Tobias Scheer
CNRS 7320, Université Nice - Sophia Antipolis
scheer@unice.fr

MOLT
Carleton University, Ottawa
18-20 March 2016

this handout and some of the references quoted at
www.unice.fr/scheer/

MELODY-CONDITIONED ALLOMORPHY AND SCRAMBLING

[written version: Scheer 2016]

1. Phonologically conditioned allomorphy (PCA) and its relevance for the architecture of grammar

(1) PCA used as an anti-modularity argument
- a. Phonologically conditioned allomorphy (PCA) is used in the OT literature in order to argue against a modular setup of grammar, which holds that phonology and morphology (or morpho-syntax) instantiate two distinct computational systems.
  McCarthy (2002: 154f)
- b. If phonological properties are used to determine which allomorph is selected, goes the argument, the scrambling of morpho-phonological properties in one and the same computational system, as is common practice in OT, is unavoidable.
- c. non-modular scrambling versions of OT also include
  Burzio (2007), Wolf (2008)

(2) Phonology-free syntax
- a. Zwicky & Pullum's (1986) principle of phonology-free syntax.
- b. literature challenging the invisibility of phonological properties for morpho-syntax:
  1. regarding syntax:
     Inkelas (1990), Inkelas & Zec (1990, 1995), Hargus (1993), Neeleman & Reinhart (1998), Szendrői (2003)
  2. regarding morphology:
     Szymanek (1980), Ackema & Neeleman (2004: 2), Burzio (2007) and Raffelsiefen (2004, 2015)
  3. surveys:
     Szymanek (1980), Vogel & Kenesei (1990) and Inkelas and Zec (1995)
- c. empirical generalization
  1. the counter-examples share the fact that the phonological property conditioning morpho-syntactic computation is located at or above the skeleton.
  2. intonation
     stress
     tree-geometric properties of the prosodic constituency
     size of lexical items (minimal word constraints)
     rhythm
     tone

(2) Phonology-free syntax
- d. But everybody agrees with Zwicky and Pullum's (1986) original observation that **melodic properties of sound** never affect a syntactic derivation.
  Vogel & Kenesei (1990: 346) as well as Inkelas & 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".

(3) prediction regarding PCA
- a. there is PCA conditioned by phonological properties at and above the skeleton.
  These are visible upon allomorph selection (which is done in the morphology).
- b. melody-sensitive PCA does not exist.

(4) Melody-free syntax
Scheer (2011: §412, 2015, 2016)
- a. is the correct generalization
- b. concatenative computation of any kind, i.e. morphological and syntactic alike,
  1. is blind to melody
  2. may be conditioned by non-melodic phonological information
- c. melody
  is what occurs below the skeleton. Non-melody is what occurs at and above the skeleton.

(5) modularity and domain specificity
- a. domain specificity in Cognitive Science is a major property of modular theory
  e.g. Segal (1996), Carruthers (2006).
- b. the input to every computational system is specific to this system and cannot be parsed by other systems:
  ==> proprietary alphabets / vocabulary.
- c. Communication among modules then requires translation from one vocabulary set into another.
- d. Therefore *labial*, *occlusion* and so forth is not anything that morphological computation could make sense of.

(6) melody vs. structure
- a. on modular standards
  1. the input to (modular) computation are vocabulary items
  2. the output is structure.
- b. syntax

input:	features (number, person, gender, case, animacy etc.)
computation:	Merge (internal and external)
output:	trees

- c. phonology

input:	1) linear order of segments and 2) their sonority
computation:	syllabification algorithm
output:	syllable structure

- d. generalization
  all items that occur at and above the skeleton are the result of phonological computation: syllable structure, metrical structure etc.
  ==> they are structure, not melodic items

(6) melody vs. structure
e. labels
1. syntax: the output of computation inherits the label of the input:
the merger of A and B produces $[AB]_A$ in case A is the head, and $[AB]_B$ if the whole is B-headed.
2. phonology: the output of computation does NOT inherit any labels of the input
- onsets, nuclei etc. are not projections of "labial", "occlusion" etc.
- neither metrical structure (grids, feet, intonation phrases etc.)
3. ==> **phonological computation does not project labels, i.e. melodic properties.**
f. hint at why there is this fundamental distinction between morpho-syntactic and phonological computation: because the latter does not build any trees.
Trees are the consequence of concatenation, and phonology does not concatenate anything.
Scheer (2013)

(7) non-melodic PCA does not violate modularity
a. phonological structure is a legitimate input to morpho-syntactic computation
b. because it does not contain any phonological vocabulary items:
1. it is not a piece of melody in itself
2. it does not bear any traces of melody (labels)
c. recall that domain specificity
prohibits the input of foreign vocabulary items to a given computational system.

