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The convergence of labor between phonology and morphology

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0. Introduction

The conference theme, "The division of labor between phonology and morphology", implies that by and large these operate independently of each other. In fact, most truly phonological (as opposed to phonetic) rules make reference to morphology either directly, or indirectly. Consider the simple fact that the definition of a lexical rule is that it applies within but not across words. Its non-application thus signals the presence of a word boundary within the uninterrupted speech stream.

Typical lexical rule, blocked at/across word boundaries:
Dakota palatalization (Shaw 1980): k ≡t□ / i__
/i-kax-e/ [it□aγe] *instr-make-Nom* 'tool'
But does not apply with compounds or clitics:
/mni-ki/ [mniki] 'the water'
Result: presence of surface [ik] signals word boundary [i#k].

In many cases rules can refer to either morphological or prosodic entities. For example, in Chinese, most rules can refer to either syllable or morpheme. This correspondence between morpheme structure and prosodic structure is of course not always so perfect, and is often blurred by later processes…but it is functionally very useful, and thus widespread. In OT, it is often handled via alignment statements.

Much effort among phonologists is spent on constructing arguments that some process MUST be described prosodically and not morphologically, but this may be the wrong direction to come from: maybe the more interesting and important observation is precisely that they usually coincide??

- Morphology is a type of lexical information: phonology often acts to preserve and signal it.
- The same is true of syntactic information, signaled via prosody.
- Signalling of word boundaries is both morphologically and syntactically informative, and thus especially widespread.
- Signalling of root/stem boundaries is undoubtedly related to their ability (i) to occur as free-standing words in some cases (ii) their historical origins as free words in some cases and (iii) their core semantic role in the larger word
- On the use of phonological information in acquiring morphological structure, see Bermudez-Otero 2006.

Cross-linguistically, there is substantial evidence for preferences like the following:

1. Preference for morphological entities to be prosodic entities (MCarthy and Prince, Downing and many others).

1.1 Words:

a. Foot: Lardil conspiracy effect: apocope of final vowels in (i), blocked if output would be sub-minimal in (ii); augmentation of monosyllables in (iii) (Downing 2006:57):

i.	yalul	yalulu-n	'flame'
	mayar	mayara-n	'rainbow'
ii.	mela	mela-n	'sea'
	tjempe	tjempe-n	'mother's father'
iii.	wika	wik-in	'shade'
	wunta	wun-in	'rain'

b. Trochee: English bisyllabic nouns:

94 % are SW, and 90% of SW words are nouns. (Kelly and Bock 1988). Used as a cue to segment speech by age of 6-9 months, (Jusczyk, Cutler, & Redanz, 1993a; Turk, Jusczyk, & Gerken, 1995).

c. Iamb: Temiar (sesquisyllabicity). Minimal word. Benjamin 1976.

tab 'egg'
ha.lab 'to go down river'
s.luh 'to shot'
sn.luh 'shooting'

Same constraint together with NoUnstressedV produces coda reduplication as in sg.log. (Spaelti 1997:53)

d. Bisyllable (Downing 2006)

(i) Chinese: 85% of nouns bisyllabic. Compounding of synonyms such as *m□i-l* 'beautiful'; augmentation of monosyllabic names as in *L/o W<ng;* truncation of trisyllables, such as *wBigu.:y⇓ > wBiy⇓* 'foreign language'.

(ii) Minimum size of Japanese loan truncations (Kubozono: 1999:47)

de.mo(-n.su.yo.re-e.syo-n) 'demonstration'
pa-n.hu.(re-t.to) 'pamphlet'

1.2 Reduplicative affixes: extensive literature esp. McCarthy and Prince and colleagues

a. Heavy syllable: Ilocano: kal-kaldi⌋ *'goats'* pus-pusa *'cats'*
b. Bisyllabic: Diyari: tjilpa-tjilparku *'bird-sp.'* kanku-kanku *'boy'*

1.3 Roots/stems:

a. Syllable: Chinese

Duanmu (2000:82) Standard Chinese: morpheme with initial non-high vowel such as /au/ begins phonetically with one of [♣ σ ⌋ γ]. Normally no resyllabification across morpheme boundaries

mian au	[mian ♣au]	'padded coat'
	[mian γau]	
	[mia⌋ γau]	
	[mia⌋ ⌋au]	
	*[mia.nau]	

If following syllable is weak, gemination is possible, but *[na.na]

/nan-a/ [nan.na] 'hard!'

