Do We Need Underlying Representations in Bantu Phonology?
Larry M. Hyman
University of California, Berkeley

(1)   Why this question? Briefly, phonology is rapidly changing and risks taking Bantu along with it! Should it?

(2)   The current state of phonology

    a.   diverse, disjointed, unclear boundaries, disparate goals and methodologies
    b.   largely oriented towards the surface due to optimality theory and technology
    c.   cutting-edge research tends to be experimental, instrumental, quantitative, statistical, computational
    d.   increasing rejection of the the basic concepts and methodologies of the structuralist-generative heritage, ultimately denying that phonology is anything like we used to think—if it exists at all

(3)   The current state of underlying representations (URs)

…the notion of UR is neither conceptually necessary nor empirically supported, and should be dispensed with. (Burzio 1996: 118)

... we will argue against the postulation of "a single underlying representation per morpheme", arguing instead for the postulation of a set of interconnected surface-based representations. (Archangeli & Pulleyblank 2015)

Advances in output-oriented derivational theory are progressively subverting the notion of an underlying-surface distinction in phonology. (Harris 2007: 137)

(4)   Why were URs originally proposed in generative phonology?

    a.   to capture generalizations   i.e. "what's in the language"
    b.   to capture the speakers' knowledge   i.e. "what's in the head"

(5)   Why do some linguists reject URs now? A variety of possible reasons:

    1.   URs are wrong   3.   URs are indeterminate   5.   URs are uninteresting
    2.   URs are redundant   4.   URs are insufficient

(6)   The purpose of my talk is to examine how Bantu phonology bears on some of the observations that have led to claims such as those in (3). For me it all started with a provocative article by Bruce Hayes:

... *all* phonology might ultimately be redistributed between the theory of phonetic rules and the theory of lexical organization.... insofar as rules apply postlexically, they are phonetic and gradient, and insofar as they treat discrete categories, they are part of the lexicon rather than applying to the output of syntax.

Of the Ilokano rules [I] studied... either they seemed phonetic in character, so that my conventional phonetic transcription represented an over idealized categorization of continuous data, or they struck me as not fully productive, lexicalized rules. At the time I occasionally wondered, "Where is the normal phonology that I was trained to study? (Hayes 1995: 67-8)

(7)   According to Hayes (1995) we should expect

    a.   word-level phonology to be "lexicalized", not fully productive, maybe just stored allomorphy, e.g. the English related words *eléctric* [k] vs. *electrícity* [s] with stress differences can simply be listed
    b.   phrase-level phonology to be "idealized" broad phonetics (cf. *phone* [m] *book*)

(8)   Much of "phonology" has since moved away from traditional representational questions and arguments based on simplicity, generality, and elegance, instead turning to surface issues (phonetics, allomorphy)

(9)   A double assault from two directions, according to whether the proposal is to reassign phonological properties (i) to phonetics or (ii) to morphology—thereby potentially squeezing phonology out of existence.

PHONOLOGY

PHONETICS   *MORPHOLOGY*

(10) Does it matter? Or, put slightly differently, WHAT matters? Is there anything left of discrete phonology once phonetics and morphology take their share? Tone says yes—at least in part.

(11) Discrete phrasal ("post-lexical") tonal phonology in Giryama [E72a] (Volk 2011: 17)

All L tone (L = unmarked)   *H tone on penultimate mora* (which is lengthened, written VV)

‘I want ...’   ‘he/she wants ...’
ni-na-maal-a   a-na-maál-a
ni-na-mal-a ku-guul-a   a-na-mal-a ku-guúl-a   ‘... to buy’
ni-na-mal-a ku-gul-a ŋguuwo   a-na-mal-a ku-gul-a ŋguúwo   ‘... to buy clothes’
                                ‡- - - - - - - - - - →
                                H

(12) It's not only grammatical tone, but also lexical tone that can do this—any /H/ tone!

