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Root and Pattern Morphology in Coptic: Evidence for the Root*

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1. Introduction

The primary goal of this paper is to develop an Optimality Theory (Prince and Smolensky 1993/2004) analysis of the root and pattern morphology of Coptic. Coptic (spoken ca. 300-1300 C.E.) was the last stage of the Ancient Egyptian language, and its root and pattern morphology has not previously been analyzed from a synchronic perspective. Specifically, I aim to determine whether the consonantal root is relevant for the Coptic data, taking into account much recent research that downplays or eliminates the role of the root in root and pattern morphology (McCarthy 1993, Bat-El 1994, Ussishkin 2000, et al.). Ultimately, I conclude that reference to the consonantal root is necessary, and develop an Optimality Theory analysis where the root is an essential part of the input.

The paper is structured as follows. Section two contains an overview of Coptic morphology and phonology, and Section three reviews the evidence for the consonantal root. The Optimality Theory analysis is laid out in Section four, and Section five concludes.

2. Coptic Verbal Morphology and Prosody

The Ancient Egyptian language is its own separate branch of the Afroasiatic family tree (sister to the Semitic languages, Berber, etc.). It had five distinct stages of development, of which Coptic was the last. Coptic was spoken from approximately the fourth to the fourteenth centuries C.E., and it is still used liturgically in the Coptic church. All Coptic

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data in this paper are from the Sahidic dialect, and come from Lambdin 1983, Layton 2000, or Reintges 2004.

2.1 Verbal Morphology

In Coptic, most verbal affixes are prefixes.[1]

(1) a. a-sotM PAST-hear 'heard'
b. na-sotM FUTURE-hear 'will hear'
c. Nta-sotM PLUPERFECT-hear 'has heard'

However, the stative (an aspectual class) and the infinitive are expressed by word-internal vocalic changes, i.e., root and pattern morphology.

(2)

Root Type	Root	Infinitive		Stative	
Biconsonantal	a. kt	kot	'to build'	ket	'is built'
Triconsonantal	b. stm	so.tM	'to hear'	sɔ.tM	'is heard'
Quadri-consonantal	c.wstn	wɔs.tN	'to broaden'	wS.ton	'is broadened'

The three patterns in (2) are the most common alternations in the data, and the analysis I develop will focus on accounting for them.[2]

2.2 Phonotactics and Prosody

Coptic has fairly liberal phonotactic restrictions. Simple codas, complex onsets, and onsetless syllables are all allowed. However, complex codas are unattested. One of the most striking aspects of Coptic phonotactics is that any segment can be a syllable nucleus, from a voiceless stop to a low vowel (this is quite similar to Imdlawn Tashlhiyt Berber, which is distantly genetically related to Coptic; see Dell and Elmedlaoui 1985 et seq.). Direct evidence about syllable nucleus status is available through an orthographic convention called the superlinear stroke, a straight line which was placed above consonantal nuclei (see Depuydt 2005 and references therein). The table in (3) contains examples of syllable nuclei for several different kinds of segments, both in Coptic script with the superlinear stroke, and in phonetic transcription.[3]

[1] X = x is a syllable peak. Any segment can be a peak in Coptic (see Section 2.2).

[2] See Reintges 1994 for a diachronic analysis of root and pattern morphology in Ancient Egyptian as a whole.

[3] Coleman (1996 et seq.) has argued that, for the Berber data, syllables with alleged consonantal nuclei actually contain a very reduced schwa. Without phonetic evidence, it may be impossible to determine whether this holds for Coptic as well. In my analysis below, for the sake of consistency, I will treat the consonantal nuclei as if they were genuine syllable nuclei.

(3)

Nucleus	Coptic : IPA	Gloss
voiceless stop[4]	`morT` : mɔ.rT	beard
voiceless fricative	`sa¥F` : sa.ʃF	seven
voiceless affricate	`pwrJ` : po.rTʃ	to divide
voiced fricative	`tBt` : tβt	fish

Looking next at prosody, it may seem that descriptive generalizations about Coptic foot form would be difficult, if not impossible, to prove since Coptic is no longer spoken natively. However, Coptic does have extensive vowel reduction to schwa or a syllabic consonant in unstressed syllables. Since most morphologically simplex words in Coptic are fairly short, there is often only one syllable in a word that is not reduced, and this syllable can be assumed to be stressed. In bisyllabic words, the stressed syllable is most often on the left.

(4)

a. só.tM	'to listen'	d. ké.mə	'Egypt'
b. té.nə	'dam, dike'	e. βó.tə	'to pollute'
c. nú.rə	'vulture'	f. pó.rK	'foal'

All the words in (4) are moraic trochaic feet, and I will assume henceforth that this is the basic foot form of Coptic.

