CHAPTER 4

ROOT FAITHFULNESS

4.1 Introduction

In the preceding chapters, I have examined positional privilege effects in a variety of positions which are defined either partially or entirely in phonological terms. Positional faithfulness effects are also exhibited by root morphemes, a category in which membership is determined solely by morphological criteria. The dispersion of faithfulness constraints along root/non-root lines, originally proposed and developed by McCarthy & Prince (1994b, 1995), has been applied to both featural and segmental faithfulness constraint families.

Cross-linguistically, root morphemes exhibit a more extensive and more marked inventory of segments, and of prosodic structures, than do affixes and content morphemes. Examples of such asymmetries, accounted for with high-ranking root faithfulness constraints, include the restriction of Arabic pharyngeal consonants to roots (McCarthy & Prince 1995:365), the absence of contrastive [back] specifications on affixes in Turkish, Hungarian, Finnish and a number of other Uralic and Altaic languages (Steriade 1993c, 1995; McCarthy & Prince 1995:365; Ringen 1997; Ringen & Vago 1997), and the limitation of laryngealized stops to roots in Cuzco Quechua (Parker 1997). A more complex case of morphologically dispersed faithfulness can be found in Japanese, where the accent patterns of nouns exhibit greater variety and more contrasts than do those of verbs; Smith (1996) proposes that this distinction is enforced by a ranking of noun faithfulness over verb faithfulness, with a necessary dispersion of root faithfulness constraints according to lexical category. In a related vein, Urbanczyk (1996) argues that reduplicative affixes in Lushootseed fall into two classes, those which pattern with roots, and those which pattern with the clearly affixal, non-reduplicative morphemes in the language. Those affixes which are root-like exhibit more marked syllable structure (allowing codas) than do the "true" affixes (prohibiting codas).

Root morphemes also exhibit privileged behavior in the presence of phonological alternations, triggering or failing to undergo processes which affect affixes. Perhaps the most familiar examples are cases of root-controlled vowel harmony, in which the values of a particular feature are spread from root to affix, but not vice versa. The familiar palatal and labial harmonies of Turkish, Finnish, Hungarian and a host of related languages fall into this class. Derived environment effects on the application of featural spreading rules have also been attributed to high-ranking root faithfulness constraints by Selkirk (1995). The dominance of root properties emerges in stress systems as well. In one case, that of Cupeño, stress clash between inherently stressed morphemes is resolved in favor of the lexical stress on the root, regardless of the linear position of the lexical stresses in question (Alderete 1997b). (That is, root stress "wins" over both prefix and suffix stress, though inherent affix stress does surface in the presence of an unaccented root.)

There is psycholinguistic evidence for the hegemony of roots over affixes, as well. A variety of recognition studies have provided support for the claim that lexical storage and access are root, rather than affix, based. Some of this evidence is summarized in (1).

(1) Processing evidence for root prominence

- Regularly inflected forms have a priming effect on root comparable to effect of bare root itself (Stanners et al 1979, Kempley & Morton 1982, Fowler et al 1985). For example, presentation of "pouring" facilitates later recognition of "pour" to the same extent that prior presentation of the bare root itself does.
- Same/different judgments are faster for roots than for inflections (Jarvella & Meijers 1983). Subjects can more quickly determine that "pouring" and "poured" contain the same root than they can determine that "kissed" and "poured" contain the same inflectional affix.
- Morphologically complex words are recognized more quickly following the presentation of another word containing the same root, but prior presentation of an affix does not produce the same effect (Emmorey 1989). For example, recognition of "permit" is facilitated by prior presentation of "submit", but the prior presentation of "submit" does not speed the recognition of "subscribe".

The importance of roots in processing, as opposed to affixes and non-root function items, is mirrored in the grammar in the form of positional faithfulness constraints which are sensitive to root membership. I turn now to an examination of the role of featural IDENT-ROOT constraints in a number of languages.

4.2 Contrast Maintenance in Roots

4.2.1 Introduction

As we have seen in the preceding chapters, positional maintenance of contrast is one type of positional privilege effect which can be captured via high-ranking positional faithfulness constraints. Syllable onsets, root-initial syllables and stressed syllables all resist the neutralization of contrast which is characteristic of non-prominent positions in a great many languages. Roots also exhibit this positional maintenance of contrast, relative to affixes and function words. In many languages, affixes and function words "underexploit the phonetic possibilities available" (Willerman 1994: 16), systematically excluding segments which are robustly attested in roots in the languages in question.

This asymmetry has not escaped notice; Bolinger & Sears (1981:58) observed that, "System morphemes (as opposed to content morphemes) might be said to lack phonetic bulk. As a class, they are usually insignificant in terms of their small number of phonemes and their lack of stress." Focusing specifically on clicks, Swadesh (1971: 130) reported that, "The unusual thing about the click languages is that these sounds are part of ordinary verbs, nouns, and adjectives...In fact, the number of Hottentot major roots beginning in clicks runs to about 70 percent of the total; interestingly, demonstratives, pronouns, and particles do not have them."