All L tone (L = unmarked)   *H tone on penultimate mora*

‘to buy wooden bowls’   ‘to break wooden bowls’
  ku-gula mi-vuure   ku-banda mi-vuúre   ‘... to buy clothes’
                                          ‡- - - - - →
                                          H

(13) This is *phonology*—there can be more than one /H/ per word, each potentially wandering at a distance

   a.   ni-na-gumbuhiziík-a   ‘I am wiped out by utter destruction’   H tone verb /-gúmbuhizik-/
          ‡- - - →
          H

   b.   a-ná-gumbuhiziík-a   ‘s/he is wiped out by utter destruction’   (Volk 2007: 17)
          ‡↗▼ ‡- - - →
          H   H   (the H of /á-/ goes on the pre-stem prefix -na-)

(14) There are many such cases of totally productive phrasal tonology which cannot be reduced to phonetic implementation—both in Bantu and in tone languages throughout the world. In such cases one can test URs and rules by putting words together in new utterances. (Tone is particularly appropriate to make this point, since there is so much more going on post-lexically than in segmental phonology.)

(15) Although this to my mind takes care of half of Hayes' concern, the other still stands: Is there productive, across-the-board word-level ("lexical") phonology? Here we run into significant analytic problems as languages conspire against us. For this let us turn to two problems in Bantu segmental phonology that I have been worrying about which raise both synchronic and diachronic questions:

   a.   the distributions and alternations deriving from Proto-Bantu *d (or *l, if you prefer)
   b.   the distributions and alternations deriving from Proto-Bantu *p

(16) In the absence of other complications, the most general expectation is that *d will be realized as a liquid [l] or [r] unless it is preceded by a homorganic nasal. Thus, there is complete complementary distribution in the following (ki-)Yaka [H31] class 9 deverbal nominalizations (Ruttenberg 1971 [2000]).

verb		*noun*		*verb*		*noun*	
lákáná	‘agonize’	n-dákáná	‘agony’	lólá	‘punish’	n-dóla	‘punishment’
léfá	‘borrow’	n-défi	‘a loan’	lúúká	‘be prudent’	n-dúúká	‘prudence’
léngá	‘go on vacation’	n-dénga	‘vacation’	lúúndza	‘bite, sting’	n-dúundza	‘a bite, sting’

(17) A second source of [d] in Yaka is before [i], not as universal in Bantu, but common

/e/	:	léká	‘listen’	lééká	‘sleep’
/u/	:	lúká	‘vomit’	lúúká	‘be clever, wise’
/o/	:	lóká	‘bewitch’	lóóká	‘become dry’
/a/	:	lábá	‘swear’	lááká	‘scream loudly’
vs. /i/	:	dímá	‘cultivate’	díímbúká	‘jump over’

(18) Here too there are lots of alternations, e.g. deverbal nominalizations with the suffix /-i/

verb			noun			verb			noun		
hál-á	'sculpt'		n-hád-í	'sculptor'		lál-á	'get lost'		yi-lád-í	'distraction'	
fúúl-á	'be in mourning'		yi-fúud-i	'mourning'		sóól-á	'choose'		n-sóód-í	'elector'	
tál-á	'watch'		n-tád-í	'spectator'		yékúl-á	'betray'		n-yékúd-í	'traitor'	

(19) The realization is [d] even before epenthetic [i] in borrowings (by-ééle would have been well-formed)

French		Yaka			French		Yaka	
bière	>	by-éédi	'beer' (cl.8)		mesure	>	mi-síídi	'measure' (cl.4)
l'hopital	>	lu-pítáádi	'mourning' (cl.11)		tribunal	>	tímíláádi	'tribunal' (cl.5)

(20) The [l] ~ [d] relation is completely general, allophonic, without complication in Yaka (with only one exception in the ca. 4000-entry Ruttenberg dictionary: ma-déésó 'beans'), not so in many other Bantu languages. We will now see how this perfect complementarity gradually becomes undone.

