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Melody-free syntax and phonologically conditioned allomorphy

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Abstract The paper argues that morpho-syntactic computation and phonological melody (i.e. segmental primes occurring below the skeleton) are entirely incommunicado, in both directions. That is, there is no morpho-syntactic operation, say, movement, which goes into effect only if the moved item begins with a labial.

This claim is run against the specific record of phonologically conditioned allomorphy (PCA). The prediction is that only non-melody, i.e. items located at and above the skeleton, may condition allomorphy: stress, tone, size, syllable structure, rhythm and the like. On the backdrop of Paster's (2006) and Nevins' (2011) cross-linguistic record of PCA, challenging cases are identified: those where the trigger is melodic without there being a plausible phonological pathway from the illegal to the legal alternant. It is shown that there is a purely phonological analysis of this pattern: the arbitrary relation between the illegal and the legal alternant is encoded in the lexicon, but in one and the same lexical entry (instead of two) where the illegal item is associated to a constituent and the rescue segment floats. When the regular (associated) segment is illegal in a given phonological context, it delinks and the floating substitute attaches to the position vacated.

As a consequence, a plausible case can be made to the end that morphological computation never takes into account melodic information when selecting allomorphs: all candidate patterns have a purely phonological analysis based on one single underlier. This result is evaluated in the context of the debate regarding modularity: non-modular approaches that grant exhaustive simultaneous access to morphological and phonological information overgenerate, while the modularity-restricted architecture makes the correct prediction: the access of morphological computation to phonological information is selective (excluding melody). Finally, the multiple inputs analysis (Mascaró 2007) is shown to face the same problem, albeit only for a subset of PCA patterns, the ones that are non-optimizing.

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1 Introduction

On the pages below I argue that morpho-syntactic computation and phonological melody (i.e. items occurring below the skeleton) are entirely incommunicado, in both directions. Zwicky and Pullum's (1986) principle of phonology-free syntax was too strong a claim (see Sect. 3), but their original insight holds: there is no syntactic operation, say, movement, which goes into effect only if the moved item begins with a labial. I submit that the correct generalization also extends to morphology: concatenative computation of any kind, i.e. morphological and syntactic alike, is blind to melody. I call this generalization *melody-free syntax* in reminiscence to Zwicky and Pullum's influential claim, and the reader should be aware that despite the fact that morphology is not mentioned in the slogan, it is meant to be included.

This broad claim is run against the specific record of phonologically conditioned allomorphy (PCA). The prediction is that only non-melody, i.e. items located at and above the skeleton, may condition allomorphy: stress, tone, size, syllable structure, rhythm and the like. This generalization is relevant in the debate on PCA: non-modular approaches such as (certain versions of) OT where morphological and phonological operations are scrambled in a single computational system use PCA in order to make a point against modularity and for morpho-phonological scrambling. If phonological information is taken into account by morphological allomorph selection, goes the argument, morphology and phonology must be a single computational engine. If it is true that PCA is conditioned only by the subset of phonological information that occurs at and above the skeleton, though, non-modular single-engine approaches have a problem since they predict that morphological computation has access to *all* phonological properties. That is, they overgenerate. It is shown that approaches which follow modular standards on the other hand correctly predict that melody is invisible (Sect. 2).

This also applies to the OT analysis of PCA that is based on multiple inputs (Mascaró 2007 and others), albeit only for those cases of PCA that are non-optimizing (i.e. do not conspire to produce unmarked results). The multiple inputs approach is discussed in Sect. 6.4.

Empirically, it is first shown that the cross-linguistic record regarding another morphological operation, infixation, is entirely melody-free (Sect. 4.1). On this occasion the status of sonority is clarified: against expectation, sonority is not melody because, unlike labiality etc., it projects to the syllabic level (Sect. 4.2). The empirical heart of the article is then the examination of PCA in Sects. 5 and 6. On the backdrop of Paster's (2006) cross-linguistic record of PCA (as well as other patterns gathered in the literature, namely by Nevins 2011), harmless and harmful cases are distinguished. The former are either syllable- or sonority-driven (Sect. 5.1) or have a melodic trigger and a plausible phonological pathway from the illegal (elsewhere) to the legal (specific) allomorph (Sect. 5.2): in Tahitian *ha'a-* occurs before labial-initial roots, *fa'a-* elsewhere. The melodic trigger in this case is dissimilation (of two labials), and the illegal *f* is turned into an *h* by way of lenition ($f \rightarrow h$ is a well-established lenition path). Hence there is only one underlying form and the alternation is not an instance of PCA, but rather of pure phonology.

Harmful cases of melody-sensitive PCA are those where the trigger is melodic as before, but without there being a plausible phonological pathway from the illegal to the legal alternant (Sect. 5.3). Hence the Hungarian 2sg marker is -*s*, except after sibilant-final stems where -*El* occurs (*E* is a harmonizing vowel). It is shown in Sect. 5.4 that this pattern may also receive a purely phonological analysis: the arbitrary relation between the illegal and the legal alternant is encoded in the lexicon, but in one and the same lexical entry where the illegal (elsewhere) item is associated to a constituent and the rescue (specific) segment floats. When the regular (associated) segment is illegal in a given phonological context, it delinks and the floating substitute attaches to the position vacated.

In Sect. 6 it is argued that the floating segment analysis may be applied to all cases of melody-sensitive PCA where the relationship between the two alternants is arbitrary (Sects. 6.2–6.4). This reduces all cases of what looks like melody-sensitive PCA to one single underlier, which means that there is no melody-sensitive PCA in the first place: the workings of the alternation are purely phonological. Crucially, though, this is not to say that all cases of PCA may be analyzed in terms of the floating segment analysis: as indicated by its name, this analysis is only about segments, i.e. melody. It is toothless when size or stress are conditioning factors since there is nothing that could float, and syllable structure is also out of reach (Sect. 6.5).

Finally, Sect. 7 looks out beyond PCA on the basis of phonologically conditioned word formation in English, and Sect. 8 concludes.

2 Where are phonological factors of PCA computed?

2.1 Phonologically conditioned allomorphy and modularity

Phonologically conditioned allomorphy is used as an argument by what Embick (2010) calls global approaches in order to show that morphology and phonology are not distinct, i.e. constitute a single computational system which takes into account both morphological (person, number etc.) and phonological (labiality, occlusion etc.) information. This system thus performs both concatenation and phonological interpretation. Representatives of this line of thought include (certain versions of) OT such as represented by McCarthy (2002: 154f), Burzio (2007), Wolf (2008) and Mascaró (2007). PCA, goes the argument, is a prime diagnostic for the scrambling nature of morphological and phonological computation because it combines both in a single process: there is no way allomorph selection could be computed just by itself, i.e. without appeal to phonological information.

Against this backdrop, the purpose of Embick's (2010) book is to defend a localist approach, i.e. where morphological and phonological activity is not performed by the same computational system. What is also at stake when opposing local and global approaches to PCA is *modularity*, i.e. the architecture of grammar that lies at the heart of the generative enterprise since *Aspects* (Chomsky 1965:

15ff). On the modular take, grammar is made of a number of distinct computational systems, represented in form of the inverted T, each of which operates over a proprietary vocabulary that is distinct from the vocabularies used by other systems. The fact that computation is based on items which belong to distinct alphabets is called *domain specificity* in Cognitive Science and constitutes a major diagnostic for telling different computational systems apart (see e.g. Segal 1996; Carruthers 2006). On this count, morpho-syntax and phonology are distinct, one operating over lexical items such as number, person, animacy etc., the other working with labiality, occlusion and the like, with zero overlap (see Scheer 2011: §643ff). That is, the input to every computational system is specific to this system and cannot be parsed by other systems. Communication among modules then requires translation from one vocabulary set into another. Therefore *labial*, *occlusion* and so forth is not anything that morphological computation could make sense of.[1]

Following modularity and the Distributed Morphology take in general (see Bobaljik 2000), Embick considers that morphology and phonology are distinct computational systems: "while morphology (VI [Vocabulary Insertion] in particular) and phonology might be interleaved, they are distinct systems, so that output or subsequent phonology cannot drive VI" (Embick 2010: 102). He further argues that allomorph selection could not be done in the phonology.

His main objection against global approaches is their violation of locality. On localist (or cyclic) standards, nothing prevents morphological computation to take phonological information into account as long as this information realizes already-merged items. Locality (cyclicity) is violated only if at any given point in the derivation phonological exponents of items are appealed to that are not yet merged into the morpho-syntactic structure. Embick shows that the prohibition of look-ahead restricts the derivation in a useful way and makes (correct) predictions that the global alternative misses.

Locality and modularity both restrict the availability of phonological material during morphological computation, though according to different rationales: locality is about *when* phonological information is available (derivational aspect), while modularity (or domain specificity) defines *what* kind of phonological information can be taken into account (substantive aspect). Embick only mentions modularity in passing, as an argument against global approaches, which are anti-modular (p. 9). In practice, though, his management of allomorphy is just like everybody else's: in case phonological properties condition allomorph selection, they are mentioned as such in the statement of vocabulary items in form of contextual conditions and are accessed by morphological computation upon allomorph selection (e.g. Embick 2010: 101).

The purpose of this article is to show that PCA obeys not only locality, but also modularity. That is, the argument against global approaches is pushed one step further: restrictions on the availability of phonological information are not only derivational (cyclic), but also substantive (type of vocabulary referred to).

[1] Bermúdez-Otero (2012: 50) argues for a version of modularity that, following Jackendoff (2002), is "bi-domain specific", i.e. where interface processors (of which Bermúdez-Otero holds that morphology is an instantiation) have access and are able to process several distinct proprietary vocabularies. See Scheer (2012: §177) for discussion.

At first blush, it seems then that phonologically conditioned allomorphy should not exist at all: how could something be phonologically conditioned without taking phonological material into account? The answer is that "phonological material" is a cover term that does not distinguish between the basic phonological vocabulary (occlusion, labial etc.) and the structure that phonological computation builds on the grounds of these input items (syllable, foot, etc.). This distinction is introduced in greater detail in the following section.

2.2 Vocabulary vs. structure in phonology: syllabic labels are not the result of projection

Syllable structure is built by a syllabification algorithm that takes as an input major class properties of segments (i.e. their sonority) and their linear order.[2] The output of this computation, syllable structure, does not belong to the proprietary vocabulary of phonology: an onset, a coda, a rhyme and a nucleus are ontologically distinct from labiality, occlusion and the like. The latter are pieces of phonological vocabulary, while the former are the result of modular (phonological) computation performed upon them. Also note that there is no projection of labels in the syntactic sense whereby the merger of A and B produces $[AB]_A$ in case A is the head, and $[AB]_B$ if the whole is B-headed. That is, the labels of syllable nodes are not the projection of any properties of the phonological vocabulary. Onset, coda, nucleus, rhyme do not have any equivalent below the skeleton, i.e. among vocabulary items (but both As in $[AB]_A$ *are* the same type of object, one being the projection of the other).

It is also not the case that vowel- or consonanthood are projections based on properties of vocabulary items. Major class qualities are idiosyncratic properties put down in the lexical identity of segments, but syllable structure does not merely compute these qualities. Rather, it is their linear sequence among several segments that decides whether an item ends up in a specific syllabic constituent: nuclei for example are local sonority peaks (talking about peaks is talking about preceding and following segments), and these may incarnate as vowels or sometimes (syllabic) consonants. A major achievement of autosegmentalism is precisely the emancipation of vowel- and consonanthood from the segmental makeup: high vowels [i, u] and their corresponding glides [j, w] are the same melodic items, i.e. made of the same set of phonological primes (I and U when unary primes are used). I and U do not carry any instructions regarding their vowel- or consonanthood: whether they end up as vowels [i, u] or consonants [j, w] depends entirely on the syllabic constituent they belong to. That is, vowels are produced when they belong to nuclei, while consonants appear in case they are associated to an onset or a coda.

All cases discussed share the fact that the label which appears on a unit at or above the skeleton is not a projection of any unique segmental property that occurs below the skeleton. Rather, labels at and above the skeleton are a genuine result of the phonological computation that creates structure (in our case syllable structure).

[2] This is true for all theories, including those like Government Phonology where syllable structure is stored in the lexicon: the phonetic signal does not contain syllable structure. Therefore L1 learners and adults who acquire new lexical items (acronyms, loans etc.) need to somehow build syllable structure, either during regular phonological computation or prior to that, i.e. upon lexicalization.

This divorce between vocabulary items and the labels of higher level units shows that structure building in phonology does not involve any projection in the syntactic sense.