These observations are borne out in a number of statistical and descriptive studies of open/closed class distinctions. For example, Willerman (1994) examined the pronoun paradigms of 32 typologically diverse languages, comparing the incidence of segments in pronouns with their overall frequency of use in the language at large. She identified significant deviations from the predicted frequency of occurrence for a number of articulatory variables. Clicks, affricates, uvulars, ejectives and secondarily articulated consonants all occurred with *less* than predicted frequency (relative to their rate of occurrence in roots) in the pronoun paradigms examined; bilabials, glottals, nasals and approximants occurred with *greater* than predicted frequency. Working with an independently developed scale of articulatory simplicity/complexity, Willerman found that the infrequently occurring segments were those which are relatively more complex. Conversely, the segments that are overrepresented in pronominal paradigms are typically the most simple, from an articulatory standpoint.

There are a number of root/affix asymmetries of this sort which have been documented in descriptions of specific languages. Some representative cases are listed in (2).

(2) Root-based positional neutralization effects

Language:	**Roots contain:**	**Affixes contain:**
Arabic (McCarthy & Prince 1995)	A variety of consonants, including the pharyngeals ¿ and ?	No pharyngeals
German (Bach 1968)	A wide range of segments, including affricates, palatal and velar fricatives, front rounded vowels	Inflectional suffixes contain only {s, t, n, r, \}
!Xóõ (Traill 1985)	An extremely large consonant inventory, including clicks at several places of articulation, with several accompaniments	Grammatical morphemes contain only {b, t, k, s, n, l}
Cuzco Quechua (Parker & Weber 1996)	Plain, ejective and aspirated stops	Only plain stops
Zulu, Xhosa (Doke 1990)	Plain, voiced, nasal and aspirated clicks at three places of articulation	No clicks

The examples in (2), along with a variety of similar cases, arise from the interaction of IDENT-ROOT(F) and IDENT(F) with featural and segmental markedness constraints in the familiar positional privilege ranking pattern illustrated in (3).

(3) Positional privilege ranking, roots
IDENT-ROOT(F) » $\mathbb{C}$ » IDENT(F)

The ranking of IDENT-ROOT(F) over some constraint or constraints $\mathbb{C}$ which favor phonological alternation in the feature F will ensure that that feature is faithfully realized within the root. However, subordination of the context-free IDENT(F) constraint will result in neutralization of contrast in non-root morphemes—a pattern of interaction which is familiar from the examination of positional faithfulness effects in preceding chapters.

4.2.2 Case Study: Southern Bantu Clicks

As an example, let us consider the distribution of clicks in Zulu and Xhosa, two Bantu languages of South Africa. The inventories of both languages contain clicks at three places of articulation: dental [|], post-alveolar [!] and lateral [||]. Contrasts in nasality and phonation type are also realized among the clicks. In Zulu and Xhosa, clicks may appear within roots (in initial or non-initial syllables), but never occur in affixes. Some examples of Zulu roots containing clicks are given in (4); Xhosa examples appear in (5).

(4) Some Zulu clicks (Beckman 1994a)

$|up^{h}a$	'trap!'
|ula	'sing!'
˜|oma	'praise!'
$!^{h}asa$	'slap!'
g|oboza	'dip!'

(5) Xhosa clicks (Ladefoged 1993)

úku-$|^{h}$óla	'to pick up'
ukú-$||^{h}$oia	'to arm oneself'
ukú-˜!ola	'to climb up'
ukú-˜||iia	'to put on clothes'
ukú-˜£||ó˜£||a	'to lie on back knees up'

Click consonants are distinguished from non-clicks by the airstream mechanism which is used in their production. Clicks are produced with an ingressive velaric airstream [IVA], while most consonants are produced with an egressive pulmonic airstream. Assuming, for the purposes of demonstration, that clicks bear a feature [IVA], the distributional restriction on clicks in Zulu and Xhosa derives from the constraints in (6), with the ranking in (7).

(6) Click constraints, Zulu and Xhosa

IDENT-ROOT(IVA)
Let β be an output segment contained in a root, and α the input correspondent of β. If β is [γIVA], then α must be [γIVA].
"A root segment and its output correspondent must have identical specifications for the feature [IVA]."

IDENT(IVA)
Let α be an input segment and β its output correspondent. If α is [γIVA], then β must be [γIVA].
"An input segment and its output correspondent must have identical specifications for the feature [IVA]."

*IVA
"No ingressive velar airflow."

(7) Root faithfulness ranking, Zulu and Xhosa

IDENT-ROOT(IVA) » *IVA » IDENT(IVA)

The ranking of IDENT-ROOT(IVA) above *IVA in (7) will allow clicks to occur freely within the root, as shown in (8). Any deviations from the input airstream specification of a root consonant will result in a fatal violation of IDENT-ROOT(IVA).

