specific effect is an epiphenomenon that does not warrant a special theoretical treatment to begin with. Minimality effects for roots, for example, might simply emerge from a minimality restriction about prosodic words. This hypothesis is elaborated in Gouskova (2023) for Quechua: Since roots can appear unaffixed, the disyllabic minimality for roots falls out from a disyllabic minimality restriction for prosodic words that does not reference any morphological categories. Similarly, Smith (2011) argues that the lexical category with more phonological privilege in a language often happens to be the category that can appear as a free form whereas the less privileged category is always bound. That, for example, in Mono only nouns are restricted by a bisyllabic minimality but not verbs Olson (2006) falls out from a bisyllabic word minimality restriction given that only nouns can occur without any affixation (Smith, 2011). In addition, the distinction into free and bound morphemes can also predict class-specific phonology beyond minimality restrictions, namely as base-identity effects. This implies a framework where a morphologically complex form can be forced to be identical to its surface base form; an argument made in, for example, Shiraishi (2006) for segmental contrasts between nouns and verbs.

And even without such a mechanism, an independent explanation for a class-specific neutralization might arise from the phonological and morphological regularities of a language. The other class-specific effect mentioned for Mono above is the fact that tone is contrastive only for nouns but predictable from the inflectional features for verbs (Olson, 2006). Given that all verbs are necessarily combined with inflectional affixes and that those cause tonal overwriting, the non-contrast for verbs is simply an epiphenomenon: Underlying verb tones are overwritten in seemingly all surface forms. And there is in fact one morphological context where the underlying tones of verb roots does surface, namely in nominalization contexts. If a verb is nominalized, a verb root is augmented to the bisyllabic word minimum that holds for all nouns. Interestingly, the resulting nominal surfaces with any of the three possible tones of the language and the choice between them is unpredictable. A straightforward explanation for this is the assumption that the underlying verb root tone finally has a chance to surface (Olson, 2006, 103+104).

Constraint indexation hence allows to directly implement class-specific effects by allowing the phonology to refer to structural information like 'root' or lexical categories like 'noun'. An indexed faithfulness account to only those categories predicts the asymmetry that those classes can show more prominence. Some examples were cited where this asymmetric prediction might be too restricted and additional indexations might be necessary to account for all patterns. On the other hand, class-specific effects might be an epiphenomenon arising from affixation of category-morphemes or an independent morphological distinction between bound and free forms. It remains an open empirical question whether this more restrictive view is able to handle all putative class-specific effects.

4 Summary

This chapter collected some of the phenomena surrounding the diverse forms of morphemes in the languages of the world. The main theoretical questions was the role of modularity: How many morpheme forms can be predicted from enriched underlying representations and which phenomena require a more direct influence of the morphology on the phonology? Do we need cophonologies or multiple input theories to predict all patterns at the morpho-phonology interface?

One possible combination of assumptions that emerges as one that can predict most of the phenomena and still remains restrictive enough to exclude several unattested patterns is listed in (11). It was discussed in **??** that a representational account based on GNA (11-a) and containment can predict all attested non-concatenative morphemes and excludes systematically unattested global patterns that a cophonology account predicts. That such an account with enriched underlying representations is also able to predict a variety of seemingly suppletive allomorphs is argued in appendix A2. That morpheme-specific effects can receive the same representational account as non-concatenative morphemes is the argument made in 3.1. Similarly to the predictions of a lexically indexed constraint approach, GNA predicts that morpheme-specific phonology is locally restricted to material that is at least adjacent to the triggering morpheme. A cophonology account again overgenerates in this respect. This subsection also emphasized that classical nonlinear accounts might not be sufficient to account for all instances of seemingly unpredictable phonology and that gradiently active representations (11-b) are necessary as well. The class-specific effects discussed in 3.2 concluded that at least a reference to roots is necessary in the phonology (11-c-i). Category-specific effects, on the other hand, can in principle receive a representational re-analysis as affixation of a category-morpheme. That the phonology also needs to be able to distinguish whether two elements are affiliated with the same or a different morpheme (11-c-ii) was only briefly alluded to in the discussion of template effects within a GNA model in section 2. This argument is made more explicit in the appendix A2 and A3. Derived Environment Effects, for example, require at least the existence of a constraint ALTERNATION penalizing new associations between elements with the same morphological affiliation.

(11) A phonological model with minimal access to morphological information
- a. **Generalized Nonlinear Affixation**
  Underlying representations can contain floating sub- or suprasegmental material
- b. **Gradient Symbolic Representations**
  Phonological elements might differ in their underlying activation
- c. **Minimal morphological reference**
  Constraints can
  - (i) refer to 'root'
  - (ii) distinguish whether two elements have the same or a different morphological affiliation

It is clear that this summary is potentially too optimistic since it glosses over several potential undergeneration problems that an account based on (11) still has. Firstly, it remains an open empirical question whether indeed all category-specific effects can be re-analysed as morphemes. In addition, subsection 3.2 only focussed on two representative class-behaviours: More reference to non-phonological categories might hence be necessary as soon as, for example, loanwords are taken into account. And secondly, the non-local regularization patterns discussed in 3.1 remain completely unaccounted for under an account based only on (11).

Whether an account only allows a minimal reference to morphological information as the one in (11) or has maximal access to all morphological information, it is faced with the question whether morphemic affiliation can be manipulated in the phonology. In the discussion above, this question is relevant not only for constraints indexed to specific morphemes, lexical categories, or the 'root' but also for the scaling factors with their locality restriction. This question arises since GEN is standardly taken to be unrestricted: It can insert, delete, change, or reorder any phonological element. If phonological constraints can refer to morphological information as well, we might hence expect that GEN can also change this type of information. Though rarely made explicit, the vast majority of accounts takes it for granted that the morphemic affiliation of elements can never change, called the 'Consistency of Exponence' assumption. As is discussed in appendix A4, none of the explicit arguments that Consistency of Exponence should be violable are particularly convincing – we can hence safely assume that morphological affiliation cannot be manipulated by the phonology.

This chapter has only pointed out some of the data that is necessary to understand the role of morphemes in phonology. The main conclusion hence has to be that there are a lot of rather different phenomena that are potentially relevant for any argument for or against a certain theoretical account based on strict modularity, interleaving, or information transfer between morphology and phonology. The only way to improve our understanding of the morpho-phonology interface is hence to continue to work on even more case studies and arguments from different empirical areas.

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