(21) Like Yaka, Ciyao [P21] prohibits [li] sequences

/e/	:	lela	'nurse, take care of'		lééndá	'be sticky'
/u/	:	lala	'be worn out, be hoarse'		lúúndá	'add to, lengthen'
/o/	:	lula	'froth up, effervesce'		lóóndá	'follow after, succeed'
/a/	:	lola	'look at, see'		láándá	'be like, resemble'
vs. /i/	:	dila	'cry'		dííndá	'wait'

(22) Ciyao also exhibits extensive l ~ d alternations, e.g. in verb forms (Ngunga 2000: XX)

a.	mil-a	'swallow'		mid-isy-a	'swallow a lot'	(intensive)
				mid-il-a	'swallow for/at'	(applicative)
				mid-ile	'swallow'	(perfective)
b.	kul-a	'grow big'		kud-isy-a	'grow very big'	(intensive)
				kud-il-a	'grow big for/at'	(applicative)
				kud-ile	'grow big'	(perfective)

Only one exceptional case exists of [li] out of 7740 records in the CBOLD (Armindo Ngunga) version of Sanderson (1954), pwítílí 'scattering in all directions' (an ideophone).

(23) Many Bantu languages which have an active /li/ → [di] rule inexplicably have words with [d] not preceded by [n] or followed by [i]. Ciyao thus differs from Yaka in having a small number of words with [de, da, du, do] sequences (cf. Ngunga 2000: XX).

/e/	:	delela	'be avaricious'	googodecela	'inform against, disparage'
/u/	:	duuma	'shout angrily'	ci-dúulo	'salty acid'
/o/	:	dodoma	'hesitate'	kodola	'beckon, cluck with tongue, snap fingers'
/a/	:	daal-a	'take for granted'	ci-dawáati	'box'

	i(i)	e(e)	a(a)	u(u)	o(o)	w	y	*Totals* (minus i(i))
l _	1	162	1141	184	126	37	---	1650
d _	338	26	110	92	21	1	7	275 (= 13.4%)

(24) The logical analysis is to assume two contrasting underlying segments, /l/ (which alternates with [d]) and /d/, which is always realized [d]. This, however, raises two problems:

　　a.　how should we analyze tautomorphemic [nd], e.g. leend- 'be sticky': as /nd/, /nl/, /nD/ or ?
　　b.　how should we analyze tautomorphemic [di], e.g. dil- 'cry': as /d/, /l/, /D/, or ?

(25) The last case I will consider is Ruwund [L53], which adds another dimension to the l ~ d alternation which at first glance resembles Yaka and Ciyao (Nash 1992; Hyman & Inkelas 2000 [2012])

a.	dil-a	'cry'		did-ish	'make cry'	(causative)
				did-in	'cry for/at/over'	(applicative)
				did-in	'cried'	(recent past)
b.	sal-a	'work, do'		sad-ish	'make work, do'	(causative)

sad-in   'work, do for/at'   (applicative)

sad-in   'worked, did'   (recent past)

(26) Like Ciyao, Ruwund has words with [d] before vowels other than [i]

/e/	:	sudeen	'end up on'	(applicative of sul 'end')
/u/	:	ru-dung	'heart'	duut 'settle'
/o/	:	dookal	'come out'	
/a/	:	dì-caada	'day after tomorrow'	(re final [d]: ru-pàd 'polygamy' < PB *-pádì)

(27) More remarkably, Ruwund has words with [li], hence contrasting with [di]

lil	'raise a child'	ku-lìm	'weight'
lik	'stop, leave (alone)'	n-kaliweeñ	'craftsman'
palik	'fall from a height'	ci-salijook	'deed'

(28) The following table shows the number of each syllable type from 1348 verbs stems in Nash (1991)

	i(i)	ee	a(a)	u(u)	oo	Totals	
l _	22	24	39	113	14	212	(without [li] = 190)
d _	73	2	8	5	3	91	(without [di] = 18)

(29) The [li] forms are explained by the fact that short *ĕ > i (and short *ŏ > a, e.g. *bón- > màn 'see')

Proto-Bantu   Ruwund   *Proto-Bantu   Ruwund*

*dɩd-	>	dil	'cry'	*ded-	>	lel-	>	lil	'raise (child)'
*dɩm-	>	dim	'cultivate'	*dek-	>	lek-	>	lik	'stop, leave (alone)'

Unless we recognize abstract short /e/, Ruwund will require /l/ vs. /d/, a contrast that is robust only before [i]. There still will be the problem of how to interpret tautomorpheme [nd], e.g. [ruwund].