(8) Clicks are permitted in roots

	/úku-|hóla/	IDENT-ROOT(IVA)	*IVA	IDENT(IVA)
a. ☞	úku|hóla		*	*
b.	úkukhóla	*!		

Candidate (8b), in which the more marked ingressive airstream mechanism of the input click has been replaced by an egressive pulmonic airstream specification, incurs a fatal violation of IDENT-ROOT(IVA). The faithful (8a) is optimal. Parallel results obtain for any input click, provided that it is sponsored by a root morpheme.

In the affixal arena, however, a different picture emerges. There are no Zulu or Xhosa affixes which contain clicks, and the grammar must account for this distributional regularity. The constraint subhierarchy in (7) will prohibit the surface occurrence of clicks in affixes, even if clicks are present in the input. This is demonstrated in (9), with a hypothetical, click-containing prefix. A click is also assumed in the root, to more directly illustrate the contrast between root and affix behavior.

(9) Clicks are prohibited in affixes

	/ú!u-|hóla/	IDENT-ROOT(IVA)	*IVA	IDENT(IVA)
a.	ú!u|hóla		**!	
b. ☞	úku|hóla		*	*
c.	ú!ukhóla	*!	*	*
d.	úkukhóla	*!		**

Candidates (9c,d) are ruled out by their fatal violations of IDENT-ROOT(IVA); input root clicks must remain clicks in the output. Of the two remaining candidates, (9b) is optimal; it incurs fewer violations of the markedness constraint *IVA than does the fully faithful (9a). Under this ranking, so long as root faithfulness is satisfied, the decision is passed to the markedness constraint—and the markedness constraint will always rule in favor of less marked structure. Clicks in affixes, which are not protected by IDENT-ROOT, must be unfaithfully rendered in the output.

The Southern Bantu clicks present a straightforward example of root-based positional maintenance of contrast. Here, there is no evidence to suggest that IDENT-ROOT(IVA) is crucially dominated by any constraint which impacts on the distribution of clicks. However, there are languages which both exhibit root faithfulness effects and give evidence that root faithfulness constraints are crucially dominated. One such case is that of glottalized and aspirated stops in Cuzco Quechua.

4.2.3 OCP Effects in Cuzco Quechua

Cuzco Quechua exhibits a number of interesting root-based effects in the distribution of glottalized and aspirated stops. There are three series of stops in the phonetic inventory: plain, glottalized and aspirated. According to Parker & Weber (1996) and Parker (1997), the glottalized and aspirated stops of the language are subject to a number of restrictions in their distribution. Glottalized and aspirated stops occur only in roots; they never surface in affixes. Furthermore, only one laryngealized segment is permitted within a given root; glottalized and aspirated segments may not cooccur. These generalizations suggest a role for root faithfulness, but one in which root faithfulness is subordinated to the OCP. The constraints listed in (10) are central to the analysis:[1]

(10) Laryngealization constraints, Cuzco Quechua

IDENT-ROOT(glottis)
Let β be an output segment contained in a root, and α the input correspondent of β. If β is [γcg], then α must be [γcg]. If β is [γsg], then α must be [γsg].
"A root segment and its output correspondent must have identical specifications for the features [constricted glottis] and [spread glottis]."

IDENT(glottis)
Let α be an input segment and β its output correspondent. If α is [γcg], then β must be [γcg]. If α is [γsg], then β must be [γsg].

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[1] For a complete, and slightly different, positional faithfulness analysis of Cuzco Quechua, the reader is referred to Parker (1997). There it is argued that the features [constricted glottis] and [spread glottis] are floating in underlying representation, and that featural MAX constraints (MAX-ROOT(constricted glottis) and MAX-ROOT(spread glottis) are required to account for the full range of CQ facts. This seems likely to be correct, but a full examination of the IDENT(F)/MAX(F) distinction is beyond the scope of this dissertation. I will leave this as a matter for future research; the choice of floating vs. associated features will not undermine the point at hand.

"An input segment and its output correspondent must have identical specifications for the features [constricted glottis] and [spread glottis]."

*[cg]	*[sg]
"No constricted glottis"	"No spread glottis"

OCP: Glottis
"Adjacent glottal specifications are prohibited"[2]

The limitation of laryngealized stops to roots calls for the ranking shown in (11). Glottalized or aspirated stops may surface in roots, but they may never occur in affixes; this is achieved by the placement of the markedness constraints *[cg] and *[sg] in the midst of the faithfulness constraints which regulate these features.

(11) Positional neutralization subhierarchy, Cuzco Quechua
IDENT-ROOT(glottis) » *[cg], *[sg] » IDENT(glottis)

In a manner entirely parallel to the case of clicks in Southern Bantu, (11) will permit laryngealized segments only in roots. This is shown in (12)–(14).