There is additional evidence from vowel reduction that Coptic has one main stress per word, as far to the right edge of the word as possible, and no secondary stress. This is shown most clearly in very long words, where there is only one full (non-reduced) vowel on or near the right edge.

(5) [N-tN-Nt-mNt-(sá.βə)]
and-1PL-bring-ABSTRACTNOUN-wise
'and we bring wisdom'

(5) has only one stressed syllable in one trochaic foot (sá.βə) on the far right edge. There was probably no secondary stress since all the other vowels are reduced.

3. Root or Word

In this section, I discuss whether reference to a consonantal root is required for an analysis of Coptic root and pattern morphology. In the seminal generative account of root and pattern morphology developed by McCarthy (1979 et seq.), the consonantal root is a separate morpheme and an indispensable part of word formation. However, in more recent research, it has been proposed that the consonantal root is irrelevant for some or all root and pattern word formation processes (Hebrew: Bat-El 1994, 2003ab, Ussishkin 2000, 2005; Arabic: McCarthy 1993, Benmamoun 2003; Ethiopian Semitic: Rose 2003,

[4] Coptic does not have voiced stops, except in loan words from Greek.

Buckley 2003, et al.). In this approach, the base for word formation is not a consonantal root, but an output form that has already been derived, and the word formation process is subject to Output-Output Faithfulness (Benua 2000). The vowels of the base are overwritten by the vowels of the affix, and overwriting occurs instead of suffixation or prefixation in order to satisfy strict prosodic constraints (the Optimality Theory counterpart of the traditional template).

I start by assuming an output-output approach for Coptic. Initially, this kind of account looks promising, as discussed in Section 3.1. However, the empirical evidence indicates that the consonantal root must be the base for affixation, and this evidence is presented in Section 3.2.

3.1 Output-Output Approach

Recall that root and pattern morphology occurs in the infinitive and stative verb forms in Coptic (see (2)). The hypothesis that I will initially adopt is that the infinitive is the base for the stative, i.e. the input for the stative is the (already-derived) infinitive plus a vocalic stative affix. There are several reasons to consider the infinitive more "base-like" than the stative. First, it is the base for prefixal verbal morphology in Coptic, e.g. the prefixes in (1) attach to infinitives. Also, the infinitive is less marked semantically than the stative. It is "the main lexical form of the verb" (Lambdin 1983: 21), and used in a wide variety of different morphological contexts, whereas the stative has an easily characterizable meaning (state aspect) and is used only when that meaning is called for. There is also an apparent TETU effect in the stative: degenerate (monomoraic) feet are not allowed in the stative, but are allowed in the infinitive. This is very much like Ussishkin's (2000, 2005) account of Modern Hebrew, where it is monosyllabic feet that are only allowed in the base.

(6)	Infinitive	Stative	Gloss
	a. kβɔ	keβ	'make cool'
	b. si	seu	'satisfy'

In (6), the infinitive [kβɔ] is a degenerate foot, but the stative form [keβ] is not. Similarly, the infinitive [si] is a degenerate foot, but the stative form [seu], with a diphthong, has two moras. The relevant markedness constraint here is FTBIN(μ).

(7) FTBIN(μ)
Feet are binary on the moraic level.

To account for the degenerate foot infinitives, FTBIN(μ) must be ranked below FAITH-IO, which the infinitive is subject to. However, to rule out degenerate foot statives, FTBIN(μ) must be above FAITH-OO, which the stative is subject to. The resulting TETU ranking is in (8).

(8) FAITH-IO >> FTBIN(μ) >> FAITH-OO

This is illustrated in Tableaux (9) for the infinitives and (10) for the statives.

(9)

/kβɔ/ 'to make cool'	FAITH-IO	FTBIN(μ)
☞ a. (kβɔ)		*
b. (kɔβ)	*!	

In (9), Candidate (a) is the winner, despite the fact that it is a degenerate foot and violates FTBIN(μ). The non-degenerate candidate is eliminated since it violates FAITH-IO (specifically, the constraint LINEARITY). Essentially, input-output faithfulness cannot be given up for foot structure.

(10)

/kβɔ + e / 'to make cool' + STAT	FTBIN(μ)	FAITH-OO
☞ a. (keβ)		*
b. (kβe)	*!	