(8) conclusion of all this:
the tables have been turned
a. PCA is supposed to be an argument against modularity
==> now PCA is an argument in favour of modularity and against scrambling approaches.
b. if melody-free syntax is correct,
hence if PCA is never melody-driven,
scrambling approaches that have phonology and morphology done in the same computational system overgenerate:
1. they predict that ALL phonological information is permanently available for (morphological) allomorph selection.
2. but if a subset of phonological information, i.e. melodic properties, turn out to never condition PCA, they overgenerate.
c. melody-free syntax
on the other hand predicts melody-free allomorphy because of modular principles:
1. non-melody is available upon morphological allomorph selection
2. melody is not.

(9) approaches concerned
a. all regular scrambling models
typical OT (to avoid "mainstream": e.g. McCarthy (2002: 154f)
Burizo (2007), Wolf (2008)

(9) approaches concerned
b. Multiple inputs
1. advocated in much of the OT literature on allomorphy
2. Mascaró (2007)
and work affiliated e.g. by Kager (1996), Lapointe (1999), Mascaró (1996, 2007) and Tranel (1996)

(10) workings of multiple inputs
a. optimizing PCA
1. pure matter of phonology
2. there are two distinct lexical recordings
3. but no allomorph selection takes place in morphology: they are told apart by purely phonological computation.
4. example: Basque derivational suffix -dar / -tar
- underlying form of the suffix: /{-tar, -dar}/
- when concatenated to a root: /Eibar-{-tar, -dar}/
- both items contained in angled brackets are submitted to GEN
- GEN produces candidates *Eibar-tar* and *Eibar-dar*
==> **allomorph selection done in the phonology**
b. non-optimizing PCA
regular allomorph selection in morphology: no multiple inputs here.
c. optimizing PCA = multiple inputs
1. will never produce counter-examples to melody-free syntax because it does not involve any morphological allomorph selection in the first place.
2. but it conflicts with Melody-free Syntax
If the empirical generalization that allomorphy is never conditioned by melody is true, then the patterns that Mascaró (2007) takes to be cases of allomorphy cannot be allomorphy.
That is, they must have a single underlier.
==> discussion is open, see below.
d. non-optimizing PCA = regular allomorph selection
in this subset of PCA, there are no multiple inputs and everything is just like in all other scrambling approaches: ALL phonological information is predicted to be available upon allomorph selection.
==> overgeneration.

(11) remainder of the talk

study the empirical record to show that
there is no such thing as melody-conditioned PCA

2. Preliminary: sonority is not melody

(12) sonority
a. traditional approach
1. sonority is given a melodic identity in terms of primes
2. major categories (glides, nasals, liquids, fricatives and stops) are defined by binary features such as [±son] or [±cons], which are not any different form [±labial] etc.
3. ==> sonority is a piece of phonological vocabulary.

(12) sonority
  b. Government Phonology
    1. unary primes: I, A, U
    2. there is no specific prime for sonority
    3. sonority is a function of complexity (Harris & Lindsey 1995)
    4. ==> sonority is not a piece of phonological vocabulary

(13) sonority does not behave as melody I
  a. sonority is projected above the skeleton: it may be read off syllable structure.
  b. branching onset
    1. its existence allows us to predict the relative sonority of the segments is hosts.
    2. it does not allow us to make any prediction concerning the labial, dorsal, nasal, laryngeal properties of the segments involved.

(14) sonority does not behave as melody II
  a. stress algorithms may be sensitive to sonority
  b. Weight-by-Position (Hayes 1989)
    stress placement according to syllable structure.
    Syllable heavy when closed (light when open).
  c. but there is fine-tuning of Weight-by-Position
    1. in some languages sonorant, but not obstruent codas contribute to the weight of their syllable.
    2. documented cases of this pattern are found in native American Wakashan languages (e.g. Wilson 1986, Zec 1995: 103ff, Szigetvári & Scheer 2005: 44f).
  d. nothing of the kind for place, nasality, laryngeal features
    no case on record such as "a coda is heavy only if it is labial".

(15) stress and vocalic sonority
  a. on the vocalic side, de Lacy (2002) and Gordon (2006: 52) have established the same generalisation, which is also based on broad cross-linguistic evidence.
  b. 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:
  c. "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)

(16) conclusion
  a. sonority is an outlier among properties that are traditionally viewed as subskeletal.
  b. sonority is not a melodic property of sound: it does not behave as such.
  c. 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)

3. Typology of PCA

(17) typological studies surveys of PCA
  a. Paster (2006)
    1. survey of about 600 languages
    2. 137 cases of PCA in 67 languages described.
    3. chapter 2 is about segmentally conditioned PCA, chapter 3 is concerned with tone- and stress- conditioned PCA, while chapter 4 reviews prosodically conditioned PCA.
    4. chapter 2: 72 cases of PCA from 32 different languages.
  b. Nevins' (2011) Handbook article about PCA.
  c. other sources
    Bye (2007), Bonet & Mascaró (2006), Mascaró (2007)

(18) general landscape
  a. tone, stress, intonation-driven PCA
    1. very large group
    2. conditioning factors all reside above the skeleton: ok with Melody-free Syntax.
  b. C vs. V conditioning
    1. large group
    2. example
      Moroccan Arabic: the 3sg masculine object/possessor clitic is *-h* after V-final, but *-u* after C-final stems.
    3. ok with Melody-free syntax: the relevant information is encoded above the skeleton (syllable structure).
    4. examples under (19)
  c. sonority-based
    1. ok with Melody-free syntax: sonority is not a piece of melody.
    2. examples under (20)
  d. a residue of cases that appear to be melody-driven
    list under (26)

(19) 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

(19) PCA #1
C vs. V conditioning
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

(20) 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* → *g* process in the language, which does feature *nd* clusters (including word-finally).