Note that what was said about syllable structure was articulated using the syllabic units of classical syllable structure (the onset-rhyme model), but is meant to be theory-neutral: all theories of syllable structure share the properties mentioned, moraic theory as much as for instance Government Phonology (or CVCV, Lowenstamm 1996; Scheer 2004). This is also true for metrical structure: feet or metrical grids are the result of a computation based on syllable structure, and there is no discussion about labels because there are none. Metrical grids are made of grid marks only, and foot structure has formal properties (binary, ternary, iambic, trochaic, strong, weak, head, dependent) but no labels.

Now recall that modularity in general and domain specificity in particular hold that vocabulary items that are processed by a given module cannot be read, parsed or understood by another module. In the case of PCA, this means that phonological vocabulary—labial, occlusion and the like that occur below the skeleton—cannot be taken into account by morphological computation, i.e. allomorph selection. Nothing prevents the conditioning of allomorphy by other pieces of phonological representations, though: PCA is free to take into account the output of phonological computation: structure that occurs at and above the skeleton. Syllable and metrical structure have not inherited any labels from the melody below the skeleton and do not entertain a projecting relationship with it in the syntactic sense. Therefore morphological computation is able to see, parse and interpret all pieces of phonological structure that occur at and above the skeleton.

2.3 Global approaches overgenerate

As was mentioned, the purpose of this article is to show that PCA complies with the predictions made by modularity. That is, allomorph selection is never conditioned by melody. The only phonological factors that bear on PCA are located at and above the skeleton. This distribution, if correct, has gone unnoticed thus far, and it will be shown below that there is reason to believe it is correct.

The global perspective on the other hand predicts that any kind of phonological information is able to condition PCA because all pieces of phonology are permanently available to ongoing computation. If this turns out not to be the case, the global approach has a serious problem: it overgenerates.

Note that this applies to all analyses that grant full access to phonological information upon allomorph selection, regardless of where this selection takes place: in the Lexicon as under the Lexicalist Hypothesis (see e.g. Lieber and Scalise 2007), or upon vocabulary insertion as in Distributed Morphology. That is, the generalization that is introduced in the present article is *empirical* in kind and confronts all theories of allomorphy: a subset of phonological information, melody, is never taken into account when allomorph selection is performed.

This of course requires a consensual definition of the set of patterns that instantiate allomorphy. Alas, allomorphy is not anything that can be read off the surface: it can only be established through analysis (see Sect. 3.2) and therefore, quite expectedly, different analysts working in different theories have different takes on what counts as an allomorphic alternation. This issue will run through the remainder of the article: it is discussed especially in Sects. 5.2 and 6.4.

3 Melody-free syntax

3.1 From phonology- to melody-free syntax

Before examining the empirical record, this section recalls how Zwicky and Pullum's (1986) initial claim of a phonology-free syntax was faced with numerous counter-examples. These appear to share the fact that the phonological property conditioning morpho-syntactic computation is located at or above the skeleton (Scheer 2011: §412).

The literature that challenges the invisibility of phonological properties for morpho-syntax includes Inkelas (1990), Inkelas and Zec (1990, 1995), Hargus (1993), Neeleman and Reinhart (1998), Szendrői (2003) regarding syntax, Szymanek (1980), Ackema and Neeleman (2004: 2), Burzio (2007) and Raffelsiefen (2004, 2015) regarding morphology. Szymanek (1980), Vogel and Kenesei (1990) and Inkelas and Zec (1995) provide surveys of phenomena that are frequently quoted in support of the fact that phonology may have bearing on morphology and syntax.

Everybody agrees with Zwicky and Pullum's (1986) original observation that melodic properties of sound never affect a syntactic derivation, though; Vogel and Kenesei (1990: 346) as well as Inkelas and Zec (1990: 366, 1995: 547) for example are explicit on this. That is, nobody has ever seen anything like "verbs that begin with a dental are raising verbs."

On the other hand, recurring candidates for bottom-up conditioning are located above the skeleton. This broad observation is hinted at by Kaisse and Hargus (1993: 4): "if an affix subcategorizes for a base with certain derived phonological properties, those properties are almost always supra-segmental (e.g. stress)." A more documented record of this intuition can be gained when parsing the literature in greater detail: the phenomena quoted are intonation and stress (Szendrői 2003; Hargus 1993), tree-geometric properties of the prosodic constituency (for example the existence or branchingness of constituents, Inkelas and Zec 1988, 1990: 372ff), the size of lexical items (minimal word constraints: number of syllables or moras, e.g. Inkelas and Zec 1990: 372ff; Hargus 1993; Bendjaballah and Haiden 2013) and rhythm (Guasti and Nespor 1999).

There is thus reason to believe that the distinction between phonological properties below and at/above the skeleton is relevant when it comes to the conditioning of morpho-syntactic activity.

3.2 Beware of analysis

An important point to be kept in mind all through is that when we are talking about phonological conditioning of morpho-syntactic processes in general and of PCA in particular, we are talking about *analysis*: PCA is not an observational fact. That is, the presence of a phonological condition in the surface description of a phenomenon does not establish that morpho-syntactic computation parses phonological information. There may be a number of different analyses, which may or may not resort to phonological conditioning of morphological computation.

Let us take a look at an example. Bendjaballah and Haiden (2013) are concerned with a phenomenon in Chemini Berber (Algeria) whereby the occurrence of prepositions is determined by their size. At first blush, this suggests that morpho-syntactic preposition selection is conditioned by the size of the candidate. Hence "small" prepositions made of a single consonant such as *g* "in", *f* "on" or *n* "genitive" can only occur in Construct State—they are excluded in Free State. On Bendjaballah and Haiden's analysis, though, this size-based distribution is a purely phonological effect: case (KP) spells out an empty CV unit in all configurations, which however is used by an overt segmental marker only in Free State. This CV unit remains empty in Construct State and therefore is available for hosting other segmental material. Small prepositions are lexically floating segments, i.e. lacking syllabic support, and therefore need to parachute on independently available syllabic space in order to be realized. This space is provided in Construct State, but not in Free State. Small prepositions thus have no landing site in the latter and therefore do not occur in this context.

On this analysis, small prepositions are restricted to Construct State not because syntax selects prepositions according to their size, but because they are lexically floating segments that are small enough to be hosted by a CV unit which is only provided in Construct State. Hence at no point does syntactic computation "look into phonology", or is influenced by any phonological property.

The take-home message is that we need to be careful with the definition of what exactly phonology bears on: "morphology" or "syntax" are only broad descriptive terms. There are various ways in which morphological and syntactic patterns may be influenced by phonology, but only those where morpho-syntactic computation is under the spell of phonology count for the purpose of phonology-free (or melody-free) morphology and syntax.

4 Infixation and sonority

4.1 Infixation

Let us approach the generalization that morpho-syntactic computation in general and PCA in particular is melody-free by first looking at infixation. Typological surveys of infixation include Moravcsik (2000) and Yu (2007). The latter studied 154 infixation patterns in 111 languages belonging to 26 different phyla and isolates. Based on this record, Samuels (2009: 147ff) provides an overview of phonological factors that are known to condition infixation. The list of anchor points that infixes look at in order to determine their landing site falls into two categories: edge-oriented and prominence-oriented. For the left edge for example, documented situations are "after the first consonant (or consonant cluster)", "after the first vowel", "after the first syllable" and "after the second consonant". Prominence-based attractors are stressed vowels, stressed syllables or stressed feet.

As may be seen, in no case is melody reported to be relevant for the definition of the landing site. Hence cases where infixes are inserted after, say, the first labial consonant of the word (and in absence of labials are prefixed) do not appear to be on record. Phonological conditioning factors are located exclusively at and above the skeleton.

4.2 Sonority is not melody

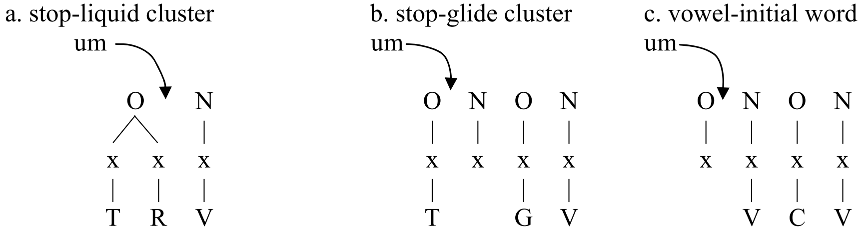
A case that turns out to be of general relevance for melody-free syntax is discussed by Zuraw (2007) in her study of Tagalog infixation. On the ordinary take, sonority is a melodic property since relevant primes in all models are located below the skeleton: traditionally, major categories (glides, nasals, liquids, fricatives and stops) are defined by binary features such as [±son] or [±cons]. In Government Phonology where unary primes such as I, A, U are used, there is no specific prime for sonority, which is a function of complexity (Harris and Lindsey 1995). That is, the more primes a segment is made of, the less sonorous it is. Hence in Harris and Lindsey's system, the glides *j*, *w* are made of just one (place-defining) prime, I/U respectively (which is interpreted in a consonantal position), while fricatives bear a place definer and a prime responsible for noise, h: *f* for example identifies as U, h. Finally, an additional manner prime responsible for stopness, ?, contributes to plosives: *p* for example is made of U, h,?. As a result, sonority may be read off the segmental expression that consists solely of primes defining place and manner, i.e. without there being any specific prime defining sonority.

On this backdrop, let us look at Zuraw's (2007) discussion of Tagalog infixation (Austronesian, Philippines). In this language, the *-um-* infix lands after the first consonant of words: the infixed form of *labusaw* "made turbid" is *l-um-abusaw*. Tagalog does not have native cluster-initial words, hence speakers must make a decision to insert the infix either after C_1 or C_2 when applying native morphology to cluster-initial loans. For example, English *graduate* could come out as either *g-um-raduate* or *gr-um-aduate*. Zuraw reports that *-um-* splits word-initial stop-glide clusters significantly more often than stop-liquid clusters. We are thus facing an impact of sonority-defined cluster types on the computation of infixation—something that should not happen according to melody-free syntax.

This does not mean that infixation is melody-driven, though. Unlike other melodic properties, sonority is projected above the skeleton in the form of syllable structure. It is undisputed that syllable structure is a function of two and only two properties: the linear order of segments and their sonority.[3] The sonority of segments is thus legible from above the skeleton by simply looking at syllable structure. In our case, if stop-liquid clusters are syllabified as branching onsets but stop-glide clusters do not qualify for this status and end up as two separate onsets, the infix simply lands after the first onset of the word, as under (1a,b). This computation then looks at the projection of melody (i.e. syllable structure)—not at melody itself.

[3] Approaches that are based on licensing-by-cue but still acknowledge the syllable (e.g. Steriade 1999) may take exception to this statement.

(1) Tagalog sonority-driven infixation
(T is shorthand for stops, R for liquids and G for glides)



The fact that obstruent-sonorant clusters may build branching onsets while sonorant-glide clusters do not is a known pattern. For one thing, this is what the traditional notion *muta cum liquida* conveys: clusters are specific and solidary when liquids follow obstruents. In the evolution from Latin to French for example, post-obstruent glides were heterosyllabic and hence in strong position, while liquids in the same context were tautosyllabic (see e.g. Bourciez and Bourciez 1967: §§144f, 168f, 171). Yod in strong position strengthened to Old French t͡ʃ / d͡ʒ (> Mod. Fr. ʃ / ʒ): Lat. rabia > *rab.ja > Fr. ra[ʒ]e "rage", Lat. sapiam > sap.ja > Fr. sa[ʃ]e "to know subj. 3sg", Lat. leviu > *lev.ju > Fr. liè[ʒ]e "cork". The original obstruent is regularly lost in coda position (like in Lat. rup.ta > Fr. route "road"), and the preceding tonic vowel confirms the heterosyllabicity of the cluster: Lat. a becomes *e* and *e* goes to *ie* in open syllables (Lat. mare > Fr. mer "sea", Lat. feru > Fr. fier "proud"), but the respective results in closed syllables are *a* (Lat. carta > Fr. charte "charter") and *e* (Lat. herba > Fr. herbe "grass"). Thus in all cases at hand, the tonic vowel shows the behavior of a checked vowel.

In the same position, liquids on the other hand do not strengthen, and the tonic vowel diagnostic shows that the cluster is tautosyllabic. Hence Lat. pĭp(e)re > Fr. poivre "pepper", Lat. capra > Fr. chèvre "goat", Lat. pĕtra > Fr. pierre "stone". Tonic *ĭ*, *a*, *ĕ* appear as Fr. *oi*, *e*, *ie* in open syllables (Lat. pilu > Fr. poil "hair", see above for examples of the other two vowels), but become Fr. e, a, e in closed syllables (Lat. vĭrga > Fr. verge "rod", see above for examples of the other two vowels). All vowels preceding *muta cum liquida* thus show unchecked behavior.