(30) Three generalizations: (i) languages with a l ~ nd relation tend to have some cases of self-standing [d]; (ii) stems with [d] are always rarer than stems with [l]; (iii) [d] tends to occur earlier in the stem

Chichewa [N31] (5862 entries; Al Mtenje)   Ndebele [S44] (5000 entries; Galen Sibanda)

	C1	C2	C3	C4	Totals		C1	C2	C3	C4	Totals
l	315	883	855	392	2445	l	210	631	696	323	
d	147	94	55	7	303	d	166	107	28	5	
% d	31.8%	9.6%	6.0%	1.8%	11.0%	% d	44.1%	14.5%	3.9%	1.5%	

(31) There does not seem to be any generalization concerning the following vowel

Chichewa (/lw, ly/ → dw, dy)   Ndebele (no prevocalic restriction on /l/)

di	de	da	do	du	Total		di	de	da	do	du	Total
75	35	66	49	59	284		48	35	93	24	69	269

(32) In terms of word class, nouns and verbs are fairly even. Of 284 Chichewa words with [d], 124 are nouns, 113 are verbs. However, there are 47 adverbs, ideophones, or interjections, e.g. bede bede 'being afraid', kwédi kwédi 'truly', bubudu 'gnawing', dala 'intentionally', dodolílido 'upside down', kodí 'is it so?'

(33) [l] vs. [d] is reminiscent of the "double reflex" problem addressed in the 1990s: Proto-Bantu reconstructed consonants appear to have two different reflexes in many Bantu languages. However, a historical splitting of *d into [d] and [l] is not likely here. Fewer cases of [d] can be related to Proto-Bantu than the regular reflex [l]. For example, none of eight Lusoga [JE16] CV(V)d- verb roots have PB sources as far as I have been able to determine. This is consistent with Botne (1992: 46): "none of the [Eastern and Southern Bantu] languages manifested double reflexes of *d."

-god-	'fold'	-guud-	'disgust'
-gud-	'drink producing gulping sound'	-gudy-	'affect, bite severely'
-dud-	'become rotten, have pus in a wound'	-bbeed-	'lift' (bb = [b])
-dèèd-	'hackle'	-wad-	'accuse falsely'

cf. *pád 'vex, persecute' [zone J]   (fiabilité 5) > wad- 'accuse falsely' vs.
*pád 'scrape' [zones B, C, E, G-S] (fiabilité 1) > wàl- 'scrape'

(34) So why do the above and other Bantu languages have [d] where they should have [l] such that the perfect phonology is messed up? Possible sources of [d], which may be derived from

    a. an earlier [nd] that got simplified to [d] (cf. Blanchon 1991, Janssens 1993 for NW Bantu)
    b. ideophones and other expressive vocabulary
    c. borrowings
    d. morphological processes
    e. a combination of the above

(35) I would like now to turn to a much clearer case where morphological processes complicate original complementary distribution in synchronic phonology, this time drawing from the [ɣ] and [p] reflexes of *p in Lusoga [JE16], which has the following surface-contrasting segments, where there is variation between marginally contrastive [w] and [ɣ] (van der Wal 2004: 4)

		labial	*dental*	*alveolar*	*palatal*	*velar*
stops	*voiceless*	p	ṭ	t	č	k
	voiced	b	ḍ	d	ǰ	g
prenasalized	*voiceless*	mp	ṇṭ	nt	ɲč	ŋk
	voiced	mb	ṇḍ	nd	ɲǰ	ŋg
fricatives	*voiceless*	f		s		
	voiced	v		z		
prenasalized	*voiceless*	mf		ns		
	voiced	mv		nz		
sonorants	*nasal*	m	ṇ	n		ŋ
	oral			l		
approximants		w			y	ɣ