4. Beware of analysis

(21) analysis
a. allomorphy is not an observational fact: it needs to be established by analysis, and there may be competing accounts that are non-allomorphic.
b. consider these cases
1. 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
2 Tahitian
causative/factitive marker *ha'a-* before labial-initial roots, *fa'a-* elsewhere
==> dissimilation
3. Basque
postnasal voicing of voiceless obstruents in a subset of affixes: e.g. derivational suffix *-dar* after nasal-final stems, *-tar* elsewhere.
==> postnasal voicing

(22) Sibe
a. lends itself to an assimilation analysis
b. uvulars (but not velars) are known to pattern with gutturals, which in turn are sensitive to lowness (e.g. McCarthy 1991).
c. 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.
d. Under this analysis, there is no allomorphy: the alternation is the result of a purely phonological process based on one single underlier.

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

(24) PCA may be reduced to a single underlier iff
a. the trigger is phonological.
Tahitian: 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: *f* → *h* is a well-known lenition trajectory. That is, dissimilation is realized by lenition.

5. The tough cases

(25) cases of what looks like melodically-driven PCA
a. phonological trigger, but no plausible phonological pathway from the illegal to the legal alternant
b. dissimilation
1. all cases in point that I could identify are either due to
- similarity avoidance (dissimilation) or to
- harmonic incompatibility (vowel harmony).
2. Nevins (2011: 2360) also notes the ubiquity of triggering dissimilation in melodically conditioned PCA.
c. encouraging
1. all cases of what looks like melody-driven PCA seem to involve a phonological trigger.
2. This does not follow from anything: there could well be a melodic condition on allomorphy that follows a purely morphological rationale.
3. ==> one of the two conditions for reducing the patterns to a single underlier is fulfilled.

(26) PCA #4
phonological trigger, but no pathway from the illegal to the legal alternant
[a-d from Paster (2006), e-g from Nevins (2011: 2359ff), d from Bonet & Mascaró (2006)]

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. Hungarian
3sg, 2pl, 3pl indicative definite present tense
-i after front stems, *-ja* after back stems.

d. 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"

e. 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 Ignacio").

f. 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.".

g. 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".

h. 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).

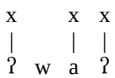
6. The floating segment analysis

(27) Caddo example (26)a

a. Caddo (Caddoan, Oklahoma)
simple future *-ʔaʔ*, but *-waʔ* after *ʔ*-final stems

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

c. morphological
simple future ↔ -ʔaʔ general
↔ -waʔ / ʔ-__ specific / rescue
phonological



(27) Caddo example (26)a

d. workings
1. 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.
2. *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.
3. The floating "rescue" item then attaches to the vacated position.

(28) suspicious similarity of supposedly unrelated alternants

a. In the case of Caddo (but which is quite frequent), the single underlier analysis explains the fact that only one segment of the three-segment affix shows arbitrary variation, the other two segments being stable.

b. When two distinct lexical recordings are assumed as under (27)c, 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.

c. The standard reaction is to invoke a diachronic development based on a single ancestor.

(29) floating segment analysis

a. a single-underlier, phenomenon-unspecific alternative to allomorph selection of alleged melody-sensitive PCA

b. where α alternates with β and the relationship between both is arbitrary
lexical situation — lexically associated item illegal for phonological reasons: α cannot remain associated to its constituent

(30) **claim**

a. **the floating segment analysis may be applied to *all* cases of alleged melody-sensitive PCA where no plausible phonological pathway exists between the illegal and the legal alternant**

b. below, it is shown that all relevant patterns identified under (26) can be accounted for.

7. Case studies

7.1. Two straightforward cases

(31) two straightforward cases

a. Yucunany Mixtepec Mixtec (26)d
1. 3sg familiar marker is *-a* after *i*-final stems, but *-i* elsewhere.
2. *-i* is associated to its nucleus in the lexicon and *-a* floats.
3. When *-i* is illegal due to dissimilation, it vacates its constituent and the floating *-a* takes its place.

(31) two straightforward cases

b. The Spanish conjunctions "and" and "or" (26)e
(Bonet & Mascaró 2006, Mascaró 2007: 722)

1. 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").
2. or
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)").
3. he general item *i* / *o* is lexically associated and accompanied by a floating rescue vowel, *e* / *u*.
4. In case the general item is illegal because of dissimilation, it dissociates. The rescue vowel then attaches to the vacated position.