- [See slides at end of talk] Corpus study shows different data: Fang 2004: 80% of nasal codas lost before vowels (more than before C onsets) Chen 2000: 100% of [n] codas lost between [a] vowels.
- Result of Align (Morph, syll), *VN.V >> VV-Coord, Onset. (*VN.V covers the combination of NoCoda and Syllable Contact Law violations).
- VV-Coord (Gafos) is violated when vowel gestures overlap so much that nasal closure is never achieved, even though tongue is moving into position for closure, as shown by survival of transitional formants.

b. Bi-moraic μμ:

(i) Japanese bi-moraic hypocoristics (Poser 1990): morpheme sculpted to match a phonological entity:

Akira > aki-tyan
Syuusuke > syuu-tyan
Kinsuke > kin-tyan

(ii) Japanese compound clippings: Kubozono (1999:40) New stems created from irst two moras of each half, and then combined:

ri.mo-o.to ko-n.to.ro-o.ru ≡ [ri.mo][ko-n] *'remote control'*
ha-n.ga-a su.to.ra-i.ki ≡ [ha-n][su.to] *'hunger strike'*

(iii) (Coatzospan) Mixtec open-class morphemes: CVV or CVCV. Pike, Gerfen .

kwΞΞ *'green'* mΞnP *'lake'*

c. Bisyllable (not necessarily bi-moraic):

a. Bantu canonical stem: Downing 2006:29, and p.c. , who argues that the minimal bi-syllabicity requirement cannot be derived from Prosodic Word-hood.

b. Semitic root templates: McCarthy 1993, Downing: katab *'write'* kaatab *'cause to write'*

c. Sierra Miwok: bi-syllabic non-primary verb stems: (Downing: 92)

pol<:n- pol<n:- p.ˑla:n- p.ˑlna- *'fall'*

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2. Preference for edge-based processes

Used to signal the ends of morphological and syntactic entities, especially words and phrases: often but not always prosodic (which almost always disambiguates speech)

2.1 Words

a. Initial saliency: Tip-of-the-tongue effects: Bowman / Bradman for Beckman. Lexical access: Cutler and Norris 1988. Positional Faithfulness: Beckman.

b. Initial/final stress: Finnish/French (Vroomen et al 1998)

c. Initial strengthening: Fougeron and Keating (1997) measured amount (area) and duration of contact for initial [n], and found word-initial as well as phrase-initial strengthening effects in English. See also Quené 1993 on Dutch.

d. Initial lengthening: English (Turk and Shattuck-Hufnagel 2000)

e. Final weakening, such as devoicing (German, Russian) and debuccalization (Caribbean Spanish); lack of release.

f. Final lengthening: possibly universal phrase/utterance finally, but reported word finally in a wide range of languages: see Vaissiere (1983: 60) for an overview. Turk (p.c.) reports that contra Vaissiere phrase-final lengthening is also found in languages with quantity distinctions, such as Dinka (Remijsen and Gilley 2008), Finnish and Japanese (Nakai et al, Nakai and Turk). Magnitude of final lengthening correlates with prosodic constituent boundary depth. Wightman et al. (1992) [Caveat: word-final shortening is also found, suggesting that these are learned effects.]

g. Boundary tones: Pitch rise at start of word : French, (Vaissiere 1983: 63). HL word accents in Japanese (Beckman and Pierrehumbert)

2.2 Roots/stems: apparently rarer. Why??

a. Stress: 'Demarcative' stress widespread. E.g**.** Perfect stress to morphology match in Diyari (Kager 1997:47). All polysyllabic (but not monosyallblic) morphemes have initial stress.

yákalka-yìrpa-màli-na 'to ask-BEN-RECIP-PART'

Morphological structure	*Prosodic structure*	*Stress patterns*	
a. {{{mada} la}ntu}	[[[mada] la] ntu]	máda-la-ntu	'hill-CHARAC-PROPR'
b. {{puluru} ngi}	[[puluru] ngi]	púluru-ngi	'mud-LOC'
c. {{pinadu} wara}	[[pinadu] wara]	pínadu-wàra	'old man-PL'
d. {{{kana} ni}mata}	[[[kana] ni] mata]	kána-ni-màta	'man-LOC-IDENT'

b. Final lengthening:

(i) Hungarian: Stems lengthen before suffixes (a). Cannot be re-analyzed as word final shortening because underlying long vowels remain long word-finally (b):

a.	kutya	kutya:t	*'dog'*
	zene	zene:t	*'music'*
b.	kave:	kave:t	*'coffee'*

(ii)McCarthy (2005) explicitly argues that stem-final lengthening is typologically implausible, and re-analyzes a possible case in Cairene Arabic as final shortening.