(12) Glottalized stops are permitted in roots

/t'anta/ 'bread'	IDENT-ROOT(glottis)	*[sg]	*[cg]	IDENT(glottis)
a. ☞ t'anta			*	
b. tanta	*!			*
c. tant'a	*!*		*	**

(13) Aspirated stops are permitted in roots

/p^{h}atay/ 'explode'	IDENT-ROOT(glottis)	*[sg]	*[cg]	IDENT(glottis)
a. ☞ p^{h}atay		*		
b. patay	*!			*
c. pat^{h}ay	*!*	*		**

In each of these cases, the fully faithful candidate is optimal; no deviations from input laryngealization are permitted, due to high-ranking IDENT-ROOT(glottis). Compare this with the case in (14), where the input includes a hypothetical suffix containing an aspirated stop. ([-kuna] is a pluralizing suffix in the language.)

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2 This formulation is obviously preliminary. See Itô & Mester (1996) and Alderete (1997a) for recent OT treatments of the OCP. Note that Cuzco Quechua has voiced obstruents only in Spanish loanwords. In the core vocabulary , it is probably sufficient to state the OCP over laryngeal specifications (assuming privativity).

(14) Aspirated stops are not permitted in affixes

/tanta-kʰuna/	IDENT-ROOT(glottis)	*[sg]	*[cg]	IDENT(glottis)
a. tantakʰuna		*!		
b. ☞ tantakuna				*
c. tʰantakuna	*!	*		**

Under this constraint ranking, the fully faithful (14a) can never be optimal, for it incurs a markedness violation not assessed the neutralizing candidate (14b). Because *[sg] dominates the context-free constraint IDENT(glottis), the neutralizing candidate wins. Candidate (14c) shows that aspiration cannot be shifted back onto the root; IDENT-ROOT(glottis) prevents migration of this sort.

As noted above, laryngealized consonants are not permitted to cooccur within a root. This restriction holds across laryngeal features; the language has no roots which contain combinations of glottalized and aspirated segments. Nor does it permit multiple instances of glottalization or aspiration. This fact is not captured by the constraint ranking presented above, for the ranking of IDENT-ROOT(glottis) above the markedness constraints *[cg] and *[sg] predicts that any number of laryngealized segments may surface in a root. This is illustrated, with a hypothetical input, in (15).

(15) Multiple laryngealized segments are permitted

/pʰat'ay/	IDENT-ROOT(glottis)	*[sg]	*[cg]	IDENT(glottis)
a. 💣 pʰat'ay		*	*	
b. patay	*!*			**
c. pʰatay	*!	*		*

Candidate (15a) incorrectly surfaces intact, with two laryngealized segments. Competing candidates in which one or both laryngealized segments have been neutralized fatally violate undominated IDENT-ROOT(glottis).

In order to prevent the surface occurrence of candidates such as (15a), a constraint or constraints which penalize multiple laryngealized consonants must dominate IDENT-ROOT(glottis). Parker & Weber (1996) and Parker (1997) argue that the responsible constraint is the Obligatory Contour Principle (Leben 1976; Goldsmith 1976; McCarthy 1979, 1986; Mester 1986; Odden 1986, 1988). Localized to laryngeal specifications, the OCP will prevent the cooccurrence of [cg] and [sg], as well as preventing the cooccurrence of multiple instances of either of the individual features. When IDENT-ROOT(glottis) is dominated by this OCP over laryngeal specifications, the correct results obtain. This is illustrated in (16), where the hypothetical root from (15) is taken as input.

(16) Multiple laryngealized segments are prohibited

/pʰat'ay/	OCP	IDENT-RT(glottis)	*[sg]	*[cg]	IDENT(glottis)
a. pʰat'ay	*!		*	*	
b. patay		**!			**
c. ☞ pʰatay		*	*		*

In the event that multiple laryngealized segments are input to the grammar, only one will be permitted to surface, even though all of the segments in question may be affiliated with the root.[3] This is due to the ranking of the OCP above the root faithfulness constraint IDENT-ROOT(glottis). While this constraint, ranked above the markedness constraints *[cg] and *[sg], does play an important role in restricting laryngealized segments to roots, it is itself trumped by a higher-ranking constraint. This general ranking configuration, $\mathbb{C}_i$ » IDENT-ROOT » $\mathbb{C}_j$ » IDENT, must obtain in any language which permits a feature or segment to occur within roots, but only in specific, limited circumstances. OCP languages present one class of such cases, but other constraints, including other positional faithfulness constraints, may fill the $\mathbb{C}_i$ slot in this ranking schema. I turn to such a case in §4.3.