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

(32) prediction made by the floating segment analysis

a. *all* pieces that make the legal and the illegal alternant distinct must be able to be derived by purely phonological means.

b. Hungarian present tense indef. 2sg marker (26)b
seems to be out of reach:
-s everywhere except after sibilant-final stems
-El occurs after sibilant-final stems (*E* is a harmonizing vowel).
==> two segments alternate: E and l.

(33) Hungarian present tense indef. 2sg

a. -s

kap-sz	you get
dob-sz	you throw
lök-sz	you push
vág-sz	you cut
nyom-sz	you press
lő-sz	you shoot
ró-sz	you scold

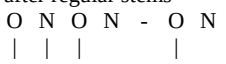
b. -El

mos-ol	you wash
néz-el	you look
tesz-el	you put
ráz-ol	you shake
vonz-ol	you attract
főz-öl	you cook

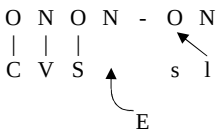
(34) -s / -El

a. lexical identity

b. after regular stems



c. after sibilant-final stems



(35) floating segment analysis

a. Nothing happens under (34)b when the suffix attaches to a stem that is not sibilant-final.

b. under (34)c, the lexically associated *-s* is illegal and delinks, which leaves the onset empty so that the floating lateral can attach.

c. The final cluster created is illegal, though: Hungarian does not allow for *-Sl#* (where *S* is a sibilant).

d. 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).

e. The illegal *-Sl#* cluster is the reason why an epenthetic vowel is inserted.
[Into the stem-final empty nucleus under (34)c 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.]

f. the epenthesis of (harmonizing) vowels for phonotactic reasons between stems and suffixes is commonplace in Hungarian (Siptár & Törkenczy 2000: 219ff).

(36) generalization missed
the allomorphic take misses a striking (phonological) generalization, i.e. the motivation for the presence of the *-E-*, (i.e. the impossibility of **-Sl#*).

7.3. Hungarian *-i* / *-ja*: harmonic incompatibility

(37) Hungarian *-i* / *-ja* (26)c
3sg, 2pl, 3pl indicative definite present tense
-i occurs after front stems, while *-ja* is found after back stems.

a. -ja

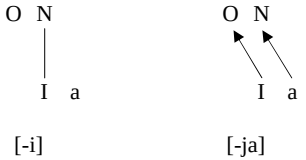
stem vowel	stem-final C				
a	labial	kap	kap-ja		gets, gets it
	dental	lát	lát-ja	[laaccɑ]	sees, sees it
	dental	ad	ad-ja	[ɑɟɟɑ]	gives, gives it
	sibilant	olvas	olvas-sa	[olvaʃʃɑ]	reads, reads it
	sibilant	mász	mássza	[maassɑ]	
	velar	rak	rak-ja		puts, puts it
o	labial	dob	dob-ja		throws, throws it
	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	ússza	[uussɑ]	swims, swims it
	velar	csuk	csuk-ja		closes, closes it
	velar	rúg	rúg-ja		kicks, kicks it

(37) Hungarian *-i* / *-ja* (26)c
3sg, 2pl, 3pl indicative definite present tense
-i occurs after front stems, while *-ja* is found after back stems.
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

(38) harmonic system
a. neutral vowels
1. i is traditionally considered neutral
2. neutral = some i-stems take front, others take back suffixes
víz "water" - *víz-nek* "id., dative"
híd "bridge" - *híd-nak* "id., dative"
b. Törkenczy (2011: 2977f)
but Törkenczy provides evidence that the i of our morpheme is truly front, rather than neutral: it is not transparent as expected, but opaque.
1. final i of Martini (beverage) is neutral:
martini-z-i / *martini-z-za* "drink Martini 3sg def. pres. indic."
(the *-z-* is a verbalizing suffix)
2. 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"
c. ==> since it is truly front
1. as a harmonic head the -i 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.
d. ***back stem + -i**

(39) floating segment analysis
a. when occurring in a back harmony domain, the -i needs to be non-front.
b. The only way to comply with this requirement is for the -i to vacate its nuclear position, i.e. the one targeted by vowel harmony.
c. 3sg (2pl, 3pl) ind. *-i* / *-ja*: single underlier cum harmony
1. lexical shape 2. after back stems, i.e. under harmonic anti-front pressure



(39) floating segment analysis
c. Rebrus (2000)
1. 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.
2. 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.
3. The difference with the analysis under is thus twofold: in the latter the I is associated in the lexicon, and the A is underlyingly present as a floating item.

7.4. Catalan masculine marker

(40) Catalan masculine marker (26)f
a. *-u-* appears between the stem and the suffix in case the former ends in an *-s* and the latter is s-initial.
b. This situation occurs with the plural marker *-s*

	masc. sg. -ø	masc. pl. -s	
class A: alternating -u-	gos	gos-u-s	dog
	gɔt	gɔt-s	glasses
class B: stable -u-	mos-u	mos-u-s	lad

c. the *-u-* in class A cannot be epenthetic since the regular epenthetic vowel in Catalan is schwa.
d. It must thus be somehow lexically recorded. The obvious origin of the *-u-* is class B.
e. Bonet *et al.* (2015) thus set up an allomorphic analysis:
masculine marker ↔ zero / class A
↔ -u- / class B
f. in case a similarity avoidance conflict arises in class A through the contact of two *s*, the allomorph of class B is chosen.