Zuraw (2007: 299) also reports that vowel-initial words are "infixed" before the first vowel: *abot* "attain" produces *um-abot*. She attributes this landing site to the existence of an epenthetic glottal stop at the outset of vowel-initial words: *abot* in fact is *ʔabot*, and the infixed form *ʔ-um-abot*. One may wonder whether the glottal stop, being epenthetic, is present or visible by the time the landing site of the infix is computed. If *-um-* lands after the first onset, the correct form is produced also in absence of the glottal stop: *abot* begins with an empty onset, and *-um-* lands to its right like everywhere else, as shown under (1c).

Further support of the fact that sonority, but not other segmental properties, may be read off by processes that operate at and above the skeleton comes from stress. On the consonantal side, only positional (syllabic) factors may affect stress assignment, except for sonority. So-called Weight-by-Position regulates whether or not closed syllables count as heavy when stress-placement is weight-sensitive. That is, languages parametrically choose whether codas do or do not make a syllable heavy (Hayes

1989). Weight-by-Position, however, allows for more fine-tuning: in some languages sonorant, but not obstruent codas contribute to the weight of their syllable. Documented cases of this pattern are found in native American Wakashan languages (e.g. Wilson 1986; Zec 1995: 103ff; Szigetvári and Scheer 2005: 44f). Hence syllable structure (codas) and sonority may impact stress assignment—but there is no case on record where, say, labiality or palatality have this effect ("a coda is heavy only if it is labial").

On the vocalic side, de Lacy (2002) and Gordon (2002: 52) have established the same generalization, which is also based on broad cross-linguistic evidence. In many languages stress placement is sensitive to the sonority of vowels (low, mid, high), but de Lacy wonders why no other property ever seems to play a role.

(2) "One issue this typology raises is not why stress is sensitive to sonority, but rather why it is not sensitive to so many other properties. There are no stress systems in which subsegmental features such as Place of Articulation or backness in vowels plays a role in assigning stress. The same goes for features such as [round], [nasal], and secondary articulation." (de Lacy 2002: 93)

The take-home message of this section is that sonority is not a melodic property of sound: it does not behave as such. Of all properties that are traditionally accommodated below the skeleton, sonority is the only one that is pervasively visible from above, i.e. by operations that are carried out above the skeleton (stress placement) or outside of phonology (infixation).[4]

The identity of sonority and its status as an outlier among properties that are traditionally viewed as subskeletal may not be fully understood (especially regarding vocalic sonority). The facts are converging towards the conclusion that sonority is not a piece of melody, though. For consonantal sonority at least, there is a reason why sonority but no (other) segmental property is visible from above the skeleton: according to the basic (and undisputed) workings of syllable structure, sonority is the only property located below the skeleton that projects (in the sense of Sect. 2.2). The difference between an RT and a TR cluster can be read off at the syllabic level because the former will by syllabified as a coda-onset interlude, while the latter ends up as a branching onset. By contrast, labiality and the like do not project and have no representative at the syllabic level: there is no way of telling whether, say, the first member of a branching onset is labial, dental or velar by looking at syllabic constituency.

5 Phonologically conditioned allomorphy

5.1 Harmless cases: syllable- and sonority-driven

In order to evaluate whether PCA may also have melodic conditioning, below Paster's (2006) typological survey of what she calls Phonologically Conditioned Suppletive Allomorphy is parsed. Paster surveyed about 600 languages and described 137 cases

[4]This indicates that Government Phonology may be on the right track when refusing to make sonority a melodic prime.

of PCA in 67 languages. Chapter 2 of her Ph.D. is about segmentally conditioned PCA, chapter 3 is concerned with tone- and stress- conditioned PCA, while chapter 4 reviews prosodically conditioned PCA.

In Chap. 2, relevant for our purpose, Paster mentions 72 cases of PCA from 32 different languages. These fall into two major groups: a large set where the conditioning factor is consonant- vs. vowelhood, and a number of cases where sonority is the driving factor. An example of the former is found in Moroccan Arabic where the 3sg masculine object/possessor clitic is *-h* after V-final, but *-u* after C-final stems (p. 56). A debate in the literature is whether the driving force behind PCA is the "optimization" of the string, i.e. in the Moroccan Arabic case the creation of unmarked CVCV sequences. This is predicted by the OT-based "P>>M" analysis whereby phonological constraints are ranked ahead of morphological constraints in a single constraint hierarchy (McCarthy and Prince 1993). Paster (2006, 2009: 25f) shows that there are numerous cases of PCA that are not phonologically optimizing in any discernible way (see also Bye 2007 and Nevins 2011: 2370ff).

The distinction between optimizing and non-optimizing patterns is further discussed in Sect. 6.4. For now, the only thing that matters is the fact that C vs. V conditioning is non-melodic: it is based on a major class distinction and anyway legible at the syllabic level where consonants and vowels belong to distinct constituents. Table (3) below provides a survey of cases driven by C vs. V that Paster (2006: 35ff) mentions (more examples may be found on pp. 77ff).

(3) PCA #1
C vs. V conditioning

a. Yidiɲ (Pama-Nyungan, Australia)
-la after V-final stems, *-da* after C-final stems
b. Korean
-wa after V-final stems, *-kwa* after C-final stems
c. Moroccan Arabic
3sg masculine object/possessor clitic: *-h* after V-final, *-u* after C-final stems
d. Tzeltal (Mayan, Mexico)
2sg *aw-* before V-initial stems, *a-* before C-initial stems
[more of the same with 1sg and 3sg]
e. Modern Western Armenian
-n after V-final, *-ə* after C-final stems
f. Warrgamay (Pama-Nyungan, Australia)
ergative *-ŋgu* after V-final, *-du* after C-final stems
g. Midob (Nubian, Sudan)
-non- before V-initial, *-no-* before C-initial suffixes
h. Kashaya (Pomoan, Northern California)
-cin' after V-final monosyllabic stems, *-men'* after other V-final stems; *-an'* after C-final stems
i. Biak (West New Guinean, New Guinea)
2sg prefix *wa-* with CC-initial stems, infix *-w-* otherwise
j. Korean
accusative *-rɨl* after Vs, *-ɨl* after Cs

k. Dja:bugay (Pama-Nyungan, Australia)
genitive *-n* after V-final, *-ŋum* after C-final stems

l. Dakota (Siouan, Northern USA)
1du/pl *u-* before C-initial, *uk-* before V-initial stems

m. Russian
reflexive *-sja* after Cs, *-sj* after Vs

The other group mentioned is based on sonority. Some examples are shown under (4).

(4) PCA #2
sonority-based conditioning

a. Kwamera (Central-Eastern Oceanic)
prefective *ɨn-* before stems beginning with non-high initial vowels, *uv-* before consonant-initial stems and stems that begin with a high vowel.

b. Martuthunira (Pama-Nyungan, Australia)
genitive *-ku* after nasals, *-yu* after laterals or rhotics (no other Cs available in this position).

c. Nishnaabemwin (Algonquian, Ontario)
conjunct order 3rd *-g* after nasal-final stems, *-d* elsewhere. No evidence for a $d \rightarrow g$ process in the language, which does feature *nd* clusters (including word-finally).

5.2 PCA that may not be PCA

Let us now look at cases discussed by Paster whose PCA character may be doubted (including by Paster). Recall from Sect. 3.2 that allomorphy is not an observational fact: it needs to be established by analysis, and there may be competing accounts that are non-allomorphic.[5]

(5) PCA #3
cases whose allomorphic status may be doubted

a. Sibe variety of Manchu (Tungusic, China)
uvular-initial suffixes -χ after stems with a low vowel, velar-initial suffixes *-x* after stems without a low vowel.
==> assimilation

b. Tahitian
ha'a- before labial-initial roots, *fa'a-* elsewhere
==> dissimilation

c. Basque
postnasal voicing of voiceless obstruents in a subset of affixes: e.g. derivational suffix *-dar* after nasal-final stems, *-tar* elsewhere.
==> postnasal voicing

[5] A reviewer points out the case of the diminutive in Spanish, whose allomorphs *-ito*, *-cito*, *-ecito* are conditioned by a complex set of factors including the familiar distinction between C- and V-final stems, the quality of the stem-final vowel (*o*, *a* vs. *e*), the size of the stem (number of syllables), the stem-final consonant, the stem-internal vowel/diphthong and stress (see Eddington 2012: §3). I leave the challenge raised by this pattern open for further study.

The Sibe alternation under (5a) lends itself to an assimilation analysis: uvulars (but not velars) are known to pattern with gutturals, which in turn are sensitive to lowness (e.g. McCarthy 1991). Hence the single underlier /-x/ is turned into the uvular -χ when the stem contains a low vowel, which spreads its lowness onto the suffix. Under this analysis, there is no allomorphy: the alternation is the result of a purely phonological process based on one single underlier.

The Tahitian causative/factive marker under (5b) is a plausible instance of dissimilation: the initial labial of the single underlier /fa'a-/ cannot occur before stem-initial labials. Its dissimilation proceeds via lenition: $f \rightarrow h$ is a well-known lenition trajectory (e.g. Harris and Lindsey 1995: 71). Hence there is a single underlier, and all processes involved are purely phonological: dissimilation as much as the derivation of the alternative segment ($f \rightarrow h$).

Finally, let us consider the Basque case under (5c) that is given an allomorphic status by Mascaró (2007: 719ff). There are no morphological factors involved in the process of determining whether *-tar* or *-dar* appears on the surface (compare *Eibar* "town name" – *eibar-tar* "inhabitant of Eibar" vs. *Arizkun* "town name" – *arizkun-dar* "inhabitant of Arizkun"). The only tie to morphology is the fact that the process is not general in the language: some affixes show it, others do not, and Mascaró (2007: 722) reports that both sets are randomly distributed among affixes. What is the reason, then, to set up two distinct allomorphs (instead of a single underlier), when the pattern requires only regular phonology applied to a subset of morphemes? Mascaró (2007: 721) dismisses the single underlier option because he argues that "natural" phonological processes, i.e. those that produce or improve the markedness of the string, should not be restricted to apply to (sets of) specific morphemes. One may wonder why this should be, since markedness promotion in specific contexts is what TETU (the emergence of the unmarked) is all about: grammar does not produce unmarked structures in all cases because faithfulness requirements outrank them, but they emerge when faithfulness restrictions for some reason are released in specific contexts.

It thus appears that the classification of patterns as allomorphy that have no morphological conditioning at all except for being morpheme-specific entirely depends on more general considerations regarding the treatment of regularity, redundance in lexically stored items, the purview of grammar in general and of phonology in particular.

Let us therefore look at some background regarding the question of what actually counts as a phonological process. In SPE-based early generative phonology, (almost) any surface alternation was interpreted as the result of phonological computation (including items like *rebel* – *bellicose*, *cardiac* – *heart*, *eye* – *ocular*, *sweet* – *hedonism*, *queen* – *gynaecology*, see Lightner 1978: 18f). The abstractness debate triggered by Kiparsky (1968–1973) tried to identify general criteria that could tell for any given alternation whether it does or does not involve phonological computation (the evaluation measure, or evaluation metrics, e.g. Kiparsky 1974). There was no conclusive result, though, to the effect that the size of the set of alternations that are considered phonological by different theories and fashions wildly diverges (see Scheer 2015). While phonological theories in the 80s aimed at restricting the expressive power of phonological computation (by various means: autosegmentalism, Lexical Phonology, Government Phonology), the shift of focus from representations to computation in OT since the 90s has massively increased the computational power and therefore the set of alternations that are held to be phonological.

In the context of PCA and the understanding that allomorphy is not an observational fact but always due to analysis, the critical impact of the general debate on what exactly counts as phonological concerns morpheme-specific phonological computation. The idea that a single morpheme, or an arbitrarily defined set of morphemes, can obey specific phonological regularities that are not active elsewhere in the language is embodied in the OT literature by cophonologies (e.g. Anttila 2002) and indexed constraints (e.g. Pater 2000). Like Mascaró (2007), Bermúdez-Otero (2012: 64) argues against morpheme-specific phonological computation: underlying representations are lexically idiosyncratic, but computation is not, or should not be. In his view, a generality criterion needs to be applied in order to find out which alternations are the result of phonological computation: an alternation that requires a morpheme-specific phonology is suspect per se. Bermúdez-Otero does not require 100 regularity in the language for a process to identify as phonological – but a more general relevance than just for one morpheme (e.g. application in a cyclic domain) is needed to admit the alternation in the purview of phonology.