4.3 A Case Study in Positional Interactions: Ibibio Consonant Assimilation

4.3.1 Introduction

Having examined a wide range of positional faithfulness effects in a variety of positions, I will close the discussion of featural positional faithfulness effects with a discussion of Ibibio consonant clusters. Consonant assimilation effects in Ibibio provide evidence for the relative ranking of three sets of positional faithfulness constraints. Crucially, both the IDENT-ROOT and

[3] The laryngealized segment which survives in the output is always the leftmost one. See Parker & Weber (1996) and Weber (1997) for an account of this generalization.

IDENT-ONSET constraints which are relevant must be low-ranking, with only IDENT-σ_1 ranked above the markedness constraints which favor phonological alternation.

Ibibio is a Nigerian language which, according to Greenberg (1963), belongs in the Benue Congo branch of the Niger-Congo family. It is further classified as a Lower-Cross language of the Cross-River subfamily. The verbal system of Ibibio exhibits a number of interesting positional privilege effects. These effects are most clearly seen in the behavior of consonants clusters, which are always homorganic. This is true both of root-internal clusters, and of clusters formed by the concatenation of roots and suffixes. (Most of the verbal morphology of Ibibio is suffixal, with suffixes imposing a variety of prosodic requirements on the base. See Akinlabi & Urua 1993 for extensive discussion of the templatic requirements imposed by Ibibio affixes.)

Verb roots in Ibibio are typically monosyllabic, and may have CV, CVC or CVVC shapes.[4] Representative examples are given in (17).

(17) Monosyllabic verb roots (Akinlabi & Urua 1993)

wà	‘sacrifice’	wàt	‘paddle’	wààk	‘tear’
sé	‘look’	dép	‘buy’	déép	‘scratch’
kpø`	‘carry’	kø`˜	‘knock (on the head)’	kø`ø`˜	‘hang up (a dress)’
nø`	‘give’	dóm	‘bite’	fáák	‘wedge between 2 obj.’
dá	‘stand’	dát	‘take/pick up’	µø`ø`n	‘crawl’

Synchronically underived disyllabic verb roots are also attested in the language. Such roots may have the form CVCCV, CVVCV, or CVCV, as illustrated in (18).

(18) Disyllabic verb roots (Akinlabi & Urua 1993: 4)

dáppá	‘dream (vb.)’	fáá˜á	‘argue’	sà˜á	‘walk’
dámmá	‘be mad’	yø'ø'˜ø'	‘plaster a wall’	sárá	‘comb’
dø'kkø'`	‘tell’	yèèmé	‘wilt’	bø'©ø'	‘overtake’
tèmmé	‘explain’	dààrá	‘rinse’	fè©é	‘run’

4 The absence of a contrast between surface CVV and CV roots is striking. Akinlabi & Urua (1993) discuss various analytic alternatives, including the suggestion that CV forms are derived from bimoraic CVV by a rule of post-lexical truncation. No clear conclusions are reached, but the discussion makes it clear that the CV structures are not restricted to phrase-final position. This is not obviously a case of final shortening, though such an analysis may be possible, given additional information about the syntax of the language. I will not provide an analysis of this gap in the root inventory.

As the leftmost examples in (18) illustrate, root-internal consonant clusters are always composed of identical segments; no differences in place or manner of articulation are permitted. This pattern holds of derived root+suffix combinations, as well, as illustrated in the data below. The monomorphemic examples of (18), repeated in (19), are contrasted with root+negative suffix cases in (20). All data are taken from Akinlabi & Urua (1993).

(19) Ibibio consonant clusters, monomorphemic words

dá**pp**á	‘dream (vb.)’
dá**mm**á	‘be mad’
dø'**kk**ø'	‘tell’
bà**kk**á	‘divide’
tè**mm**é	‘explain’

(20) Ibibio consonant clusters, negative verb forms

a.	í-dép-**p**é	‘he is not buying’	dép	‘buy’
	í-bót-**t**ó	‘he is not molding’	bót	‘mold’
	í-µèk-**k**é	‘he is not shaking’	µèk	‘shake’
	n'-nám-**m**á	‘I am not performing’	nám	‘do/perform’
	n'-kø`˜-**˜**ø'	‘I am not knocking’	kø`˜	‘knock’
cf.				
b.	˜'-kàà-©á	‘I am not going’	ka‡	‘go’
	n'-séé-©é	‘I am not looking’	sé	‘look’
	n'-dóó-©ó	‘I am not’	dó	‘be (copula)’
	...dáppá-**k**é	‘...not dreaming’	dáppá	‘dream’
	...dø'kkø'-**k**é	‘...not telling’	dø'kkø'	‘tell’

Several interesting points emerge from a study of the forms above. The data in (19), illustrative of a general pattern in polysyllabic roots, indicate that Ident-Root must be dominated by a constraint or constraints favoring total assimilation in consonant clusters. Though there are no overt alternations in (19), the grammar must be able to explain the absence of non-geminate clusters within roots. Only if faithfulness within the root is subordinated to higher-ranking markedness constraints can this result be achieved. One possible ranking is sketched in (21).