(41) alternative floating segment analysis
a. there are two slightly different morphemes for the two noun classes:
class A: *-u-* lexically floats
class B: *-u-* is lexically attached
b. Diachronically speaking, the latter is a typical development of the former (segments become floating).
c. lexical ingredients of singular and plural forms of the two noun classes

1. class B sg.	2. class B pl.	3. class A sg.	4. class A 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

d. Nothing specific needs to be said for the "lad" class under 1), 2): the lexically associated *-u* is concatenated and the result is pronounced as such.
e. 3)
In the singular form of class A, the morpheme corresponding to this class is a floating *-u-* and as such remains unpronounced (according to regular autosegmental standards): the result is *gos*.

(41) alternative floating segment analysis

f. 4)
In the plural, 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*.[1]

g. In class A 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.

h. in sum

1. there is only one single underlier for the class A morpheme.
2. the class B item (associated) and the class A 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).

7.5. Dutch agentive suffix *-er* / *-aar*

(42) Dutch agentive suffix *-er* / *-aar* (26)g
Smith (1976), van Oostendorp (2009)

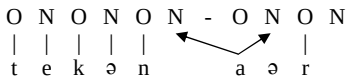
a. *-[ə]r* after all stems except
-aar after stems whose last vowel is schwa

b. hence
dans-er, *schrijv-er*, *voorzitt-er* "dancer, writer, chairperson"
vs.
wand[ə]l-aar, *bewond[ə]r-aar*, *tek[ə]n-aar* "walker, admirer, illustrator"

c. floating segment analysis

1. lexical identity of the suffix

2. after stems whose last vowel is schwa



d. interesting property of the Dutch pattern:

1. the rescue vowel, *a*, is long.
2. How could a lexically floating vowel be long?
3. answer: final empty nuclei (FEN)
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.
4. prediction
-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.
5. 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.

[1] 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.

(42) Dutch agentive suffix *-er* / *-aar* (26)g
Smith (1976), van Oostendorp (2009)

e. stress
Another intriguing property of *-aar* is that unlike other super-heavy suffixes (i.e. of the shape -VVC) it does not attract stress.

1. Under the analysis in c), 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.
2. 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.[2] The *-r* is thus an onset and does not contribute weight. The suffix therefore is not super-heavy and does not attract stress.

7.6. Udihe

(43) Udihe (26)h
(Southern Tungus, Far East Siberian)
Bye (2007: 72f), Nevins (2011: 2361f), both based on Nikolaeva & Tolskaya (2001)

a. 3sg verbal perfective marker
1. laryngealization of the stem-final vowel (creaky voice)
2. except when this vowel is high, in which case *-ge* is suffixed

b.

	pf stem	
laryngealization	*etetę*	to work
	zawą	to take/grab
	oloktǫ	to cook
suffixation	*dodi-ge-*	to hear
	bu-ge-	to give

c. rationale
all vowels in Udihe have (contrastive) laryngealized versions except high vowels, which are unable to take this articulation (Nikolaeva & Tolskaya 2001: 39f).

(44) this looks like Udihe is out of reach for the floating segment analysis

a. Given this description, the reader can only conclude that laryngealization is some kind of floating melodic item that hooks onto the stem-final vowel.

b. 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.

c. floaters everywhere

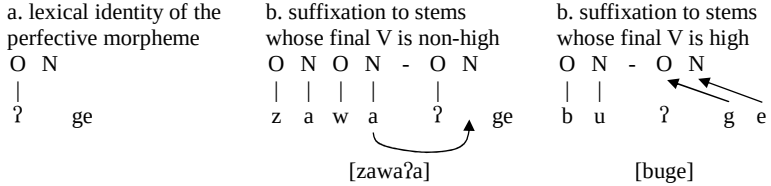
1. In the Udihe case, however, both the general (elsewhere) and the specific (rescue) item appear to be floating:
2. laryngealization cannot stand alone and needs a vocalic host to parachute on.
3. The *-ge* must float anyway because it is the specific rescue item, and also because it does not appear on the surface when laryngealization affects stem-final vowels.

[2] 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.

(45) laryngealized vowels
- a. are "a compound phonation type, characterized by complex articulation: one part of the glottis vibrates and produces voicing, while another part produces a creak" Nikolaeva & Tolskaya (2001:.39)
- b. Nikolaeva & Tolskaya (2001: 41) report that experimental phonetic studies have shown that a laryngealized vowel is pronounced
  1. [V_iʔV_i]
     (or [V_ihV_i] depending on dialect)
  2. i.e. as two vowels of the same quality with an intervening glottal stop (or *h*).
  3. laryngealized vowels = <'V>
     'a = [aʔa] or [aha]
- c. long vowels
  1. This phonetic identity as a structure involving two vowels is reflected by phonological behaviour:
  2. "[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).
- d. diachronic origin
  Nikolaeva & Tolskaya (2001: 41f) mention that the diachronic origin of laryngealization is *-k-, which has thus become *ʔ* (or *h*).