(orthographic "gh")

(36) The problem concerns the alternation between *gh* [ɣ] and [p], the latter occurring after a nasal, e.g. the first person subject/object prefix /n-/ and the class 9/10 prefix n- (cf. Brown 1972: 81-5, Byarushengo 1977 and Schadeberg 1989 re related alternations in Lumasaaba, Luhaya, and Lunyole)

(37) The realization of the first person subject marker before a vowel, e.g. /-a-/ 'distant past', shows that it must be underlyingly /n-/

    a. /p/ : tù-pìm-á 'we measure' m̀-pím-á 'I measure' n-á-pìm-á 'I measured'
         /t/ : tù-tùùŋg-á 'we sew' ń-tùùŋg-á 'I sew' n-á-tùùŋg-á 'I sewed'
         /k/ : tù-kòl-á 'we work' ŋ́-kòl-á 'I work' n-á-kòl-á 'I worked'

    b. [ɣ] : tù-gh-á 'we give' m̀-p-à 'I give' n-á-gh-à 'I gave'
              tù-ghèt-á 'we bend' m̀-pét-á 'I bend' n-á-ghèt-á 'I bend'
              tù-ghùlír-á 'we hear' m̀-pùlìr-á 'I hear' n-á-ghùlìr-á 'I heard'

         Proto-Bantu *p > ɸ > w > ɣ (*cf.* *-pá- 'give', *-pèt- 'bend, fold', *-púlìl- 'hear')

(38) The alternation between [ɣ] and [p] is quite robust, occurring also in class 11/10 singular/plural pairs

    a. ò-lú-ghàghá 'feather' *plural:* é-m̀-pàghá
    b. ò-lú-ghááḍó 'piece, slice' *plural:* è-m̀-pááḍó
    c. ò-lú-ghúúmbú 'young banana leaf' *plural:* è-m̀-púúmbú

(39) The same alternation between [ɣ] and [p] also occurs in reduplication both of nouns and verbs

    a. é-m̀-pàghá 'feathers' → é-m̀-pághá + ghàghá 'lousy feathers'
        è-m̀-pááḍó 'pieces, slices' → è-m̀-pááḍó + ghááḍó 'lousy pieces, slices'
        è-m̀-púúmbú 'banana leaves' → è-m̀-púúmbú + ghúúmbú 'lousy banana leaves'

    b. m̀-p-à 'I give' → m̀-p-à + gh-á 'I give a bit here and there'
        m̀-pét-á 'I bend' → m̀-pét-á + ghét-á 'I bend a bit here and there'
        m̀-pùlìr-á 'I hear' → m̀-pùlìr-á + ghúlír-á 'I hear a bit here and there'

(40) The alternation between [ɣ] and [p] also occurs when class 9 or 10 is diminutivized or augmented

9/10 noun			diminutive	augmentative	
a.	é-ḿ-pùbé	'rat'	→	à-ká-ghùbé	ò-gú-ghùbé	'small/big rat'
	é-ḿ-pàghá	'wing'	→	à-ká-ghàghá	ò-gú-ghàghá	'small/big wing'
	é-ḿ-pèghó	'wind'	→	à-ká-ghèghó	ò-gú-ghèghó	'small/big wind'
b.	é-ḿ-pùbé	'rats'	→	ò-bú-ghùbé	ò-gá-ghùbé	'small/big rats'
	é-ḿ-pàghá	'wing'	→	ò-bú-ghàghá	ò-gá-ghàghá	'small/big wings'
	é-ḿ-pèghó	'winds'	→	ò-bú-ghèghó	ò-gá-ghèghó	'small/big winds'