Note that the Basque case discussed probably passes Bermúdez-Otero's generality criterion since postnasal voicing in this language does not apply to just a single morpheme, but to a large set of morphemes (and it is not clear which pattern – postnasal voicing or postnasal faithfulness to the underlying voice value of obstruents – is regular, and which one is exceptional).

It also needs to be noted that the generality criterion is not easy to apply in cross-linguistic studies such as Paster's where hundreds of languages are processed, since it requires more in-depth knowledge of individual systems, which is typically not available or not reported. That is, setting up analyses based on assimilation as for Sibe, or on $f \rightarrow h$ in Tahitian shows that the pattern as such is manageable by purely phonological workings. It remains to be seen, though, whether it makes sense given the systemic properties of the languages at hand and the set of active phonological processes they accommodate. In case the relevant processes are not plausible, morpheme-specific phonology and the generality condition come into play. The take home message thus is that it may not be enough to identify a phonological regularity in order to claim that the alternation is due, or in the case of PCA, reduces to phonological computation.

In sum, this section was about to show that the diagnostic of patterns to be allomorphic in nature is strongly theory- and analysis-dependent. At this stage of the discussion I do not take any stand in the debate revolving around the continuum of patterns that should or should not be treated as allomorphy since the point to be made in this article is meant to be theory- and analysis-independent. That is, the absence of melodic conditioning in allomorph selection is an *empirical* fact that holds no matter how big the piece of the cake is that turns out to be allomorphic. What I claim is that whatever patterns analysts come up with where allomorph selection is performed by morphological computation, either melody plays no role in allomorph selection, or there is a purely phonological way (the floating segment analysis to be introduced in Sect. 6) of implementing it. In no case will morphological computation have to make reference to melodic information. In Sect. 6.4, though, I will end up arguing against the purely phonological allomorph selection that Mascaró (2007) advocates for the kind of patterns under (5).

5.3 A phonological trigger, but no phonological pathway to the legal alternant

The discussion in the previous section suggests that some PCA-looking patterns may be reduced to purely phonological computation because it can be shown that the alleged allomorphs in fact reduce to one single underlying form. This demonstration requires that two properties of the alternation be phonological.

(6) PCA may be reduced to a single underlier iff
- a. the trigger is phonological
  Tahitian under (5b): dissimilation, i.e. prefix- and stem-initial consonants must not both be labials.
- b. there is a plausible phonological pathway from the illegal to the legal alternant
  Tahitian under (5b): $f \rightarrow h$ is a well-known lenition trajectory. That is, dissimilation is realized by lenition.

There are patterns, though, where a phonological trigger may be identified, but no case for a plausible phonological pathway from the illegal to the legal alternant can be made. These patterns are the tough ones, i.e. those where two distinct underlying forms, and hence allomorphy, resist reduction to a single underlier. Interestingly, all cases in point that I could identify (in Paster's work and elsewhere) are either due to similarity avoidance (dissimilation) or to harmonic incompatibility (vowel harmony). Nevins (2011: 2360) also notes the ubiquity of triggering dissimilation in melodically conditioned PCA. We will see in Sect. 7 that dissimilation also appears to be the odd man out beyond PCA. The question why there seems to be a particular bond between dissimilation and PCA that appears to involve melody thus calls for an answer (but is not further pursued in this article).

The pattern at hand where a phonological trigger may be identified but no plausible phonological pathway from the illegal to the legal alternant is illustrated under (7) below: the first three cases are taken from Paster's Ph.D., the others are mentioned in the wealth of empirical material gathered by Nevins (2011: 2359ff), except for (7d) which is described by Bonet and Mascaró (2006) and Mascaró (2007: 722). Note that all examples are based on similarity avoidance, except maybe Udihe where the alternation is triggered by the incompatibility of creaky voice and high vowels.

(7) PCA #4
phonological trigger, but no pathway from the illegal to the legal alternant
- a. Caddo (Caddoan, Oklahoma)
  simple future -*ʔaʔ*, but -*waʔ* after *ʔ*-final stems
- b. Hungarian
  present tense indef. 2sg -*s*, but -*El* after sibilant-final stems (where *E* is a harmonizing vowel)

c. Yucunany Mixtepec Mixtec (Otomanguean, Mexico)
3sg familiar *-a* after *i*-final, *-i* elsewhere (all stems are V-final). Hence *kù'ù* "woman's sister" – *kù'-ì* "her sister", but *sì'i* "leg" – *sì'-aà* "his leg"

d. conjunctions "and" and "or" in Spanish
"and": *i* everywhere except before words that begin with *i*, where *e* is observed (*María y Pedro* "Maria and Pedro", but *María e Ignacio* "Maria and Ingnacio").

e. Catalan
masculine marker zero (for a given noun class) except before plural *-s* when the stem ends in *-s*, in which case *-u-* appears: *gɔt* – *gɔt-s* "glasses sg., pl.", but *gos* – *gos-u-s* "dog sg., pl.".

f. Dutch
the agentive suffix is *-er* [-ər] everywhere except after stems whose last vowel is schwa, in which case *-aar* is found: *dans-[ə]r* "dancer", but *wand[ə]l-aar* "walker".

g. Udihe (Southern Tungus, Far East Siberian)
the perfective marker laryngealizes stem-final vowels (creaky voice), except when these are high, in which case -ge is suffixed. In Udihe, high vowels cannot be laryngealized (all other vowels afford contrastive laryngealization).

In Caddo under (7a) the simple future suffix is underlyingly /-ʔaʔ/, but cannot be realized as such after stem-final glottal stops because two glottal stops in a row are prohibited. In this context, the suffix-initial glottal stop is dissimilated to *w*. The latter bit is the crucial property of the pattern that sets it apart from the parallel Tahitian case under (5b): in both languages, segments that are too similar are not tolerated (two labials in the latter, two glottal stops in Caddo), but in Caddo there is no reason why a *w* rather than, say, a *d* or an *r* appears in place of the glottal stop. By contrast, in Tahitian there is a plausible phonological pathway from the illegal to the legal alternant: when *f* needs to be altered, it lenites to *h*. Therefore the Caddo simple future suffix cannot be reduced to a single underlying form: it spells out an unmarked form *-ʔaʔ*, which in case of need is suppleted by *-waʔ*. That is, the relationship between the regular and the rescue item is arbitrary and hence lexical, not phonological.

The Hungarian pattern under (7b) is of the same kind (Paster 2006: 41f). The 2sg indefinite object suffix is realized as *-s*, except when the stem ends in a sibilant, in which case *-El* appears (where *E* is a mid vowel subject to backness and rounding harmony). Hence *kap-sz* "you get", *lök-sz* "you push", *nyom-sz* "you press", *lő-sz* "you shoot", but *mos-ol* "you wash", *néz-el* "you look", *tesz-el* "you put", *ráz-ol* "you shake" (note that spelt <s> transcribes [ʃ], while <sz> stands for [s]). Here again, the dissimilatory origin of the alternation is obvious (sibilant dissimilation), but there is no phonological pathway from the unmarked *-s* to the rescue form *-El*. Their relationship is arbitrary, hence both must be recorded in the lexicon.

For the time being let us take stock of the fact that this pattern may not be very frequent, but appears to be consistent across languages. The fact that all cases seem to follow the same logic (phonological trigger but no plausible phonological pathway, a specific and an elsewhere alternant, the former rescuing the latter in case it cannot be used) and have the same trigger (similarity avoidance) suggests that their driving force is a pervasive mechanism.

It will be shown in Sects. 6.2 and 6.3 that the cases under (7) can be accounted for along the floating segment analysis (which complies with melody-free syntax) that is developed on the grounds of another Hungarian pattern discussed in the following section.

5.4 Floating segment analysis of Hungarian *-i* / *-ja*: one single underlier

Let us now consider the 3sg, 2pl, 3pl indicative definite present tense alternation of *-i* and *-ja* in Hungarian (Paster 2006: 34).[6] The short story is that *-i* occurs after front stems, while *-ja* is found after back stems. We are thus facing a melodic trigger as described under (6a) (front vs. back), and as in the cases discussed in the previous section there does not appear to be any plausible phonological pathway from either alternant to the other (given the environment and the melodic conditioning). What makes this alternation peculiar is that we lack the by now familiar trigger, dissimilation. Rather than by similarity avoidance, allomorph selection seems to be operated by the harmonic system based on purely melodic criteria, while the shape of both allomorphs is arbitrary. Hence a single underlier appears to be out of reach. The pattern is illustrated under (8).

(8) Hungarian *-i* / *-ja*

a. -ja

stem vowel	stem-final C				
a	labial	*kap*	*kap-ja*		'gets', 'gets it'
	dental	*lát*	*lát-ja*	[laaccɑ]	'sees', 'sees it'
	dental	*ad*	*ad-ja*	[ɑɟɟɑ]	'gives', 'gives it'
	sibilant	*olvas*	*olvas-sa*	[olvaʃʃɑ]	'reads', 'reads it'
	sibilant	*mász*	*mássza*	[maassɑ]	
	velar	*rak*	*rak-ja*		'puts', 'puts it'
o	labial	*dob*	*dob-ja*		'throws', 'throws it'
	dental	*mond*	*mond-ja*	[monɟɑ]	'says', 'says it'
	sibilant	*mos*	*mos-sa*	[moʃʃɑ]	'washes', 'washes it'
	sibilant	*tosz*	*tossza*	[tossɑ]	'pushes', 'pushes it'
	–	*ró*	*ró-ja*		'carves', 'carves it'
u	dental	*fut*	*fut-ja*	[fuccɑ]	'runs', 'runs it'
	dental	*fúr*	*fúr-ja*		'drills', 'drills it'
	sibilant	*úsz*	*úszsza*	[uussɑ]	'swims', 'swims it'
	velar	*csuk*	*csuk-ja*		'closes', 'closes it'
	velar	*rúg*	*rúg-ja*		'kicks', 'kicks it'

[6] I am grateful to Péter Szigetvári and Péter Rebrus for advice on all issues concerning Hungarian in this paper, especially for checking and completing the data sets as well as for mentioning relevant literature. All remaining errors are mine of course.

b. -i

stem vowel	floating C			
i	–	*visz*	*visz-i*	‘carries’, ‘carries it’
e	–	*kér*	*kér-i*	‘asks for’, ‘asks for it’
ő	–	*főz*	*főz-i*	‘cooks’, ‘cooks it’
ö	v	*nő*	*növ-i*	‘grows’, ‘grows it’
ü	v	*nyű*	*nyüv-i*	‘wears out’, ‘wears it out’

Two additional phonological processes are orthogonal to our purpose. On the one hand, the yod of the *-ja* allomorph merges with dental stops and palatalizes them, producing palatal geminate stops. The gemination indicates that the yod is lexically equipped with a skeletal slot. This is confirmed by the fact that yod is lost after sibilants and the preceding consonant geminates on its position.

The other process concerns *-v-*: the *-i* allomorph sometimes triggers the appearance of a *-v-* which is absent from the stem when pronounced in isolation. Diachronically and presumably synchronically, the *-v-* belongs to the stem (today in form of a floating consonant) and appears before vowel-initial suffixes: the stem *nő* mentioned under (8b) also derives *növ-és* “growth”, *növ-ő* “growing” and *növ-el* “make grow”. Note that the stem vowel shortens when the *-v-* is present (*ő* notes the long version of short *ö*). The *-ja* allomorph does not allow the *-v-* to surface: *ró* “scold”, *ró-ja* “scolds it”, against *rov-ás* “scolding (noun)”, *rov-ó* “scolding (participle)”. This confirms that the yod comes with a consonantal position, which when accommodating yod is not available for the floating *-v-*. The *i*-allomorph and the other vowel-initial suffixes mentioned begin with an empty onset, though, onto which the floating stem-final *-v-* parachutes.

Törkenczy (2011: 2977f) provides interesting additional information about the behavior of the *-i* allomorph, which quite unexpectedly is not neutral/transparent, but opaque. In Hungarian, (short) *i*, (long) *í* and (long) *é* are neutral with respect to harmony (acute accent indicates length, short *e* being also neutral, but showing specific behavior, see note 7): stems where only these vowels occur may trigger either front or back versions of suffixes. Following these neutral stems, suffixes are either consistently front or back, or they show front/back variation (vacillation). Hence *víz* “water” takes only front suffixes (e.g. *víz-nek* “id., dative”), while *híd* “bridge” only occurs with back suffixes (e.g. *híd-nak* “id., dative”). When the last vowel of the stem is neutral but preceded by a back vowel, variation occurs in some cases, e.g. *dzsungel* “jungle” produces both datives *dzsungel-nek* and *dzsungel-nak*. The neutrality of *i*, *í*, *é* is usually accompanied by transparency: the vowel of the last suffix in *add-ig-i-ak* “those occurring up to then” is (obligatorily) back because the root vowel is back. In this example, thus, the presence of two intervening front – but neutral – vowels does not impede the harmonic span.