(46) creaky voice is not a floater
- a. This information substantially modifies the picture:
- b. the perfective morpheme *does* have a segmental identity, *ʔ* (or *h*),
- c. and this item cannot just be floating because it makes the stem-final vowel long.
- d. That is, its lexical identity must include some syllabic space.

(47) floating segment analysis based on this evidence



(48) workings
- a. When suffixed to a stem whose final vowel is laryngealizable as under (47)b,
  1. nothing happens except the spreading of the stem-final vowel to the final empty nucleus that comes with the suffix.
  2. laryngeal transparency
     a vowel is copied "through" a glottal articulation, well known from other languages (see e.g. Stemberger 1993).
  3. Since there are no syllabic constituents that the floating *-ge* could attach to, it remains unpronounced.
- b. When attached to a stem whose final vowel cannot be laryngealized as under (47)c
  1. the glottal stop dissociates,
  2. which opens the way for the floating *-ge* to parachute on the now vacant onset and nucleus of the suffix.

(48) workings
- c. stand-alone ʔ / h?
  1. There is a good reason why the glottal stop (or *h*) cannot stand alone: they do not exist as independent consonants in Udihe (Nikolaeva & Tolskaya 2001: 51).
  2. In other words, they can only occur when taken in a spreading domain that spans two nuclei, which makes a single laryngealized segment.
- d. The analysis 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.

8. The floating segment analysis can only do segmentally conditioned PCA

(49) what the floating segment analysis cannot do
- a. As indicated by its name, the floating segment analysis is about segments:
- b. it replaces one segment (or a smaller melodic piece) by another.
- c. 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.
- d. hence many PCA patterns that cannot be accounted for by the floating segment analysis:
  1. Size restrictions: size is not an object, and nothing that can float.
  2. stress, intonation and rhythm, which are not objects either, and which therefore cannot float.

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

9. Multiple inputs and morpheme-specific phonology

9.1. Antipathy against morpheme-specific phonology

(51) Basque
Mascaró (2007: 719ff)
- a. postnasal voicing of voiceless obstruents in a subset of affixes
  E.g. derivational suffix
  1. *-dar* after nasal-final stems
  2. *-tar* elsewhere
- b. Eibar - eibar-tar "town name, inhabitant of Eibar"
  Arizkun - arizkun-dar " town name, inhabitant of Arizkun").
- c. there are no morphological factors involved in the process of determining whether *-tar* or *-dar* appears on the surface
- d. The only tie to morphology
  1. is the fact that the process is not general in the language: some affixes show it, others do not
  2. Mascaró (2007: 722) reports that both sets are randomly distributed among affixes.

(52) antipathy against morpheme-specific phonology
  a. 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?
  b. 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.
  c. 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 strutures in all cases because faithfulness requirements outrank them, but they emerge when faithfulness restrictions for some reason are released in specific contexts.

(53) allomorphy depends on your world view
  a. 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
    1. the treatment of regularity
    2. redundancy in lexically stored items
    3. the purview of grammar in general and of phonology in particular.
  b. 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 embodies in the OT literature as
    1. cophonlogies (e.g. Anttila 2002)
    2. and indexed constraints (e.g. Pater 2000)
  c. Like Mascaró (2007), Bermúdez-Otero (2012: 64) argues against morpheme-specific phonological computation
    1. underlying representations are lexically idiosyncratic, but computation is not, or should not be
    2. a generality criterion needs to be applied in order to find out which alternations are the result of phonological computation:
    3. an alternation that requires a morpheme-specific phonology is suspect per se.
    4. 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.
  d. ooooold question: what exactly counts as phonological?
    Abstractness debate of the 70s, never solved and always relevant.
    Different takes on it make phonological theories look wildly different since the set of empirical facts they are designed to account for dramatically varies in size: 50%, 30%, 5% of what SPE did?

9.2. Multiple inputs & the floating segment analysis both avoid morpheme-specific phonology

(54) multiple inputs
  Basque post-nasal voicing
  a. morphemes that produce postnasal voicing
    1. 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.
    2. the underlying form of the suffix that appears as *-tar* and *-dar* on the surface is /{-tar, -dar}/
    3. 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.
  b. morphemes that do not produce postnasal voicing
    1. only one single item:
    the adverbial suffix *-ki* for example is simply /-ki/
    2. High ranked IDENT(voice) then assures that the voiceless obstruent of this morpheme will always surface as such.
    3. This constraint is toothless in the case of multiple inputs such as /{-tar, -dar}/ since there is nothing to be faithful to: the lexical recording provides both voiced and voiceless items.
    4. Hence IDENT(voice) will never be violated by morphemes with multiple inputs, and lower ranked constraints will decide about the winning option.
  c. no morpheme-specific phonology
    1. no constraint ever applies only to a subset of morphemes: all constraints evaluate all morphemes,
    2. morpheme-specificity is expressed in the lexical recording of morphemes (multiple or single inputs).