(41) Problems for synchronic underlying /p/ → [ɣ] (applying when /p/ is not preceded by a nasal)

  a. [p] occurs in a more restricted environment (after [m]), while [ɣ] occurs more generally

  b. it would be odd to posit /p/ in the many words with morpheme-internal [ɣ] which never occurs after a nasal: ò-mú-sàghó 'doctor', ò-kú-yúgh-á 'to pour' etc.

  c. there are cases of contrast between [ɣ] and [p], e.g. the following the result of borrowing

      è-cí-sàghó 'bag' *vs.* è-cí-kópò 'cup' (< Swahili ki-kopo)
      é-ń-ḏìghó 'thirst' *vs.* é-ń-ṯúpà 'bottle' (< Swahili chupa)

      (cf. è-pícípící 'motorbike', ò-kú-pápál-á 'to flap the wings, flutter', which are sound symbolic)

  d. contrastive [p] also occurs in the diminutive and augments forms of the following nouns

      é-m-pìtí 'hyena' → à-ká-pìtí 'small hyena' ò-gú-pìtí 'big hyena'
      è-m-pálá 'leopard' → à-ká-pálá 'small leopard' ò-gú-pálá 'big leopard'

(42) Problems for synchronic underlying /ɣ/ → [p] / n __

  a. where does the labiality of [p] come from?

  b. where does the devoicing come from? why /ɣ/ → [p] rather than /ɣ/ → [b] (or [g])?

      Note that the change in voicing is less surprising if we posit /p/ → [ɣ]: while we would expect debuccalization to produce /p/ → [h], as in Haya, voicing can result from a constraint that rules out [x] (or [h]).

  c. should /nɣ/ be considered for non-alternating morpheme-internal [mp], e.g. è-cí-ghùùmpú 'clod'?

(43) Other not-so-attractive possibilities for deriving the labiality of [p] by rule

  a. set up a prefixal allomorph /m-/ that occurs before /ɣ/, then: /ɣ/ → [p] / m __

  b. posit /w/ instead of /ɣ/, then: /w/ → [p] / n __ (N.B. [ɣ] corresponds to [w] in Luganda and Lumasaaba before back vowels, vs. [y] before front vowels; there is ɣ ~ w confusion in the area)

  c. other ideas? (Note: Schadeberg 1989 reported that the alternations is p ~ ŋ in Nyole!)

(44) Since Lusoga [p] ~ [ɣ] has the above problems—and is not a "natural" alternation—maybe best to just list both initial [p] and initial [ɣ] allomorphs, the former being subcategorized for a [+nasal] prefix (less desirable: the morphosyntactic features that these prefixes realize: 1pers.sg., class 9, class 10)

  a. 'hear' : /-pùlir-/ₙ_ /-ghùlir-/ (elsewhere) á-ghùlìr-á, ḿ-pùlìr-á 'he/I hear'
      'rat' : /-pùbe/ ₙ_ /-ghùbe/ (elsewhere) é-ḿ-pùbé, à-ká-ghùbé 'rat/small rat'

  b. 'flutter' : /-papala/ ò-kú-pápálá 'to flutter'
      'motorbike' : /-picipici/ è-pícípící 'motorbike'

  (The underlying tones are inverted in Lusoga, /L/ vs. Ø, from earlier /H/ vs. Ø, as in Luganda.)

(45) Let us evaluate Lusoga [p] ~ [ɣ] with respect to the arguments presented against URs in (6)

  a. URs are wrong : /p/ → [ɣ] makes wrong predictions; /ɣ/ → [p] is "odd"
  b. URs are redundant : the same job can be done with allomorphs, as in (44)
  c. URs are indeterminate : URs of non-alternating [mp] not clear: /p/, /ɣ/ or something else
  d. URs are insufficient : URs do not encode other information, e.g. when [w] vs. [ɣ], etc.
  e. URs are uninteresting : do you really want to argue about URs in this case?