(21) Only geminate clusters within roots
*Place, *Manner » Ident-Root(Place), Ident-Root(Manner)[5]

[5] Parallel to the discussion of voice assimilation in Chapter 1, we might adopt Share(Place) and Share(Manner) as alternatives to *Place and *Manner above. Though the choice may have important consequences cross-linguistically, it will not be crucial to the discussion here.

With the opposite ranking of faithfulness and markedness constraints, we would expect to find a full range of place and manner specifications on either consonant in an internal cluster. That such a range of clusters is not found indicates that the ranking in (21) must hold—but this ranking does not indicate which of the root consonants determines the final outcome. Based on the discussion of onset faithfulness in Chapter 1, the prediction is clear: high-ranking IDENT-ONSET should ensure that place and manner features spread regressively from the onset of the second syllable to the coda of the first. Because monomorphemic verb roots never exhibit alternations in root-internal clusters, it would appear that we have no evidence to contradict this prediction of onset faithfulness.

However, counterevidence is provided by the behavior of consonant clusters in derived forms. Consider the data in (20), repeated in (22). In these data, the suffix-initial consonant alternates between a complete copy of the preceding consonant, as in (22a), and a dorsal [k] or [©][6], as in (22b).

(22) Ibibio consonant clusters, negative verb forms

a.	í-dép-**p**é	‘he is not buying’	dép	‘buy’
	í-bót-**t**ó	‘he is not molding’	bót	‘mold’
	í-µèk-**k**é	‘he is not shaking’	µèk	‘shake’
	n'-nám-**m**á	‘I am not performing’	nám	‘do/perform’
	n'-kø`˜-˜ø'	‘I am not knocking’	kø`˜	‘knock’
cf.				
b.	˜'-kàà-©á	‘I am not going’	ka‡	‘go’
	n'-séé-©é	‘I am not looking’	sé	‘look’
	n'-dóó-©ó	‘I am not’	dó	‘be (copula)’
	...dáppá-**k**é	‘...not dreaming’	dáppá	‘dream’
	...dø'kkø'-**k**é	‘...not telling’	dø'kkø'	‘tell’

Here, assimilation is overt, and clearly progressive. The suffix-initial consonant assimilates in place and manner of articulation to the preceding root-final consonant, suggesting (*contra* Chapter 1) a ranking of IDENT-CODA (Place, Manner) » IDENT-ONSET(Place, Manner). Such a ranking would dramatically increase the typology of consonant assimilation, predicting an unattested incidence of progressive spreading—an undesirable result. Furthermore, this move is

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6 See Chapter 5 for an account of the *k*.© alternation.

unnecessary; a single generalization will both account for the aberrant direction of assimilation here, and the full incidence of consonant contrasts in the monomorphemic cases of (19) above. In both cases, it is the initial syllable of the root which is exhibiting privileged behavior—allowing contrasts in place and manner which are not attested elsewhere, and triggering (rather than undergoing) assimilation. Though IDENT-ROOT(Place, Manner) and IDENT-ONSET(Place, Manner) must be low-ranking, the initial syllable faithfulness constraints crucially must dominate the markedness constraints responsible for generating assimilation.

(23) Constraint subhierarchy, Ibibio consonant assimilation

IDENT-σ_1(Pl., Man.) » *PLACE, *MANNER » IDENT-RT(Pl, Man), IDENT-ONS(Pl, Man)

This ranking will account for all of the consonant distribution effects outlined above, as I will show in §4.3.2.

4.3.2 Analysis

I will begin with an analysis of consonant distribution in monomorphemic verb roots. While non-contiguous consonants may differ from one another (24a), consonant clusters must always exhibit complete identity (24b).

(24) Consonant distribution in monomorphemes

a.	wàt	'paddle'	wààk	'tear'
	dép	'buy'	déép	'scratch'
	kø`˜	'knock (on the head)'	kø`ø`˜	'hang up (a dress)'
	dóm	'bite'	fáák	'wedge between 2 obj.'
	dát	'take/pick up'	µø`ø`n	'crawl'
b.	dáppá	'dream (vb.)'		
	dámmá	'be mad'		
	dø'kkø'	'tell'		
	bàkká	'divide'		
	tèmmé	'explain'		

This identity requirement, an extreme version of the classic Coda Condition effects examined in Chapters 1 and 2, is an important diagnostic of constraint ranking, for it indicates that faithfulness to input place and manner cannot be paramount in the grammar. While faithfulness in root-initial syllables remains an imperative, as indicated by the range of contrasts permitted in (24), faithfulness in non-initial syllables must be subordinated to markedness constraints which favor assimilation. Following the general outline of place assimilation presented in the Tamil analysis of Chapter 2, I will assume that place and manner assimilation derive from featural markedness constraints, for which *PLACE and *MANNER will serve as shorthand labels. The now-familiar positional privilege subhierarchy in (25) will generate the attested distributional asymmetries.