♣*ábu*	"father"	♣*abú:ja*	"my father"
		♣*abú:k*	"your father"
γát"a	"a cover"	*γat"á:ha*	"her cover"
kúnti	"you (f. s.) were"	*ma kuntí:*	"you (f. s.) were not"
♣*ú+lu*	"tell (pl.)!"	♣*ulú: li*	"tell (pl.) me!"

c. Initial strengthening: Stem-initial strengthening of /n/ to [d] in Jicarilla Apache head-stems, (Tuttle 2000) and elsewhere in Athabascan:

shi-d<<	'my eye'	[id<:]
1sg-poss-eye		
na-k∴h	'tears'	[na-kç∴h]
eye+water		

b. Boundary tones: routine in phrasal phonology, but word-internal in Kinande (Black 1995): e.g. in Recent Past II, a H boundary tone links to first mora of the stem, (and then spreads left by a regular rule)

$[tu\text{-}a]_I[mð\text{-}[hðm\text{-}ir\text{-}a\text{-}a]_S]_M$ 'we hit for him'

3. Preference for the domains of processes to signal morphological structure:

3.1 Words

a.Vowel Harmony:

(i) Word in Finnish, where it cues word segmentation (Suomi et al 1997, Vroomen et al 1998);

(ii) Igbo: (Zsiga 1992): ATR harmony applies to inflectional affixes and dependent pronouns (1), but not to most 'extensional affixes' and compounds (2), or between words (3) (tones not shown):

(1)]-sω-ala 's/he has told' o-si-ele 's/he has cooked [3sg-root-perf]

(2) nw□-chu 'die prematurely' k□-fu ,kick away'

(3) nkωta ojii 'dog black, i.e.black dog'

[Note: (i) Possibly a case of stem, not word, domain. (ii) Zsiga argues that the domains here are not morphological but prosodic, and that VH applies *within* the PrWd, while another rule of total vowel assimilation applies in V-V contact only *across* PrWd's. This requires her to put PrWd's in the lexicon, so again lexical information is being preserved by phonology.]

(iii) Note than VH domains CAN be larger than word, as in Vata, (A&P 2007).

b. Consonant harmony:

(i) Sibilant harmony in Tahltan (Shaw) and Chumash (Beeler 1970). Right-to-left:

k-i□kin 'I save it' k-iskin-us 'I save it for him'

k-atshaw 'I sin' at□aw-i□ 'a sin'

(ii) Nevins and Vaux (2003) on front harmony in Karaim.

c. OCP effects: Voicing dissimilation**:** Japanese rendaku blocked if locus word contains another voiced obstruent, but not if preceding word has one.

iro-kami	iro-gami	'coloured paper'
de-kut□I	de-gut□I	'leave-mouth; exit'
kami-kaze	*kami-gaze	'divine wind'

e. Tone spreading typically inside words only

f. More co-articulation within than across words: Ladefoged (1993): more labialization of /k/: *coo* > *clue* > *sack Lou*. Johnson and Juzczyck (2001): co-articulation used as cue to word segmentation by 8-month old infants.

3.2 Roots/stems

a. Vowel harmony:

(i) Front/back harmony in root in Ikwere (Clements and Osu 2005: 169).

(ii) Warlpiri back-round harmony does not spread to pre-verb *pirri-*: (Nash 1986:85). Exact nature of domain unclear. See Pentland and Laughren 2004.

kiji-rni 'throw-NONPAST'
kiji-ka 'throw-IMPERATIVE'
kuju-rnu 'throw-PAST'
pirri-kuju-rnu 'scatter-throw-PAST'

b. Sibilant Harmony: Basque sibilant harmony holds in roots, but does not affect suffixes: apico-alveolar [simits] *'tick'* and palatal [urt□int□] *'squirrel'* series cannot co-occur in roots, but suffixes are invariant□ [gison-entsat] *'man-benef indef'* [et□erentsat] *'house-benef indef'* A&P 2007). Co-occurrence of disharmonc sibilants signals presence of multiple morphemes.

c. Nasal harmony: root (excluding prefixes) in Ikwere: Clements and Osu (2005: 178). At a later level, spreads to suffixes, but not across words in compounds or in phrases. (p.189-90). Prefixes are neither targets (b) nor triggers (c) of nasal harmony. Disharmonic words poly-morphemic. (Tones not shown. Also ATR harmony)

a.	eri	'to eat'	o-ri-lem	's/he has eaten'
	]w:]	'to drink'	]-w:]-n:ɛm	's/he has drunk'
b.	a-dv	rɛ-dv	'to fall' (verb/noun)	
c.	]-r]	n-r r]	'to betray a secret'(verb/noun)	

d. OCP effects:

(i) Shona (Myers 1997): Within macrostem only, H tones fuse. As a result, all syllables lower in Meeussens Rule environment after H-toned clitic in (b). Signals the cohesion of the macrostem:

Fusion: (Within macrostem only)

a.	tí-téng-és-é	'we should sell'	
b.	há-ti-teng-es-e	'let us sell'	(*há-ti- téng-és-é)

(ii) Semitic OCP-Place: Holds in roots., but suffixes may have same POA as a root C; cf: kattab-tu *'I read'* , ta-kattab *'write to e.o.'*. Signals morpheme boundary.

e. More 'co-articulation' within than across stems: English NC clusters always homorganic within roots, and within Level 1 morphology (Harris's non-analytic root-level morphology): *camd *conmit. Possible at Level 2 (Harris's word-level) morphology: hemmed, unmissable.

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4. Other traces of morphological structure retained inside larger words and compounds : implemented typically via OO constraints

4.1 Words inside compounds or phrases

a. Stress: can distinguish words from phrases (bl<ckbird / black bPrd).

b. Syllable structure: Mandarin: no resyllabification across syllable boundaries signals a morpheme boundary: *an. a* vs. *a. na*

c. Allophonic differences: Sensitivity to differences such as *night rate vs. nitrate* was found in infants as young as two months of age (Hohne & Jusczyk, 1994),

4.2 Roots/stems inside words:

a. Stress:

(i) extensive literature on stress preservation and related effects in English (SPE, Burzio etc). e.g. Unreduced vowel on second syllable of *'condensation'* in US English reveals existence of *'condense'*. Contrast with reduction in *'compensation'*.

(ii) Can also be used to identify word-internal morphological structure:

e.g. stress more than 3 syllables from right edge in English signals presence of a suffix or a clitic, as in *jettisonable*

(ii) word class: Nouns vs. verbs

b. Syllable structure: May differ at different levels of morphology:

Harris (1994): Presence of certain consonant clusters signals presence of a morpheme boundary: e.g. VCd, VVCd only produced by affixation, where C =

obstruent. English root-level phonology/morphology vs. word-level: root-level (Level 1, non-analytic, (ii) examples below)) respects strict syllable template. Word level (Level 2, analytic, (i) examples below) is more liberal.

(a) (i) VC-*t* capped, passed, miffed
(ii) VC*t* apt, past, lift
(b) (i) VC-*d* penned, billed, (barred)
(ii) VC*d* pend, build, (bard) [C = [+son])
(c) (i) VC-*d* robbed, lagged, hedged
(ii) VC*d* * [C = [-son])
(d) (i) VVC-*t* seeped, peaked, leafed
(ii) VVC*t* *
(e) (i) VVC-*d* fatigued, seized, teamed
(ii) VVC*d* *

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5. Information conservation moulds phonology in other ways:
More preservation of C than V:

a. Differences in informational functions: C provide lexical info, V provide grammatical info. Nespor et al (2003). At its most obvious in Semitic.

b. Processing evidence: Transitional probabilities for C (but not V) used to identify words vs. non-words. Bonatti et al (2005).

c. Consonants are more likely to be preserved:

(i) Vowels reduce or neutralize all the time, often completely, but neutralization of all C to one only is rare.

(ii) In codas, stops might go to [♣], fricatives to [h], and nasals to [N], but actual coda deletion of all codas is rare. Lombardi (2001) claims that it only happens in response to a ban on Place features in the coda, and never to a ban on [voice]

Eg: Diola: ujuk-ja > ujuja 'if you see'

Even here, typically, it applies to stops, not nasals, which assimilate word-internally, and become [n] finally. So retain a 3-way contrast: obstruent/sonorant/zero or 4-way one (stop/fric/son/zero).

(iii) Medially, might get voicing or manner neutralized, but place retained.

(iv) C-harmony is rare in adult language, again because it would destroy too much information.

(v) And of course there are fewer V to start with, in most cases, so complete neutralization removes fewer contrasts than it would for C.

(vi) Affixes often have a restricted set of consonants (e.g. Pulaar, which has 11 single C verb affixes, all coronal (Arnott 1970)) and so complete neutralization removes fewer contrasts than it does in roots, perhaps related to proposed universal ranking of Root-Faith >> Affix-Faith. (Beckman 1998).

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6. Conclusions

- The norm is for phonology and morphology to work in tandem.

- When phonology blurs morphology, it is typically in the service of ease of articulation, or of universal markedness tendencies such as prosodic binarity.
- Over time, morphological structure thus blurred in sufficient contexts will become undetectable to the language learner, and thus no longer available for productive use except via statistical generalization, like strong verbs in English. .

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