The input for (10) is the infinitive plus a vocalic stative affix. Candidate (a) wins even though it violates FAITH-OO (specifically, the constraint O-CONTIGUITY), because is a well-formed bimoraic foot. Candidate (b) is a degenerate foot, like the winning candidate in (9), and it loses because faithfulness between output forms can be sacrificed to satisfy foot structure, unlike faithfulness between an input and an output.

Although an output-output approach seems to characterize the data well, there is substantial morphophonological evidence that the consonantal root plays a crucial role in the formation of the stative. I examine the evidence in the next section.

3.2 Evidence for the Root

If the relationship between the infinitive and the stative were subject to Output-Output faithfulness constraints, the stative would be expected to be faithful to some of the properties of the infinitive. Several researchers (Bat-El 1994, Ussishkin 1999) have used these "transfer effects" between a base and an output form to argue for an Output-Output relationship. However, the stative for any given verb in Coptic is insensitive to the phonological properties of the infinitive. Instead, the form of the stative can only be reliably predicted from the number of root consonants, i.e., there is a basic biconsonantal stative pattern, a basic triconsonantal pattern, and so on for each kind of root. This strongly suggests that the base for the stative is a consonantal root, and not an infinitive.

The first kind of evidence against a faithfulness relationship between the infinitive and the stative comes from anomalous infinitives; their anomalies never have an effect on the form of the stative. For example, some biconsonantal verbs have an uncharacteristic final vowel in the infinitive. However, the statives of these verbs are like the statives for other biconsonantal verbs, with a CeC pattern.

(11)

Root	Infinitive	Stative	Gloss
a. βt	βo.tə	βet	'to pollute' / 'to be polluted'
b. st	si.tə	set	'to throw' / 'to have thrown'
c. fk^j	fo.k^jə	fek^j	'to leap' / 'to have leapt'

Under an OO-analysis, the loss of the final schwa from the infinitive to the stative cannot be predicted, as shown in the tableau in (12).

(12)

/βotə + e/ 'to pollute' + STAT	FAITH-OO	NOCODA
💣 a. (βé.tə)	*	
☞ b. (βét)	**	*

Candidate (a) violates FAITH-OO because one of the base vowels has been overwritten, but it is otherwise well-formed. In Candidate (b), the attested form, one of the base vowels has likewise been overwritten, but the final schwa has been deleted, which causes a seemingly needless additional FAITH-OO violation. Moreover, Candidate (b) has worse syllable structure than (a), since it has a coda. An OO-account thus cannot predict that Candidate (b) is the winner.[5] However, if the base for the stative is a consonantal root, then the attested, regular form of the stative can be accurately predicted. Despite their anomalous infinitives, the roots for the verbs in (11) are exactly like other biconsonantal roots, and their statives would be predicted to follow the regular biconsonantal pattern.

A similar effect can be observed in deadjectival infinitives. Descriptively, deadjectival infinitives conform to a CCɔC template, and in order to fill the final consonantal slot, the second consonant of biconsonantal roots spreads.

(13)

Root	Infinitive	Gloss
a. kns	knɔs	'to become stinky'
b. km	kmɔm	'to become black'
c. k^jn	k^jnɔn	'to become soft'

(13a) illustrates the CCɔC template for a verb with a triconsonantal root. In contrast, (13bc) have biconsonantal roots and final spread consonants in the infinitive.[6] Crucially, in the stative, the biconsonantal verbs have a regular biconsonantal pattern, CeC.

[5] A constraint like FINAL-C ("All words end in a consonant") ranked between FAITH-IO and FAITH-OO could eliminate Candidate (a), but there are several classes of statives that end in vowels, e.g. Classes III, V and VII under Layton's (2000) classification.

[6] It is unclear whether spreading only happens with nasals. Note also that it is not possible that these are triconsonantal roots with two final nasal consonants; other words derived from the same roots show only two root letters, like [kemə] "the black land (Egypt)" from /k m/ and [k^jɔn] 'soft' from /k^j n/.

(14)

Root	Infinitive	Stative	Gloss
a. km	kmɔm	kem	'to become black' / 'to be black'
b. kʲn	kʲnɔn	kʲen	'to become soft' / 'to be soft'
c. kns	knɔs	kɔ.nS	'to become stinky' / 'to be stinky'

The final spread consonant is not transferred to the stative, which is unexpected under an OO-analysis. In fact, the biconsonantal deadjectival verbs have the typical biconsonantal stative CeC pattern, whereas the triconsonantal verb (14c) has the typical triconsonantal stative pattern, i.e. highly different statives, despite their nearly identical infinitives. This is strong evidence that the stative is taking the consonantal root as its base.[7]

The next kind of evidence for the consonantal root involves the lack of common output-output transfer effects between the infinitive and the stative. The first transfer effect that I will examine is consonant cluster transfer, and an example of how it holds in the OO-formation of Modern Hebrew denominal verbs (Bat-El 1994, Ussishkin 1999) is in (15). The basic template for Hebrew denominal verbs is CiCCeC, as in (15a), but the forms in (15bc) have a CCiCCeC pattern with an initial consonant cluster.