(25) IDENT-σ_1(Place), IDENT-σ_1(Mn) » *PLACE, *MANNER » ID(Place), ID(Mn)

This is demonstrated in the following tableaux.

Consider first the distribution of consonants in monosyllabic verb roots, as in (26).

(26) Free distribution in root-initial CVC syllables

/dóm/	ID-σ_1(Pl), ID-σ_1(Mn)	*PLACE	*MANNER	ID(Place), ID(Mn)
a. ☞ dóm		**d, m**	**d, m**	
b. dón	*!	**d, n**	**d, n**	*
c. dób	*!	**d, b**	**d, b**	*
d. dód	**!	**d, d**	**d, d**	**
e. dó̃	*!	**d, ˜**	**d, ˜**	*

In the case of a monosyllabic root, complete faithfulness is required by high-ranking IDENT-σ_1(Place) and IDENT-σ_1(Manner). There is no neutralization to a default place (arguably Dorsal in Ibibio) or manner in the coda, and no spreading of features from onset to coda.[7] Those candidates which deviate from the input are ruled out by fatal violations of IDENT-σ_1(Place) and/or IDENT-σ_1(Manner).

The polysyllabic roots provide a more interesting test case for the ranking in (25). Here, unfaithfulness is necessitated, as not all of the input consonants can be protected by the IDENT-σ_1 constraints. Consider the hypothetical root in (27).

7 Such spreading is unlikely, in any event. Major class features, primary place features and laryngeal features typically do not spread over vowels. See Clements & Hume (1995), Itô, Mester & Padgett (1995), Ní Chiosáin & Padgett (1997) for discussion.

(27) C_2 in clusters must assimilate; hypothetical root

/dápná/	ID-σ1(Pl), ID-σ1(Mn)	*PLACE	*MANNER	ID(Place), ID(Mn)
a. dáp.ná		d, p, n!	d, p, n	
b. dát.ná	*!	**d, tn**	**d, t, n**	*
c. dáp.má		d, pm	d, p, m!	*
d. dán.ná	*!*	**d, nn**	**d, nn**	**
e. ☞ dáp.pá		d, pp	d, pp	**

The candidate which exhibits total progressive assimilation, (27e), is optimal. Assimilation must progress from coda to onset, contrary to the cross-linguistically more robust regressive pattern. Due to the premium placed on initial syllable faithfulness, progressive assimilation is favored here, though onset faithfulness must necessarily be violated in the optimal output. Though, as I demonstrated in Chapter 1, IDENT-ONSET » IDENT will generally favor regressive assimilation in heterosyllabic clusters, this effect can be overridden by higher-ranking constraints. (See Lombardi 1996c for additional discussion of this point.)

Implicit in the discussion of (27) is an important point: the onset faithfulness constraints, IDENT-ONSET(Place) and IDENT-ONSET(Manner), cannot dominate the place and manner markedness constraints. Were they to do so, a full range of place and manner contrasts would be generated in all onsets, as shown in (28). (The onset constraints are arbitrarily ranked above the initial syllable constraints, though the relative ranking of the two sets has no bearing on the outcome.)

(28) High-ranking IDENT-ONSET does not permit assimilation

/dápná/	ID-ONS(Pl), ID-ONS(Mn)	ID-σ1(Pl), ID-σ1(Mn)	*PLACE	*MANNER	ID(Place), ID(Mn)
a. 💣 dáp.ná			**d, p, n**	**d, p, n**	
b. dát.ná		*!	**d, tn**	**d, t, n**	*
c. dáp.má	*!		**d, pm**	**d, p, m**	*
d. dán.ná		*!*	**d, nn**	**d, nn**	**
e. dáp.pá	*!*		**d, pp**	**d, pp**	**

Only the fully faithful (28a) can satisfy both the onset and initial syllable faithfulness constraints, and it will therefore be incorrectly selected as optimal. This result persists even when the initial syllable faithfulness constraints are ranked highest in the hierarchy. The precise character of the assimilation-favoring markedness constraints is also irrelevant to the final outcome; SPREAD(Place) and SPREAD(Manner) will have no greater impact on the outcome so long as they, too, are ranked below the onset constraints. IDENT-ONSET(Place) and IDENT-ONSET(Manner) must fall below these markedness constraints in order to account for these root-internal restrictions on consonant distribution.

(29) ID-σ_1(Pl, Mn) » *PLACE, *MANNER » ID-ONS(Pl, Mn) » ID(Pl, Mn)

With the onset constraints low-ranking, as in (29), the correct results obtain. This is shown in (30).