(46) The [l] ~ [d], and [p] ~ [ɣ] situations illustrate one of the senses of "marginal" or "quasi-" phonemes" surveyed by Currie Hall (2013), which seems to be "par for the course": Few lexical alternations occur without complications or exceptions. Although Yaka has perfect [l] ~ [d] complementary distribution (/l/ → [d] after a nasal and before /i/), this is a rarity in Bantu.

(47) Do we need URs? What we traditionally have taken as the model is a perfect UR/SR relation where /X/ → Y / Z would be

- a. phonetically natural   vs. [p] ~ [ɣ] alternation is not phonetically motivated
- b. analytically deterministic   vs. [mp] alternates with both [ɣ] and [p]
- c. completely regular   vs. there are exceptions, cases of non-alternating [p]

Lusoga [JE16] (2358 verbs; Minah Nabirye)   My Lusoga lexicon of 1276 entries

	C1	C2	C3	C4	Totals
p	25	9	0	0	34
w ~ ɣ	201	27	0	0	228

	C1	C2	C3	C4	Totals
p	13	17	1	3	34
w ~ ɣ	83	33	10	0	126

(48) Whether or not URs are "real", they are useful!

... the categories traditionally applied to the description of phonological representation... still have an important heuristic value as descriptors to be used in the building and experimental testing of models of phonological grammar. (Harris 2007:137)

(49) How to resolve this? One vs. two enterprises?

- a. heads vs. languages: capturing generalizations and speaker knowledge are not the same thing (as generative phonology originally assumed), although they may inform each other
- b. I doubt one can talk about what is in the head without doing a morphophonemic analysis (URs)
- c. Even doubters of traditional phonology appear to recognize this, as can be seen from current "retro" textbooks, e.g. Hayes (2009)
- b. URs are a *tool* much like other tools that are available, e.g. experiments, corpora (Scheer 2014)
- d. URs shouldn't be confused with what they aren't (full records of stored knowledge of lexical items)

    The strong version of exemplar theory proposes that lexical entries are directly encoded in memory on the basis of acoustic traces, thereby bypassing the need for any representation in terms of phonological categories. (Ladd 2014: 52)

- e. they also aren't the tools needed to study continuous speech outputs
- f. alternations such as Bantu [l] ~ [d] and [ɣ] ~ [p] clearly involve consonant segments, hence argue strongly against those who reject URs claiming that there are no segments

    ... "phonemism" and "alphabetism" ... may be mercifully deposited on to the junk heap of theoretic history. (Silverman 2012:187).

    ...it is only after alphabetic writing is learned that notions of segmentation... may develop. (Lodge 2009: 43)

    But compare:

    The need to refer to discrete segments even to characterize metathesis... presents particularly good evidence against suggestions that segments have no psychological reality, and are a mere artifact of an alphabetic writing system.... (Buckley 2011: 1402)

    ...the difficulty of segmenting the speech signal is not, by itself, evidence against a phonological description based on categorically distinct segments. (Ladd 2014: 23)

(50) Conclusions

- a. I started by pointing out two problems for us as Bantuists interested in phonological issues
    - i. synchronic analysis: how do we analyze alternations such as [l] ~ [d] and [ɣ] ~ [p]?
    - ii. diachronic analysis: where do the non-alternating [p]'s and [d]'s come from?
- b. With respect to the first problem, Bantu has a lot to contribute to our understanding of sound systems in general, whether it is the regularity of postlexical tonal phonology or the complexities of word-level consonant alternations—which at the very least support the "reality" of the segment
- c. With respect to the second problem, in order to understand the source of the [d]'s, [p]'s and other consonants which exceptionally fail to alternate, we need to do both detailed studies of individual languages and ultimately comparisons to see if there is overlap in the content of the vocabulary in which they are found—or at least in the scenarios that give rise to them. There are doubtless important historical discoveries to be made, both from the point of view of the individual Bantu languages and for diachronic phonology in general.

References

Archangeli, Diana & Douglas Pulleyblank. 2015. Allomorphs in a connected world. Colloquium, University of California, Berkeley, March 16, 2015.