(55) floating segment analysis
  a. follows exactly the same logic, albeit using the regular autosegmental mechanism:
  b. 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.
  c. In case the lexically associated form is illegal in postnasal environments, it delinks and the surrogate *-d* attaches.
  d. 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.
  e. 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.
  f. Here as well phonological computation never makes reference to specific sets of morphemes: all morphemes are evaluated by the same grammar.

(56) difference
   a. The difference with respect to Mascaró's scenario is the fact that there is no allomorphy:
   b. the associated and the floating segment both belong to a single underlying lexical recording.

(57) in sum
   a. the floating segment analysis:
      1. avoids morpheme-specific phonological computation
      2. reduces apparent allomorphy to a single underlier
   b. multiple inputs
      1. avoids morpheme-specific phonological computation
      2. but is allomorphic
   c. multiple inputs
      do 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.
   d. but they are incompatible with the empirical generalization that allomorphy is never conditioned by melody.
      If this is true, the patterns that Mascaró takes to be cases of allomorphy cannot be allomorphy.
   e. the floating segment analysis is a non-allomorphic alternative for the patterns at hand.

References

Ackema, Peter & Ad Neeleman 2004. Beyond Morphology. Interface Conditions on Word Formation. Oxford: Oxford University Press.

Anttila, Arto 2002. Morphologically conditioned phonological alternations. Natural Language and Linguistic Theory 20: 1-42.

Bermúdez-Otero, Ricardo 2012. The architecture of grammar and the division of labor in exponence. The Morphology and Phonology of Exponence, edited by Jochen Trommer, 8-83. Oxford: OUP.

Bonet, Eulàlia, Maria Rosa Lloret & Joan Mascaró 2015. The prenominal allomorphy syndrome. Understanding allomorphy: Perspectives from Optimality Theory, edited by Eulàlia Bonet, Maria Rosa Lloret & Joan Mascaró, 5-44. London: Equinox.

Bonet, Eulàlia & Joan Mascaró 2006. *U* u *o* e *y* o *e*. Cuadernos de Lingüística (IUOG) 13: 1-8.

Burzio, Luigi 2007. Phonetically conditioned syncretism. Selected proceedings of the 5th Décembrettes: Morphology in Toulouse, edited by Fabio Montermini, Gilles Boyé & Nabil Hathout, 1-19. Somerville, MA: Cascadilla.

Bye, Patrick 2007. Allomorphy - selection, not optimization. Freedom of Analysis?, edited by Sylvia Blaho, Patrick Bye & Martin Krämer, 63-91. Berlin: Mouton de Gruyter.

Carruthers, Peter 2006. The Architecture of the Mind: Massive modularity and the flexibility of thought. Oxford: OUP.

de Lacy, Paul 2002. The formal expression of markedness. Ph.D dissertation, University of Massachusetts.

Gordon, Matthew 2002. A phonetically driven account of syllable weight. Language 78: 51-80.

Hargus, Sharon 1993. Modeling the Phonology - Morphology Interface. Studies in Lexical Phonology, edited by Sharon Hargus & Ellen Kaisse, 45-74. New York: Academic Press.

Harris, John & Geoff Lindsey 1995. The elements of phonological representation. Frontiers of Phonology, edited by Jacques Durand & Francis Katamba, 34-79. Harlow, Essex: Longman. WEB.

Hayes, Bruce 1989. The Prosodic Hierarchy in Meter. Rhythm and Meter, edited by Paul Kiparsky & G. Youmans, 201-260. Orlando, Florida: Academic Press.

Inkelas, Sharon 1990. Prosodic Constituency in the Lexicon. New York: Garland.

Inkelas, Sharon & Draga Zec 1990. Prosodically constrained syntax. The Phonology-Syntax Connection, edited by Sharon Inkelas & Draga Zec, 365-378. Chicago: Chicago University Press.

Inkelas, Sharon & Draga Zec 1995. Syntax-phonology Interface. The Handbook of Phonological Theory, edited by John Goldsmith, 535-549. Oxford: Blackwell.

Kager, René 1996. On affix allomorphy and syllable counting. Interfaces to Phonology, edited by Ursula Kleinhenz, 155-171. Berlin: Akademie Verlag.

Lapointe, Steven 1999. Stem selection in OT. Yearbook of Morphology 1999, edited by Geert Booij & Jaap van Marle, 263-297. Dordrecht: Kluwer.

Mascaró, Joan 1996. External allomorphy as emergence of the unmarked. Current trends in phonology: models and methods, edited by Jacques Durand & Bernard Laks, 473-483. Salford: ESRI.

Mascaró, Joan 2007. External allomorphy and lexical representation. Linguistic Inquiry 38: 715-735.

McCarthy, John 1991. Semitic Gutturals and distinctive feature theory. Perspectives on Arabic Linguistics III, edited by Bernard Comrie & Mushira Eid, 63-91. Amsterdam: Benjamins.