Törkenczy’s observation, then, is that surprisingly the *-i* allomorph of our indicative marker is not transparent but opaque: it disrupts the communication between a following suffix and the preceding root. Törkenczy first shows that the two final *i*’s of *martini* “Martini (beverage)” are neutral since they allow for both *-i* and *-ja*: *martini-z-i* and *martini-z-za* “drink Martini 3sg def. pres. indic.” (the *-z-* is a verbalizing suffix). But when further harmonizing suffixes are added to the *-i* allomorph, they can only be front: *martini-z-i-tek*, **martini-z-i-tok* "you-pl spill Martini on it".

Törkenczy relates the opacity of the *-i* allomorph to the fact that the indicative marker is a harmonizing suffix, i.e. has front and back versions. Invariant suffixes such as the verb-forming *-ít* are not opaque. This observation and the opacity of the *-i* allomorph suggest that the *-i* at hand is a real front vowel exactly like *ü* and *ö*, rather than a regular *i*, whose phonetic quality alone is traditionally considered to make it a neutral vowel. That is, Hungarian has back vowels (*u*, *o*, *a*) which always impose back versions of harmonizing suffixes to their right; there are front vowels (*ü*, *ö*) which may only be followed by front versions of harmonizing suffixes; and finally there are vowels whose phonological identity cannot be deduced from their phonetic quality: *i*, *í* and *e*, *é*. These may either be front (just like *ü*, *ö*), back (just like *u*, *o*, *a*) or neither (neutral).[7] The phonological identity of each front vowel is thus lexical, i.e. a property of the morpheme in which it occurs. Recall that some stems with *i*, *í*, *e* take only front suffixes (e.g. *víz* "water" – *víz-nek* "id., dative"), while others only tolerate back suffixes (e.g. *híd* "bridge" – *híd-nak* "id., dative"). Still others – the neutral ones – admit both (*dzsungel* "jungle" – *dzsungel-nek* and *dzsungel-nak*).

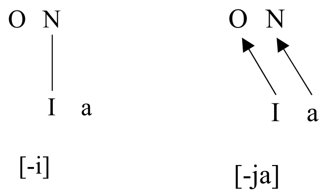
In this landscape, the *-i* allomorph of our 3sg (2pl, 3pl) indicative marker falls into the class of phonetically front vowels which are also phonologically front. This means two things: (1) as a harmonic head, it is "opaque", i.e. tolerates only front versions of harmonizing suffixes to its right; (2) as a patient of harmony whose head is a preceding vowel, it behaves like a front vowel, i.e. is incompatible with a requirement for backness. This is the key for setting up a single underlying form for both *-i* and *-ja*. Suppose the single underlier is /-i/ with "true" front qualities and associated to a CV unit. This /-i/ surfaces as such when occurring in a front harmony domain. When required to be back, there is no way this can be done: backness harmony more or less consensually implies the spreading of [-back], rather than of [+back] (or, in terms of unary primes, of I, rather than of U, see Dienes 1997). Hence the underlying vowel of suffixes that undergo backness harmony is back (e.g. the dative is /-nak/ and turns into *-nek* when receiving [-back], or an I). This means for /-i/ that it could never become back: receiving [-back] (or I) from the harmonic head will not make it back.

In this situation, the only way to comply with the requirement not to be front is for the /-i/ to vacate its nuclear position, which is the locus of the backness requirement. Table (9) below shows that the /-i/ thus moves to the onset of the CV unit that it is lexically endowed with.[8]

[7]The situation in fact is more complex, but this is orthogonal to the demonstration: there is a hierarchy of neutrality whereby statistically *í* and *i* are more often neutral/transparent than *é*, which in turn is more neutral/transparent than *e*. For example, there are only two stems with *é* that impose back suffixes (*cél* "goal" and *héj* "cover"), and none with *e*. Törkenczy (2011: 2972ff) provides more detail.

[8]This analysis is a slightly modified version of Rebrus (2000: 929f, 935), where the single underlying form of the morpheme is a CV unit with a floating I. This I is selected by front stems. Back stems require a back vowel, hence I cannot associate to the nucleus and instead attaches to the onset. An epenthetic default A then satisfies the need for a back vowel in the nucleus. The difference with the analysis under (9) is thus twofold: in the latter the I is associated in the lexicon, and the A is underlyingly present as a floating item.

(9) 3sg (2pl, 3pl) ind. *-i* / *-ja*: single underlier cum harmony
a. lexical shape b. after back stems, i.e. under harmonic anti-front pressure



Under (9), the standard assumption is followed that high vowels and glides of the same place of articulation are the same melodic object: the difference between *j* and *i*, *w* and *u* is for the glide to be associated to a consonantal position, while the vowel sits in a nucleus. The melodic identity of *j/i* under (9) is the unary prime I, but nothing hinges on this specific take on melodic representation. In its lexical shape (9a), this I is associated to a nucleus, which is preceded by an (empty) onset. When occurring in a harmony domain whose head is (phonologically) front, the lexical makeup complies with the harmonic pressure and is executed as such. The empty onset is then responsible for the above mentioned gemination of sibilants and palatalized dental stops, and offers the landing site for an eventual floating *-v-*.

In case the suffix occurs in a harmonic domain that imposes back vowels, though, the associated I is illegal and, as explained above, cannot comply to the back requirement by modifying its melody. The only way to satisfy harmony for it is to get out of the way, i.e. to vacate its nucleus, which is the locus of harmonic pressure. It therefore associates to the empty onset, as shown under (9b).

Example (9a) also bears a floating vowel, *a*, which under (9a) cannot associate because the nucleus is filled with the I. When this I vacates the nucleus under harmonic pressure under (9b), though, the *a* is realized: there is an empty nucleus it can parachute onto, and it complies with the back requirement that the nucleus is subject to. This is how *-ja* is derived from the single underlying form (9a).

Under this analysis, the Hungarian 3sg (2pl, 3pl) indicative marker is not a case of PCA: there is no allomorphy because the alternation has purely phonological workings and is based on a single underlying form.

6 Floating segment analysis of PCA: arbitrariness encoded in a single underlier

6.1 The missing pathway is a floating piece of melody

The preceding discussion has shown that what is taken to be melodically sensitive PCA appears to be due to just two driving forces: dissimilation (Sect. 5.3) and harmony (Sect. 5.4). Paster (2006: 34, note 2) reports that in her cross-linguistic survey of PCA the Hungarian pattern is the odd man out in the sense that it is one of two PCAs on her record where the (phonologically) conditioning segment is not adjacent to the PCA-subjected affix. The second case is Bari (Eastern Nilotic, Sudan), where the phonological condition is also through vowel harmony (Paster 2006: 43ff).

Dissimilation and harmony share the effect of making certain segments phonologically illegal in certain environments. This is step (6a) on the way to reduce what looks like allomorphy to a purely phonological phenomenon by devising an analysis with a single underlier. The dissimilations discussed in Sect. 5.3 (unlike those reviewed in Sect. 5.2) resist the second step (6b), though, because there is no plausible phonological pathway from the illegal to the legal alternant. These do not entertain any discernible phonological relationship, and from this arbitrariness it is concluded that they must be recorded in two separate lexical entries. Hence there are two underlying forms, which means that we are facing allomorphy.

The analysis of Hungarian *-i* / *-ja* has shown that setting up two distinct lexical entries is not the only way to encode the arbitrary relationship between the illegal and the legal alternant. What is unpredictable must be lexical, true, but lexical arbitrariness may also be achieved in a single underlier: two candidates may compete for a single constituent, and one may have an advantage because it is associated to this constituent in the lexicon. Table (10) below depicts this phonological alternative of encoding the general vs. specific character of alternants in comparison to its familiar morphological encoding. Illustration is taken from the Caddo pattern mentioned under (7a), where the simple future marker is *-ʔaʔ* except after ʔ-final stems where it spells out as *-waʔ*.

(10) phonological vs. morphological encoding of
1. alternants whose relationship is arbitrary
2. their general vs. specific character

a. morphological
simple future ↔ *-ʔaʔ*
↔ *-waʔ* | ʔ-|

b. phonological

```
x     x  x
|     |  |
ʔ  w  a  ʔ
```

The phonological expression of the fact that the *w*-version of the marker is specific, while the ʔ-version is general (elsewhere), is thus the floating character of the former, against the lexical association of the latter. That is, the *w* will only be able to be realized instead of the ʔ in case the ʔ is disqualified for some reason (here dissimilation) and thus delinks. The floating "rescue" item then attaches to the vacated position.[9]

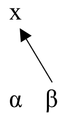
The floating segment-based and hence purely phonological analysis of what looks like melody-sensitive PCA may thus be schematized as under (11).

[9]In the case of Caddo (but which is quite frequent), the single underlier analysis of (10b) explains the fact that only one segment of the three-segment affix shows arbitrary variation, the other two segments being stable. When two distinct lexical recordings are assumed as under (10a), this fact begs the question: it is not really plausible that the two lexical items, which are supposed to be arbitrarily chosen, are accidentally identical for two thirds of their body. The standard reaction is to invoke a diachronic development based on a single ancestor.

(11) floating segment analysis
purely phonological analysis of alleged melody-sensitive PCA
where α alternates with β and the relationship between both is arbitrary

a. lexical situation

b. lexically associated item illegal for phonological reasons: α cannot remain associated to its constituent



The claim, then, is that (11) may be applied to *all* cases of alleged melody-sensitive PCA where no plausible phonological pathway exists between the illegal and the legal alternant (Sect. 5.3). The remainder of the section shows that all relevant patterns identified under (7) can be accounted for by the floating segment analysis.[10]

6.2 Melody-sensitive PCA and the floating segment analysis

The Caddo pattern under (7a) was taken as an illustration of the floating segment analysis, and the Hungarian alternation under (7b) is discussed at greater length in the following section. Under (7c), the Yucunany Mixtepec Mixtec 3sg familiar marker is *-a* after *i*-final stems, but *-i* elsewhere. In terms of (11), this means that *-i* (the α) is associated to its nucleus in the lexicon and *-a* floats (the β). When *-i* is illegal due to dissimilation, it vacates its constituent and the floating *-a* takes its place.

The Spanish conjunctions "and" and "or" (Bonet and Mascaró 2006; Mascaró 2007: 722) mentioned under (7d) may be analyzed in the same way. The former appears as *i* everywhere except before words that begin with *i*, where *e* is observed (*María y Pedro* "Maria and Pedro", but *María e Ignacio* "Maria and Ingnacio"). The same goes for the latter, which is *o* everywhere except when the following word is *o*-initial, in which case *u* surfaces (*Pedro o María* "Pedro or Maria", but *este alomorfo u otro* "this allomorph or (an)other (one)"). The general item *i / o* is lexically associated and accompanied by a floating rescue vowel, *e / u*. In case the general item is illegal because of dissimilation, it dissociates. The rescue vowel then attaches to the vacated position. Note that in this pattern as well there is no way to predict the rescue vowel from either the general item or the context.

The same goes for the Catalan masculine marker under (7e). Recall that an *-u-* appears between the stem and the suffix in case the former ends in an *-s* and the

[10] Three more patterns found in the literature are not considered in greater detail here. Nevins (2011: 2360) mentions that the feminine definite article in Spanish is *la* (*la mesa* "the table"), except when the feminine noun begins with a stressed *á*, in which case *el* appears, which is the regular masculine definite article (*el água*). It was mentioned in Sect. 4.2 that sonority is not melody and hence can be accessed by morphological computation. The Spanish similarity avoidance may be interpreted in terms of sonority, which incarnates as height in vowels: two adjacent low vowels (with the additional stress-based condition) are not tolerated (Spanish has only one low vowel, *a*). Bermúdez-Otero (forth) discusses another pattern from Spanish where allomorph selection is based on vowel height (high-mid and diphthongal alternations of the pre-thematic vowel in third conjugation verbs).