Blanchon, Jean Alain. 1991. Le pounou (B43), le mpongwè (B11a) et l'hypothèse fortis/lenis. *Pholia* 6.49-83.

Botne, Robert. Double reflexes in eastern and southern Bantu. *Afrikanistische Arbeitspapiere* 29.131-148.

Brown, Gillian. 1972. Phonological rules and dialect variation: a study of the phonology of Lumasaaba. Cambridge University Press.

Buckley, Eugene. 2011. Metathesis. In Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume & Keren Rice (eds), *The Blackwell Companion to Phonology*, vol. 3, 1380-1470. Wiley-Blackwell.

Burzio, Luigi. 1996. Surface constraints versus underlying representations. In Jacques Durand and Bernard Laks (eds.), *Current trends in phonology: Models, and methods*, pp. 118-136. University of Salford: European Studies Research Institute, University of Salford.

Byarushengo, Ernest Rugwa. 1977. On the phonological status of p/h and d/l. In Ernest Rugwa Byarushengo, Alessandro Duranti & Larry M. Hyman (eds), *Haya grammatical structure*, 17-34. Los Angeles: Department of Linguistics, University of Southern California.

Currie Hall, Kathleen. 2013. A typology of intermediate phonological relationships. *The Linguistic Review* 30.215-275.

Gulere, Cornelius W. 2009. *Lusoga-English dictionary*. Kampala, Uganda: Fountain Publishers.

Harris, John. 2007. Representation. In Paul de Lacy (ed.), *The Cambridge handbook of phonology*, 119-138. Cambridge University Press.

Hayes, Bruce. 1995. On what to teach the undergraduates: Some changing orthodoxies in phonological theory. *Linguistics in the Morning Calm* 3. Seoul: Hanshin Publishing Co., 59-77.

Hayes, Bruce. 2009. *Introductory phonology*. Wiley-Blackwell.

Hyman, Larry M. & Sharon Inkelas. 2000 [2012]. Complementarity and opacity: [l] - [d] in Bantu. *Phonology Laboratory Annual Report*, 321-326. Department of Linguistics, University of California, Berkeley. http://escholarship.org/uc/item/8gk2779c

Janssens, Baudouin. 1993. *Doubles réflexes consonantiques: Quatre études sur lel bantou de zone A*. Doctoral dissertation, Université Libre de Bruxelles.

Ladd, D. Robert. 2014. *Simultaneous structure in phonology*. Oxford University Press.

Lodge, Ken 2009. *Fundamental concepts in phonology: Sameness and difference*. Edinburgh University Press.

Ngunga, Armindo. 2000. *Phonology and morphology of the Ciyao verb*. Stanford: C.S.L.I.

Nash, Jay. 1991. *Ruwund vocabularies* . Urbana-Champaign : Center for African Studies.

Nash, Jay. 1992. *Aspects of Ruwund grammar*. PhD Dissertation, University of Illinois at Urbana-Champaign.

Ruttenberg, Piet. 2000 [1971]. *Lexique yaka-français*. München: Lincom Europa.

Sanderson, G. M. 1954. *A Dictionary of the Yao Language Zomba*. Nyasaland: The Government Printer.

Schadeberg. Thilo C. 1989. The velar nasal in Nyole (E35). *Annales Aequatoria* 10.169-179.

Scheer, Tobias. 2014. The Corpus: A Tool among Others, *Corela* [En ligne], HS-13 | 2013, mis en ligne le 19 février. 2014, consulté le 09 juillet 2015. URL : http://corela.revues.org/3006

Silverman, Daniel. 2012. *Neutralization*. Cambridge University Press.

Volk, Erez. 2007. High, low and in between: Giryama tonology. Masters Thesis, Tel-Aviv University.

Volk, Erez. 2011. Mijikenda tonology. Doctoral dissertation, Tel Aviv University.

Wal, Jenneke van der. 2004. Lusoga phonology. Masters Thesis, Afrikaanse Taalkunde, Leiden University.