McCarthy, John 2002. A Thematic Guide to Optimality Theory. Cambridge: Cambridge University Press.

Neeleman, Ad & Tanya Reinhart 1998. Scrambling and the PF-interface. The Projection of Arguments: Lexical and Compositional Factors, edited by Miriam Butt & Wilhelm Geuder, 309-353. Chicago: CSLI.

Nevins, Andrew 2011. Phonologically Conditioned Allomorph Selection. The Blackwell Companion to Phonology, edited by Marc van Oostendorp, Colin Ewen, Elizabeth Hume & Keren Rice, 2357-2382. New York: Wiley-Blackwell.

Nikolaeva, Irina & Maria Tolskaya 2001. A Grammar of Udihe. Berlin: Mouton de Gruyter.

Paster, Mary 2006. Phonological conditions on affixation. Ph.D dissertation, University of California at Berkeley.

Pater, Joe 2000. Nonuniformity in English stress: the role of ranked and lexically specific constraints. Phonology 17: 237-274.

Raffelsiefen, Renate 2004. Absolute ill-formedness and other morphophonological effects. Phonology 21: 91-142.

Raffelsiefen, Renate 2015. Phonological restrictions on English word-formation. Word-Formation: An International Handbook of the Languages of Europe, edited by Peter O. Müller, Ingeborg Ohnheiser, Susan Olsen & Franz Rainer, 893-916. Berlin: de Gruyter.

Rebrus, Péter 2000. Morfofonológiai jelenségek [Morpho-phonological phenomena]. Strukturális magyar nyelvtan III. Alaktan [Structure of Hungarian Vol III. Morphology], edited by Ferenc Kiefer, 763-947. Budapest: Akadémiai Kiadó.

Scheer, Tobias 2011. A Guide to Morphosyntax-Phonology Interface Theories. How Extra-Phonological Information is Treated in Phonology since Trubetzkoy's Grenzsignale. Berlin: Mouton de Gruyter.
Scheer, Tobias 2013. Why phonology is flat: the role of concatenation and linearity. Language Sciences 39: 54-74.
Scheer, Tobias 2015. How diachronic is synchronic grammar? Crazy rules, regularity and naturalness. The Handbook of Historical Phonology, edited by Patrick Honeybone & Joseph C. Salmons, 313-336. Oxford: OUP.
Scheer, Tobias 2016. Melody-free syntax and phonologically conditioned allomorphy. Morphology.
Segal, Gabriel 1996. The modularity of theory of mind. Theories of Theories of Mind, edited by P. Carruthers & P. Smith, 141-157. Cambridge: CUP.
Siptár, Péter & Miklós Törkenczy 2000. The Phonology of Hungarian. Oxford: Oxford University Press.
Smith, Norval 1976. -Aar. Leuvense Bijdragen 65: 485-496.
Stemberger, Joseph Paul 1993. Glottal transparency. Phonology Yearbook 10: 107-138.
Szendrői, Kriszta 2003. A stress-based approach to the syntax of Hungarian focus. The Linguistic Review 20: 37-78.
Szigetvári, Péter & Tobias Scheer 2005. Unified representations for the syllable and stress. Phonology 22: 37-75.
Szymanek, Bogdan 1980. Phonological conditioning of word formation rules. Folia Linguistica 14: 413-425.
Törkenczy, Miklós 2011. Hungarian Vowel Harmony. The Blackwell Companion to Phonology, edited by Marc van Oostendorp, Colin Ewen, Elizabeth Hume & Keren Rice, 2963-2989. New York: Wiley-Blackwell.
Tranel, Bernard 1996. French liaison and elision revisited: A unified account within Optimality Theory. Aspects of Romance Linguistics, edited by Claudia Parodi, Carlos Quicoli, Mario Saltarelli & Maria Luisa Zubizarreta, 433-455. Washington: Georgetown University Press.
van Oostendorp, Marc 2009. How I learned how to stop worrying and love the derivation. Paper presented at the 17th Manchester Phonology Meeting.
Vogel, Irene & István Kenesei 1990. Syntax and semantics in phonology. The Phonology-Syntax Connection, edited by Sharon Inkelas & Draga Zec, 339-363. Chicago: University of Chicago Press.
Wilson, Stephen 1986. Metrical Structure in Wakashan Phonology. Proceedings of the Twelfth Annual Meeting of the Berkeley Linguistics Society, edited by Vassiliki Nikiforidou, Mary Van Clay, Mary Niepokuj & Deborah Feder, 283-291. Berkeley: Berkeley Linguistics Society.
Wolf, Matthew 2008. Optimal Interleaving: Serial Phonology-Morphology Interaction in a Constraint-Based Model. Ph.D dissertation, University of Massachusetts.
Zec, Draga 1995. Sonority constraints on syllable structure. Phonology 12: 85-129.
Zwicky, Arnold & Geoffrey Pullum 1986. The Principle of Phonology-free Syntax: introductory remarks. Ohio State University Working Papers in Linguistics 32: 63-91.