Finally, Nevins (2011: 2361) reports a pattern found in Romanian that is studied by Steriade (2008). The alleged melody-sensitivity of the verbalizing suffix at stake hinges on a particular analysis of the suffix involved in plural formation, though.

latter is s-initial. This situation occurs with the plural marker *-s* e.g. in *gos-u-s* "dog pl.". The sg. *gos* shows that the regular masculine marker of this noun is zero, just as with other nouns of the same class whose stem is not s-final: *gɔt – gɔt-s* "glasses sg., pl.". Bonet et al. (2015) explain that the *-u-* cannot be epenthetic since the regular epenthetic vowel in Catalan is schwa. It must thus be somehow lexically recorded. The obvious origin of the *-u-* is another masculine noun class where the *-u-* is overt in all forms: *mos-u – mos-u-s* "lad sg., pl.". Bonet et al. (2015) thus argue that there are two allomorphs of the masculine marker, zero for the "dog" class, *-u-* for the "lad" class, and that in case a similarity avoidance conflict arises in the former through the contact of two *s*, the allomorph of the latter is chosen.

The single underlier alternative along (11) sets up two slightly different morphemes for the two noun classes: one where *-u-* is lexically attached ("lad"), the other where it floats ("dog"). Diachronically speaking, the latter is a typical development of the former (segments become floating). The lexical ingredients of singular and plural forms of the two noun classes are shown under (12).

(12) Catalan zero-u alternation in the masculine marker

```
a. class 1 sg.    b. class 1 pl.      c. class 2 sg.   d. class 2 pl.
   x x x – x         x x x – x – x       x x x            x x x   x
   | | |   |         | | |   |   |       | | |            | | |   |
   m o s   u         m o s   u   s       g o s u          g o s u s
```

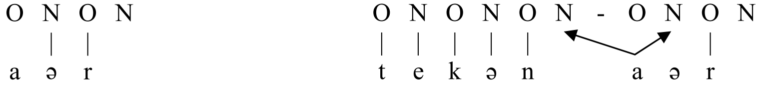
Nothing specific needs to be said for the "lad" class under (12a, b): the lexically associated *-u* is concatenated and the result is pronounced as such. In the singular form of the "dog" class under (12c), the morpheme corresponding to this class is a floating *-u-* and as such remains unpronounced (according to regular autosegmental standards): the result is *gos*. In the plural under (12d), the non-pronunciation of the *-u-* would produce an illegal sequence of two sibilants. This is avoided by the epenthesis of a syllabic support for the floating *-u-*, which thus associates to produce *gos-u-s*.[11] In class 2 roots that do not end in sibilants such as *gɔt – gɔt-s* "glasses sg., pl.", the floating *-u-* will never appear on the surface because its presence is not required.

In sum, there is only one single underlier for the class 2 morpheme. The class 1 item (associated) and the class 2 representative (floating) may of course be said to be allomorphs of the masculine marker—but these are then selected according to purely non-phonological factors (class membership).

The next case to be considered is the Dutch agentive suffix *-er* / *-aar* mentioned under (7f). Relevant literature includes Smith (1976) and van Oostendorp (2009). Stems take *-[ə]r* (*dans-er*, *schrijv-er*, *voorzitt-er* "dancer, writer, chairperson") except when their last vowel is schwa, in which case *-aar* appears (*wand[ə]l-aar*, *bewond[ə]r-aar*, *tek[ə]n-aar* "walker, admirer, illustrator"). We are thus facing a reaction against two schwas in a row. The regular floating segment analysis can be set up as shown under (13).

[11] There are other ways of analyzing the origin of the syllabic support *-u-* associates to (the final empty nucleus of the root in approaches where consonant-final words are onsets of empty nuclei), but this is orthogonal to the issue discussed.

(13) Dutch agentive *-[ə]r* / *-aar*
a. lexical identity of the suffix   b. after stems whose last vowel is schwa



The lexically floating vowel of the specific form shown under (13a) associates to the position of the schwa when schwa occurs after another schwa and is therefore illegal. The Dutch pattern has an interesting extra property, though: the rescue vowel, *a*, is long. How could a lexically floating vowel be long? The answer given under (13b) relies on the general idea that the final consonant of morphemes is an onset of an empty nucleus (Government Phonology, see Kaye 1990). That is, the *-n* of *tekən* is followed by an empty nucleus, and the floating *a* has therefore two nuclei that it can associate to in order to make a long vowel. This analysis predicts that *-aar* only ever appears after consonant-final stems since vowel-final stems (i.e. schwa-final stems) would not offer any extra empty nucleus that could make the floating *a* long. This is a correct prediction, which however has no particular merit since Dutch has no schwa-final stems at all, independently of the agentive suffix.

Another intriguing property of *-aar* is that unlike other super-heavy suffixes (i.e. of the shape -VVC) it does not attract stress. Under the analysis in (13), there is an obvious reason for that: *-aar* has a short vowel underlyingly, which acquires length only through spreading during phonological computation. If stress assignment is computed before spreading occurs, the suffix is not super-heavy and therefore does not attract stress. Of course there are alternative analyses: van Oostendorp (2009) argues that the long *aa* is tense and therefore, like all other tense vowels of the language, can occur only in open syllables.[12] The *-r* is thus an onset and does not contribute weight. The suffix therefore is not super-heavy and does not attract stress.

Finally, let us consider the Udihe pattern under (7g). Bye (2007: 72f) and Nevins (2011: 2361f) (the source of the latter being the former) provide a description whereby the perfective marker of verbs in 3sg is laryngealization of the stem-final vowel (creaky voice), except when this vowel is high, in which case *-ge* is suffixed. The rationale is that all vowels in Udihe have (contrastive) laryngealized versions except high vowels, which are unable to take this articulation (Nikolaeva and Tolskaya 2001: 39f). Hence *etetḛ*, *zawa̰* and *olokto̰* are the perfective forms of "to work, to take/grab, to cook", while *dodi-ge-* and *bu-ge-* are the perfective stems of "to hear" and "to give". The subscript diacritic added to the stem-final vowel of the former series is the IPA notation for creaky voice.

Given this description, the reader can only conclude that laryngealization is some kind of floating melodic item that hooks onto the stem-final vowel. This places the pattern out of reach for the floating segment analysis, whose basic workings rely on the difference between a lexically associated (elsewhere) and a floating (rescue) segment. In the Udihe case, however, both the general (elsewhere) and the specific (rescue) item appear to be floating: laryngealization cannot stand alone and needs a

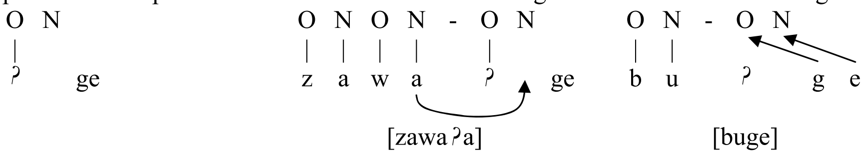
[12]There are some other isolated instances in the language where long *aa* behaves like if it were a short vowel (van Oostendorp, pc): in *twaalf* "twelve" it is followed by a consonant cluster, and in *Pasen* "Eastern" it occurs to the left of a voiceless fricative. Mid tense vowels do not occur in these environments.

vocalic host to parachute on. The *-ge* must float anyway because it is the specific rescue item, and also because it does not appear on the surface when laryngealization affects stem-final vowels.

The source of both Bye's and Nevins' data is the grammar of Udihe by Nikolaeva and Tolskaya (2001). The authors provide an extensive description of what they call laryngealized vowels (p. 39ff): "a compound phonation type, characterized by complex articulation: one part of the glottis vibrates and produces voicing, while another part produces a creak" (p. 39). Nikolaeva and Tolskaya (2001: 41) further report that experimental phonetic studies have shown that a laryngealized vowel is pronounced [V_iʔV_i] (or [V_ihV_i] depending on dialect), that is as two vowels of the same quality with an intervening glottal stop (or *h*). Laryngealized vowels are conventionally transcribed as <'V>, hence '*a* for example is in fact realized as [aʔa] (or [aha]). This phonetic identity as a structure involving two vowels is reflected by phonological behavior: "[l]aryngealized vowels have a greater intensity and duration than short vowels and are phonologically bimoraic, as is indicated by the facts of stress placement" (p. 39, note that length is distinctive in Udihe). Finally, Nikolaeva and Tolskaya (2001: 41f) mention that the diachronic origin of laryngealization is *-k-, which has thus become ʔ (or *h*).

This information substantially modifies the picture: the perfective morpheme does have a segmental identity, ʔ (or *h*), and this item cannot just be floating because it makes the stem-final vowel long. That is, its lexical identity must include some syllabic space. The floating segment analysis based on this evidence is shown under (14).

(14) Udihe perfective marker
a. lexical identity of the perfective morpheme
b. suffixation to stems whose final V is non-high
c. suffixation to stems whose final V is high



As shown under (14a), the lexical identity of the perfective marker is an onset-nucleus pair whose onset is lexically associated to a glottal stop (or *h*), and where two segments, *g* and *e*, are floating. When suffixed to a stem whose final vowel is laryngealizable as under (14b), nothing happens except the spreading of the stem-final vowel to the final empty nucleus that comes with the suffix. This process, called laryngeal transparency whereby a vowel is copied "through" a glottal articulation, is well known from other languages (see e.g. Stemberger 1993). Since there are no syllabic constituents that the floating *-ge* could attach to, it remains unpronounced. When attached to a stem whose final vowel cannot be laryngealized as under (14c), the glottal stop dissociates, which opens the way for the floating *-ge* to parachute on the now vacant onset and nucleus of the suffix. There is a good reason why the glottal stop (or *h*) cannot stand alone: they do not exist as independent consonants in Udihe (Nikolaeva and Tolskaya 2001: 51). In other words, they can only occur when taken in a spreading domain that spans two nuclei, which makes a single laryngealized segment.

The analysis under (14) also makes explicit what it means for high vowels to be unable to be laryngealized: they cannot spread "through" a glottal, i.e. the glottal is not transparent for them.

6.3 Hungarian *-s* / *-El*: when more than one segment alternates

An interesting prediction of (11) is that *all* pieces that make the legal and the illegal alternant distinct must be able to be derived by purely phonological means: they must have a plausible phonological motivation. Hence at first sight it seems that the case mentioned under (7b), the Hungarian present tense indef. 2sg marker, cannot be analyzed in terms of (11): it spells out *-s* everywhere except after sibilant-final stems, where *-El* occurs (*E* is a harmonizing vowel). Paster (2006: 42) makes the obvious point: "I am treating the pattern seen here as suppletive for two reasons. First, the allomorphs differ in more than one segment since the *-El* form has an initial vowel that the *-s* form lacks."

Let us first illustrate the pattern under (15).

(15) Hungarian present tense indef. 2sg

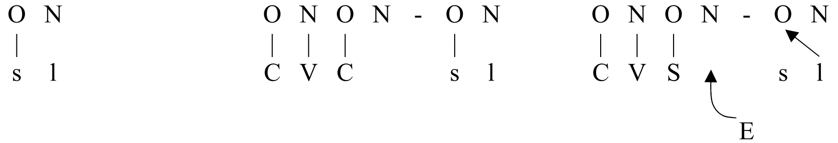
a. -s		b. -El		c. -E-s	
kap-sz	'you get'	mos-ol	'you wash'	mond-(a)-sz	'you say'
dob-sz	'you throw'	néz-el	'you look'	fing-(a)-sz	'you fart'
lök-sz	'you push'	tesz-el	'you put'	márt-a-sz	'you immerse'
vág-sz	'you cut'	ráz-ol	'you shake'	sért-e-sz	'you hurt'
nyom-sz	'you press'	vonz-ol	'you attract'	küld-e-sz	'you send'
lő-sz	'you shoot'	főz-öl	'you cook'	tanít-(a)-sz	'you teach'
ró-sz	'you scold'			műt-e-sz	'you operate'
				fűt-(e)-sz	'you heat'

As was mentioned, the non-specific *-s* occurs everywhere (15a) except when the stem ends in a sibilant (15b). The cases under (15c) are irrelevant for our purpose (they bear *-s*), but illustrate an aspect of the workings of Hungarian phonology that will prove relevant below: the *-s* is preceded by an epenthetic harmonizing vowel (which for some stems is optional, otherwise mandatory, see Siptár and Törkenczy 2000: 228). This vowel occurs for phonotactic reasons when the stem ends in heavy sequences, i.e. VCC- or VVt-.

If this pattern is to be reduced to (11), the challenge is to phonologically motivate both the *s-l* and the *zero-E* alternation. In fact the latter follows from the former, given the general workings of Hungarian. The (single) underlying form of the morpheme is shown under (16a): *s* is attached, *l* floats. Nothing happens under (16b) when the suffix attaches to a stem that is not sibilant-final.