(30) IDENT-ONSET is low-ranking

/dápná/	ID-σ_1(Pl), ID-σ_1(Mn)	*PLACE	*MANNER	ID-ONS(Pl), ID-ONS(Mn)	ID(Place), ID(Mn)
a. dáp.ná		d, p, n!	d, p, n		
b. dát.ná	*!	**d, tn**	**d, t, n**		*
c. dáp.má		d, pm	d, p, m!	*	*
d. dán.ná	*!*	**d, nn**	**d, nn**		**
e. ☞ dáp.pá		d, pp	d, pp	**	**

When the IDENT-ONSET constraints fall below the markedness constraints in the hierarchy, they are irrelevant to the outcome, as (30) demonstrates. The optimal candidate, (30e), is chosen by its relatively unmarked status, even though onset faithfulness violations are necessarily incurred.

A parallel finding obtains when we consider the ranking of IDENT-ROOT(Place) and IDENT-ROOT(Manner). When ranked above the markedness constraints, the root faithfulness constraints would prohibit any deviations from the input place and manner specifications. This is shown in (31), where the IDENT-ROOT constraints are arbitrarily ranked above the initial syllable faithfulness constraints.

(31) High-ranking Ident-Root does not permit assimilation

/dápná/	Id-Rt(Pl), Id-Rt(Mn)	Id-σ_1(Pl), Id-σ_1(Mn)	*Pl	*Mn	Id-On(Pl), Id-On(Mn)	Id(Place), Id(Mn)
a. ☞ dáp.ná			**d, p, n**	**d, p, n**		
b. dát.ná	*!	*	**d, tn**	**d, t, n**		*
c. dáp.má	*!		**d, pm**	**d, p, m**	*	*
d. dán.ná	*!*	**	**d, nn**	**d, nn**		**
e. dáp.pá	*!*		**d, pp**	**d, pp**	**	**

Here, as in the case of high-ranking Ident-Onset, the correct results cannot be obtained. So long as Ident-Root(Place) and Ident-Root(Manner) are ranked above the markedness constraint subhierarchies, no restrictions on root consonants will be possible. The root faithfulness constraints must be dominated in order to generate the correct range of surface forms in Ibibio.

(32) Final ranking, positional faithfulness in Ibibio

Id-σ_1(Pl, Mn) » *Place, *Manner » Id-Rt(Pl, Mn), Id-Ons(Pl, Mn) » Id(Pl, Mn)

This ranking extends straightforwardly to the derived root+suffix combinations of (22), repeated in (33) below.

(33) Ibibio consonant clusters, negative verb forms

a.	í-dép-**p**é	'he is not buying'	dép	'buy'
	í-bót-**t**ó	'he is not molding'	bót	'mold'
	í-µèk-**k**é	'he is not shaking'	µèk	'shake'
	n'-nám-**m**á	'I am not performing'	nám	'do/perform'
	n'-kø`˜-˜ø'	'I am not knocking'	kø`˜	'knock'
cf.				
b.	˜'-kàà-©á	'I am not going'	ka‡	'go'
	n'-séé-©é	'I am not looking'	sé	'look'
	n'-dóó-©ó	'I am not'	dó	'be (copula)'
	...dáppá-**k**é	'...not dreaming'	dáppá	'dream'
	...dø'kkø'-**k**é	'...not telling'	dø'kkø'	'tell'

Here, the underlying suffix-initial dorsal consonant assimilates completely in place and manner to the preceding consonant. This is parallel to the behavior of root-internal consonant clusters, and follows from the constraint subhierarchy of (32).

(34) Assimilation in derived forms

/nám-ká/	ID-σ1(Pl), ID-σ1(Mn)	*PL	*MN	ID-RT(Pl), ID-RT(Mn)	ID-ON(Pl), ID-ON(Mn)	ID(Place), ID(Mn)
a. nám.ká		n, m, k!	n, m, k			
b. nám.˜á		n, m, ˜!	n, m˜		*	*
c. nám.pá		n, mp	n, m, p!		*	*
d.☞ nám.ma		n, mm	n, mm		**	**
e. ná˜.ká	*!	**n, ˜k**	**n, ˜, k**	*		*
f. nák.ká	*!*	**n, kk**	**n, kk**	**		**

Candidates (34e,f) are ruled out by violations of the undominated IDENT-σ1 constraints; no regressive assimilation is possible. Of the remaining candidates, (34d) is optimal because it incurs the fewest *PLACE and *MANNER violations. Total assimilation is favored, even at the expense of IDENT-ONSET violations.

4.3.3 Conclusions

The distribution of consonant contrasts in Ibibio verbs constitutes an interesting test case for an elaborated array of featural positional faithfulness constraints. In this language, faithfulness in root-initial syllables is paramount, taking precedence over markedness constraints which favor consonant assimilation. Crucially, faithfulness constraints which regulate onsets and roots at large are necessarily low-ranking, trumped by the markedness constraint subhierarchies *PLACE and *MANNER. It is clear from this discussion that featural faithfulness constraints specific to many different positions of prominence may interact in the same grammar, producing interesting results. In the next chapter, I will shift the focus from the featural to the segmental, examining the interaction of positional MAX constraints with other constraints in the grammar.