(16) -s / -El

a. lexical identity b. after regular stems c. after sibilant-final stems



After sibilant-final stems under (16c), the lexically associated *-s* is illegal and delinks, which leaves the onset empty so that the floating lateral can attach. The final cluster created is illegal, though: Hungarian does not allow for *-Sl#* (where *S* is a sibilant). In fact the language does not allow for any final *-Cl#* cluster (except for monomorphemic cases where the lateral is preceded by a sonorant, i.e. *-nl#*, *-ll#*, *-rl#* and *-jl#*, see Siptár and Törkenczy 2000: 106). The illegal *-Sl#* cluster is the reason why an epenthetic vowel is inserted.[13] The presence of epenthetic vowels under (15c) and (16c), then, has the same reason: it is a repair rescuing phonotactically ill-formed structures. In fact the notation of what looks like the *-El* allomorph is a mirage: what we are facing is *-E-l*. Paster and others talk about *-El* because there is indeed no reason to identify the *-E-* as epenthetic in absence of the idea that (after sibilant dissimilation) *-l* is the only lexical representative of the suffix and hence creates an illegal cluster. The reason why the vowel under (15c) is considered epenthetic *-E-s*, rather than as a lexical ingredient of the suffix *-Es*, is that we do see *-s* without the *E* in the general case (15a), and that the phonotactic conditioning under (15c) is obvious. The situation is exactly the same for *-E-l*, though, except that we are never given the opportunity to see *-l* alone on the surface: regular concatenation produces an illegal sequence, which is repaired by an epenthetic harmonizing vowel.

Finally, note that the epenthesis of (harmonizing) vowels for phonotactic reasons between stems and suffixes is commonplace in Hungarian (Siptár and Törkenczy 2000: 219ff). The accusative /-t/ for example (described as *-Et* in Siptár and Törkenczy 2000: 220) appears as such after vowel-final stems (*fő-t* "head, acc.") and when it can form a legal final cluster with the final consonant of stems (*dal-t* "song, acc.", *ón-t* "tin, acc."). It is only in case the stem-final consonant and the /-t/ produce an ill-formed final cluster that they are separated by an epenthetic harmonizing *-E-* (*nyom-ot* "trace, acc.", *kép-et* "picture, acc.", *tök-öt* "pumpkin, acc."). Siptár and Törkenczy (2000: 221) add that the *-E-* also occurs with t-final stems (*bot-ot* "stick, acc.", *öt-öt* "five, acc.", *rét-et* "meadow, acc."), pointing out that this is unexpected since geminates in general and -tt# in particular are well-formed word-finally. Like our 2sg marker under (15), thus, the accusative /-t/ is similarity-avoiding – only that the way in which similar adjacent items are avoided is different: the accusative is happy with the simple presence of a vowel separating two identical consonants, while the 2sg marker seems to recur to the more drastic method of allomorphy.

A good question is of course why the distribution of repairs over suffixes in response to the same similarity avoidance is as it is: why doesn't the 2sg marker receive an epenthetic vowel when preceded by a sibilant, and why doesn't the accusative recur to a different consonant (different allomorph) when faced with a preceding *t*? There is no answer to this question: the choice of the kind of repair is idiosyncratic and hence a lexical property of each suffix. Note that the question is the same for a truly allomorphic analysis with two distinct underliers and for the floating segment analysis with only one lexical entry: there is no reason why either morpheme is repaired in this or that way. Both analyses encode the empirical situation that points to lexical idiosyncrasy by recording the difference between the two morphemes in the

[13] Into the stem-final empty nucleus under (16c) where I use Government Phonology representations, but again nothing hinges on that: in other environments the epenthetic vowel may be said to come with its own nucleus.

lexicon: the 2sg marker disposes of two distinct consonants in the lexicon (displayed in one and the same or in two lexical entries), while the accusative lacks a consonantal alternative. The only way to be repaired for the accusative is thus through epenthesis.

To round off the section (and to lead over to the following), an independent argument in favor of the purely phonological analysis presented can be made: the allomorphic take misses a striking (phonological) generalization, i.e. the motivation for the presence of the *-E-*, (i.e. the impossibility of **-Sl#*), and hence the fact that the patterns under (15b) and (15c) are identical (an epenthetic vowel rescues illegal word-final sequences). The purely phonological analysis (11) predicts that *all* alternating properties of what looks like melody-sensitive PCA can be reduced to floating items and the general workings of the phonology of the language – even when the alternants are estranged from one another on several counts. If all candidates for melody-sensitive PCA may be reduced along these lines, defenders of morphologically driven PCA have a problem: they predict that the shape of allomorphs is arbitrary – hence they should be able to be multiply arbitrary. They also predict that any phonological conditioning is a possible conditioning. Hence an allomorphy whereby, say, *-ikt* occurs after velars but *-urp* is found after dentals should be possible. On the phonological account, such an alternation will be hard to implement since there must be a phonological reason for the occurrence of each segment with respect to the selecting context, i.e. three in this case.

6.4 Multiple inputs and the avoidance of morpheme-specific phonology

An interesting property of the floating segment analysis is that it offers an alternative based on a single underlier to the patterns discussed in Sect. 5.2, whose allomorphic status is disputed. If the cases under (5) do not instantiate allomorphy but simply represent regular phonology based on a single underlier, nothing more needs to be said and their eventual melody-sensitivity is irrelevant since there is no morphological computation that could take melody into account in the first place. Recall from Sect. 5.2, however, that some authors are reluctant to accept phonological scenarios that technically work but come at the expense of making phonological computation morpheme-specific. Mascaró (2007) argues against morpheme-specificity on the grounds of optimizing patterns (which make the unmarked emerge and hence should be due to computation, rather than lexical marking), while Bermúdez-Otero's (2012) generality condition corners analyses that require a specific phonology for just one or a couple of morphemes that do not share any morphological rationale (such as membership in a cycle).

If this turns out to be the correct take, the floating segment analysis can account for all cases without recurring to morpheme-specific phonology, but also without giving in to allomorphy: there is only one single underlier. To see that, let us examine the workings of what is called the multiple inputs analysis that is advocated in much of the OT literature on allomorphy, e.g. by Kager (1996), Lapointe (1999), Mascaró (1996, 2007) and Tranel (1996). Take the Basque case under (5c) where postnasal voicing affects suffix-initial voiceless obstruents in a specific subset of morphemes. Mascaró (2007) succeeds in setting up an analysis where phonological computation does not make any reference to specific sets of morphemes by inscribing the peculiarity of the set of morphemes where postnasal voicing is active in their lexical recording. That is, the underlying form of the suffix that appears as *-tar* and *-dar* on the surface is /{-tar, -dar}/, which means that after concatenation with a stem producing e.g. /Eibar-{-tar, -dar}/, both items contained in angled brackets are submitted to GEN (multiple inputs), and thus produce candidates such as *Eibar-tar* and *Eibar-dar* which are then evaluated by regular phonology. The lexical recording of morphemes where postnasal voicing is not active on the other hand contains only one single item: the adverbial suffix *-ki* for example is simply /-ki/. High ranked IDENT(voice) then assures that the voiceless obstruent of this morpheme will always surface as such. This constraint is toothless in the case of multiple inputs such as /{-tar, -dar}/, though, since there is nothing to be faithful to: the lexical recording provides both voiced and voiceless items. Hence IDENT(voice) will never be violated by morphemes with multiple inputs, and lower ranked constraints will decide about the winning option.

In this setup, no constraint ever applies only to a subset of morphemes: all constraints evaluate all morphemes, and morpheme-specificity is expressed in the lexical recording of morphemes (multiple or single inputs). The floating segment analysis follows exactly the same logic, albeit using the regular autosegmental mechanism: the difference between the non-alternating *-ki* and the alternating *-tar* / *-dar* is that the latter has indeed multiple inputs in the sense that in its lexical recording the *-t* is associated while the *-d* floats. In case the lexically associated form is illegal in postnasal environments, it delinks and the surrogate *-d* attaches. By contrast, *-ki* has no floating rescue segment in its lexical recording and therefore nothing can be done or repaired when it appears in a context that requires postnasal voicing. The fact that it still appears on the surface in violation of the postnasal voicing requirement shows that the non-deletion of consonants is higher ranked than the compliance with postnasal voicing. Here as well phonological computation never makes reference to specific sets of morphemes: all morphemes are evaluated by the same grammar. The crucial difference with respect to Mascaró's scenario is the fact that there is no allomorphy, though: the associated and the floating segment both belong to a single underlying lexical recording.

In sum, then, the floating segment analysis has two virtues: it reduces apparent allomorphy to a single underlier, and it may avoid morpheme-specific phonological computation. Note that both issues are entirely independent: Mascaró's multiple input analysis also avoids morpheme-specific phonology, but is allomorphic in kind (i.e. it builds on two distinct lexical recordings).

Also, consider that the multiple inputs analysis (e.g. of Basque postnasal voicing) does not challenge melody-free syntax because allomorph selection is entirely done in the phonology. That is, Mascaró's purely phonological scenario will never provide counter-examples to melody-free syntax because it does not involve any morphological allomorph selection in the first place. Hence melody may be freely made reference to without violating modularity: we are only talking about phonological computation anyway.

But this does not mean that Mascaró's analysis does not conflict with the claim of the present article according to which allomorphy is never conditioned by melody. It does because it does involve allomorphy (multiple inputs are multiple underliers), which may be conditioned by melody (as in the case of Basque postnasal voicing: voicing is melody). If the empirical generalization that allomorphy is never conditioned by melody is true, then the patterns that Mascaró takes to be cases of allomorphy cannot be allomorphy. That is, they must have a single underlier. It was shown that the floating segment analysis is a non-allomorphic alternative for the patterns at hand. What it all comes down to is thus the initial question raised in Sect. 5.2: are the disputed patterns under (5) instances of allomorphy or not? Mascaró's answer is yes, the one provided in this paper is no.

Fortunately, there is an independent way of telling the two options apart. Recall that Mascaró is only talking about optimizing PCA since only these cases cause the unmarked to emerge and hence should be the result of phonological computation. He has nothing particular to say about non-optimizing PCA where allomorph selection is not phonologically natural and in these cases accepts the regular allomorphic analysis under (10a): allomorph selection is done in the morphology upon vocabulary insertion and involves lexical entries that mention phonological information. This is precisely what according to melody-free syntax should not exist.

Now if Mascaró is committed to regular morphological allomorph selection for non-optimizing PCA, his analysis will overgenerate for this subset of cases just like all other analyses do that follow (10a): they predict that any phonological property can condition allomorphy (in Mascaró's case: can condition non-optimizing allomorphy), but it turns out that a subset of phonological information, melody, never does. Mascaró thus needs two distinct analyses for optimizing (phonological) and non-optimizing (morphological) allomorphy, whereby the latter suffers from overgeneration if melody-free syntax is correct. The floating segment analysis on the other hand has a different cut through patterns that represent allomorphy, makes the prediction that allomorph selection is always operated in the morphology, and that it never refers to melody. Hence if it turns out that non-optimizing PCA indeed never makes reference to melody, a point is made against Mascaró's scenario and in favor of the floating segment analysis.

6.5 The floating segment analysis cannot do all cases of PCA

As indicated by its name, the floating segment analysis (11) is about segments: it replaces one segment (or a smaller melodic piece) by another. This is all it can do. If we are not talking about pieces, or about pieces that are too big to be manipulated by phonological computation, the floating segment analysis has no business.

Hence there are many PCA patterns that cannot be accounted for by the floating segment analysis. Size restrictions are one case in point: size is not an object, and nothing that can float. The same goes for stress, intonation and rhythm, which are not objects either, and which therefore cannot float.

The frequent case of V/C conditioning that is illustrated in Sect. 5.1 under (3) is a little different: a floating segment analysis for so-called optimizing patterns is debatable, but unavailable for non-optimizing situations. Consider an optimizing pattern such as the Moroccan Arabic 3sg masculine object/possessor clitic mentioned under (3c) where *-h* occurs after V-final, but *-u* after C-final stems. Were the distribution of allomorphs the reverse, marked CVV and VCC strings would be outputted. For these cases, a floating segment analysis as under (17) could be set up.

(17) Moroccan Arabic -h / -u

```
a. lexical identity    b. after V-final stems    c. after C-final stems
   O  N                   O  N  O  N  -  O  N       O  N  O  N  -  O  N
                          |  |  |  |     ↑          |  |  |           ↑
   h  u                   C  V  C  V     h  u       C  V  C        h  u
```

Lexically, both segments float under a syllabic support as under (17a). The language may then be said to have constraints against (heteromorphemic) V–V and C–C sequences. Hence under (17b) the vowel cannot attach and therefore the *-h* associates. Under (17c), the reverse situation is met, with reverse results. But there is trouble since the non-association of the "losing" floater begs the question: nothing withstands the association of the *-u* under (17b). This could be resolved by changing the linear order of both floaters, i.e. if *-u* is placed to the left of *-h*. Example (17b) would work as before, only that we now understand why the *-u* does not attach to the vacant nucleus: it would have to cross lines with the *-h*. But then the same problem arises under (17c): *-u*, occurring to the left of *-h*, attaches to the final empty nucleus of the stem, but nothing would then prevent the *-h* to parachute onto the empty onset.[14]

Therefore a floating segment analysis is rather implausible for optimizing V/C-conditioned PCA. It is entirely impossible for non-optimizing cases like the one mentioned under (3k): in Dja:bugay (Pama-Nyungan, Australia), the genitive marker is *-n* after V-final, but *-ŋum* after C-final stems. The number of segments set aside (one against three), there is no discernible phonological motivation for the distribution at hand: why should vowels prefer *-n*, rather than *-ŋ*, or consonants *-ŋ*, rather then *-n*? Non-optimizing PCA not only lacks a plausible pathway from one alternant to the other (6b), but also a phonological trigger in the first place (6a). In absence of such a trigger, however, there is no way to set up a phonological mechanism that either chooses or declares illegal one of the underlyingly present alternants.

At the end of this survey, we are thus thrown back exactly to the front line defined by melody-free syntax: the floating segment analysis may account for (all cases of) melody-sensitive PCA, but is toothless for cases of PCA that are conditioned by a phonological property located at or above the skeleton.

This produces a double benefit: on the one hand, melody-sensitive PCA does not exist (as predicted by melody-free syntax) since all cases may be reduced to a single underlier; on the other hand, true cases of PCA are conditioned by phonological properties at and above the skeleton. The distribution appears to be truly complementary. This means that morphological computation, when deciding about the selection of allomorphs, has a *selective* access to phonological information, i.e. to those properties that occur at and above the skeleton. Recall from Sect. 2 that while this selective access is predicted by modularity, it makes global (i.e. anti-modular) approaches overgenerate. Hence the fact that there is a purely phonological analysis of what looks like melody-sensitive PCA (multiple inputs) does not change anything to the overall picture.

[14]Note that this analysis is only viable in environments that provide for empty nuclear positions at the end of morphemes.

7 Beyond PCA

Recall that although this article is about PCA, the claim made by melody-free syntax is more general, i.e. concerns morpho-syntactic computation as such. Raffelsiefen (2004, 2015) has studied phonologically conditioned word formation in English in depth. She identifies the usual suspects above the skeleton, i.e. stress and size plus sonority, which may also combine. The suffix *-eer* for example refuses to attach to stress-final stems, with no repair (i.e. leaving a gap behind): *pístol-éer*, *rócket-éer*, *wéapon-éer*, but **platóon-éer*, **gún-éer*. Verbal *-en* selects monosyllabic stems (*though-en*, *swift-en*, *height-en*, *threat-en*), while nominal *-al* only attaches to stems that are stress-final and bisyllabic (*caróus-al*, *survív-al*, *appráis-al*, *perús-al*). Sonority also restricts the verbal *-en* formations mentioned: the suffix only attaches to stems that end in a stop or a fricative.

On the other side of the skeleton, melodic conditioning appears to be restricted to dissimilation.[15] Raffelsiefen (2015: 898) provides a list of suffixes that refuse to attach to stems that end in segments which are identical or similar to their own body. I reproduce this list under (18) below and add another case mentioned by Nevins (2011: 2358f): the Saxon genitive *'s* does attach to stem-final *-s* (*Katz's deli* [kætsɪs]), but not to other s-final suffixes such as the plural.

(18) dissimilation in word formation in English (Raffelsiefen 2015: 898)

suffix	example	does not attach to stems ending in	do not occur
-ish	sheepish, oldish	-s, -ʃ	*horse-ish, *fresh-ish
-ése	Sudanese, Nepalese	-s, -ʃ	*Bangladesh-ese, *Greece-ese
-ity	oddity, torpidity	-t	*acute-ity, *concrete-ity
-al	withdrawal, referral	-l(C)	*appeal-al, *result-al
-ify	gasify, nullify	-f	*shelf-ify, *stiff-ify
-ée	trainee, divorcee	-i	*free-ee, *pity-ee
-éer	pistoleer, rocketeer	V́C-, -r	*gún-eer, *revolver-eer
-étte	kitchenette, wagonette	V́C-, -t	*garáge-ette, *closet-ette
's	the oxen's hooves are dirty	suffixes in -s	*the cats' feet are dirty [kæts], *[kætsɪs]

In all cases, the refusal of the suffix to attach is absolute, i.e. there is no repair to illegal similarity and the result is a gap.[16] This is what makes the difference with what

[15] Raffelsiefen mentions one exception, *-ive*, but which is fuzzy anyway: it occurs only after stems that end in *-t* or *-s* (*obsess-ive*, *purpos-ive*, *select-ive*, *sticktoit-ive* etc., but **encod-ive* etc.). This conditioning does not make sense on any count: dentals are not targeted (*d*-final stems are out), obstruents are not, fricatives are not (*z*-final stems are also ruled out).

[16] A reviewer points out that there may be repairs for some suffixes: **shelf-ify* does not exist, but there is a verb, *to shelve*, which is semantically and syntactically identical to an intended **shelf-ify*. This would then point to an allomorphy *-ify* / "-ø plus voicing of the stem-final consonant". It remains to be seen, empirically speaking, whether a "zero plus voicing of the stem-final consonant" item exists for all cases of *...*f-ify*, and whether a similar case can be made for the other suffixes mentioned. But this scenario is implausible on other grounds: intended **shelfify* "to put shelves on the wall / to turn something into a shelve" and shelve "to put something on a shelve" have different non-overlapping meanings and hence cannot be the output of the same derivation.

looks like melodically conditioned PCA, i.e. the cases discussed in Sect. 5.3: were the items under (18) repaired, they would be classified as candidates for melodically conditioned PCA, and the floating segment analysis of (11) would apply.

Note that English does have the illegal-cum-repair pattern, as Raffelsiefen reports – but only with stress-based or size restrictions. Hence *-ése* (like *-éer*) does not tolerate stressed vowels at the end of stems, but instead of crashing (as with *-éer*), the derivation is repaired by shifting the stem stress to the left: *Vietnám – Viètnam-ése*, **Vietnàm-ése*, *Sudán – Sùdan-ése*, **Sudàn-ése*, *Saigón – Sàigon-ése*, **Saigòn-ése*. Regarding size, *-able* does not like derivations whose result has more than four syllables. In case longer sequences are produced by concatenation of multiple suffixes, the preceding *-ate-* is dropped: compare *don-ate-able*, *dil-ate-able*, *narr-ate-able*, *vac-ate-able* (which all make a well-formed four syllable output) with *deleg-able* (**deleg-ate-able*), *segreg-able* (**segreg-ate-able*), *vaccin-able* (**vaccin-ate-able*) (which would be longer were *-ate-* not left out).

A relevant generalization that seems to govern English word formation, then, is that stress- and size-based illegality may or may not be repaired, while illegality due to similarity never is.[17] Whatever the reason for that, melody-sensitive word formation in English is only found in patterns where the derivation crashes during phonological computation. There is no rescuing operation, and hence no need to assume that the phonological crash is performed by morphological computation. In absence of a repair by an alternative alternant, there is no need to say anything more than that

[17] In this context, a reviewer mentions the comparative *-er* and the superlative -(*e*)*st*, saying that both are subject to similarity avoidance, but nevertheless repaired – although by analytic *more* support, rather than by a competing allomorph. Hence *bitter* does not produce **bitter-er* but *more bitter*, and the superlative of *honest* is *most honest*, not **honest-est*. These are generalizations based on corpus studies by Mondorf (2003), but in fact the empirical situation is anything but clear cut. The synthetic and analytic forms of bisyllabic roots notoriously co-occur within corpora and single speakers, and their distribution can only be stated in tendencies. Also, there is a host of conditioning factors (Hilpert 2008: 407 lists no less than eleven items), and similarity avoidance is only observed for bisyllabic roots: trisyllabic roots never produce synthetic forms, while monosyllables ending in *-r* / *-st* happily take on *-er* (*dour-er*, *sour-er*, *dir-er*, *pur-er*, *clear-er*, *near-er*, *fair-er*, *rar-er*, *poor-er*, *sur-er*) and *-(e)st* (*vast-est*, *fast-est*, *moist-est*, *chast-est*, etc.). This corresponds to the judgements of natives that I have consulted. For bisyllables, there appears to be a significant difference between *-(e)st* and *-er*: the former does not combine with st-final roots (**honest-est*, **earnest-est*, **modest-est*, **robust-est*), but the latter does attach to r-final roots, even though in some cases speakers are not sure or say the form is strange (*clever-er*, *cosher-er*, *dapper-er*, *limber-er*, *proper-er*, *slender-er*, *tender-er*, *vulgar-er*, *?matur-er*, *?secur-er*, *?eager-er*, *?bitter-er*).

A relevant generalization that I did not find in the literature is the fact that *-er* and *-est* appear to have a common fate: if for any given root one is possible, the other will as well be well-formed, and in case one is bad, so will be the other. Hence there is no case where any given root would have a synthetic comparative, but no synthetic superlative, or vice-versa. This is unexpected under similarity avoidance, which accounts for **honest-est*, but has nothing to say about the fact that **honest-er* is equally bad. The same goes for all items quoted.

The common fate of *-er*, *-est* imposes severe restrictions on a purely derivational account of these morphemes: if, say, the comparative of *honest* is to be derived, grammar will first have to "test" whether the superlative is feasible (answer no: **honest-est*) and only then can decide that it will not derive **honest-er* either. This does not look like anything grammar is able to do. Tying in with the independently observed lexical variation (some roots are better or worse with *-er*, *-(e)st*), what the common fate of *-er* and *-est* strongly suggests is precisely this: *lexical* variation. Roots are marked for being able or not to take on *-er*/*-est*, and the lexical diacritic is the only thing that the derivation takes into account. This is what Bobaljik (2012: 240) concludes based on independent arguments, and this appears to be a plausible analysis – one where no phonological information is used upon morphological computation.

the phonologically illegal form is identified as such, and eliminated, in the phonology. Hence morphological computation never takes melody into account.

Another question is why melodic conditioning of word formation in English seems to reduce to dissimilation. This drives us back to the generalization that was already made at the outset of Sect. 6.1: it appears that there are two and only two phonological motivations for what looks like melody-sensitive PCA, dissimilation and harmony. The latter of course has no business in English because there is no vowel harmony – hence melody-sensitive word formation in English is down to the one remaining phonological motivation, dissimilation.

8 Conclusion

The goal of this article was to show that melody-free syntax, i.e. the idea that phonological information from below the skeleton is never used by concatenative (morphological and syntactic) computation, is a valid empirical generalization regarding PCA. If this is correct, non-modular theories such as (mainstream) OT where all phonological and morphological information is permanently available for computation overgenerate. By contrast, the fact that only a subset of phonological information can bear on allomorph selection is predicted by the modular approach where a distinction is made between domain-specific vocabulary items (below the skeleton) and structure that is built by phonological computation on the grounds of this vocabulary (at and above the skeleton). On regular modular standards, the latter may, the former may not be read by foreign computational systems.

The focus of the core of the article then was on the empirical situation: the wealth of patterns documented in the literature show that in the overwhelming majority of cases PCA is indeed conditioned by phonological information at or above the skeleton. There is a small but cross-linguistically stable set of patterns, though, where melody does seem to condition PCA. All cases have a specific phonological trigger, similarity avoidance (or harmonic incompatibility in vowel harmony systems) that makes the general alternant (elsewhere case) illegal in a particular phonological context. There is no plausible way to phonologically derive the rescue alternant (specific case) from the general alternant. The relationship between both is thus arbitrary, and both need to be recorded in the lexicon.

The article develops a way of doing that which does not resort to two independent lexical entries (allomorphy), but rather places both alternants in a single underlying form. No specific technology is needed to achieve this floating segment analysis, which is not any more "abstract" than other accounts that involve floating phonological material: only regular autosegmental representations are needed. The general (elsewhere) alternant is associated to a syllabic support in the lexicon, while the rescue (specific) alternant floats. In contexts where the former is illegal it dissociates, leaving its constituent vacant for the floating item to attach.

On this analysis, the alleged cases of melody-driven PCA are no instances of allomorphy since there is only one single underlier. Also, labor is shifted from the morphological component (non-concatenative morphological operations such as some readjustment rules in DM) to purely phonological workings.

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