(15) a. telefon 'telephone' tilfen 'to call'
b. praklit 'lawyer' priklet 'to practice law'
c. traklin 'salon' triklen 'to make something new'

The onset clusters [pr] and [tr] are preserved from noun to verb. Bat-El (1994) argues that this is evidence that the denominal verb formation process takes as its base the already-derived noun, and remains faithful to its syllable structure.

However, in contrast to the Modern Hebrew data, consonant clusters are not preserved from the infinitive to the stative in Coptic.

(16)

Infinitive	Stative	Gloss
a. kβɔ	keβ	'make cool'
b. shai	seh	'write'
c. knɔs	kɔ.nS	'stink'
d. sβɔk	sɔ.βK	'to be few'

No consonant clusters, in fact, are transferred in the three main patterns of the stative.

Besides consonant cluster transfer, a dependence between the vowel of the base and certain properties of the derived form has been used to argue for an output-output

[7] If (14bc) had statives like (14a), the syllable structure would be a bit strange For (14b), the associated stative would be [kɔ.mM] where [m] is both the onset and the nucleus of the second syllable. It is possible that there is some constraint preventing this, but even if the final [m] were, say, deleted, the attested stative is still not predicted. Instead, [kɔm] is predicted with an incorrect vowel, and the correct matching of stative with vowel can only be achieved by referencing the consonantal root (see below).

relationship between two words, as in Ussishkin 1999. However, in Coptic, the vowel of the infinitive varies quite widely with no effect on the stative. Moreover, the vowel quality of the stative affix correlates best with the number of root consonants: [eu] for monoconsonantal roots, [e] for biconsonantals, [ɔ] for triconsonantals, and [o] for quadriconsonantals.

Looking at monoconsonantal roots first, it is clear from (17) that the vowel in the infinitive can vary to a large extent, but the vowel in the stative is always the same ([eu]).

(17)

Infinitive	Stative	Gloss
a. si	seu	'to enjoy' / 'is sated'
b. tʃɔ	tʃeu	'to sow' / 'is sown'
c. wɛ	weu	'to be distant' / 'has become distant'
d. ʃai	ʃeu	'to measure' / 'is measured'

For the biconsonantal roots in (18), there is not only variation in the vowel, but some variation in prosodic shape (CVC, CCV, CCVV). However, all of the forms have the same kind of stative, the biconsonantal pattern CeC.

(18)

Infinitive	Stative	Gloss
a. pot	pet	'to run' / 'has run'
b. kβɔ	keβ	'to make cool' / 'has been made cool'
c. shai	seh	'to write' / 'is written'

The same effect holds for the triconsonantal roots in (19). There is variation in the vowel and in the prosodic shape, yet the statives are both CɔCC.

(19)

Infinitive	Stative	Gloss
a. so.tM	sɔ.tM	'to listen to' / 'to be listened to'
b. knɔs	kɔ.nS	'to stink'/ 'to be stinky'

From the strong correlation between root type (e.g., biconsonantal) and stative form, and from the lack of evidence for any faithfulness relation between the stative and the infinitive, I conclude that the base of affixation for the stative is a consonantal root.

However, it is necessary to account for the apparent TETU effect described in Section 3.1, that is, the fact that degenerate feet are allowed in the infinitive, but not in the stative. To begin with, I propose that the infinitive is lexically listed with all its vowels, i.e. not derived from a root. There are independent reasons for this, namely the extreme variation in the vowel of the infinitive (every vowel of Coptic is actually attested in some infinitive form), and the variation in the prosodic shape of the infinitive, both of which are surprising if there is a single affix or template for deriving infinitives.[8] Since the infinitive is lexically listed, FAITH-IO can still outrank FTBIN(μ), so infinitives will surface with degenerate feet to preserve faithfulness, and part of the TETU effect is accounted for. The statives will lack degenerate feet due to two main properties: they are derived, and the alignment constraint on the stative affix is ranked fairly low. One of the main goals of the next section is to explore exactly how these properties act together in preventing the stative from surfacing with degenerate feet.

4. Analysis

In this section, I advance an analysis of Coptic root and pattern morphology under the rubric of Generalized Template Theory (GTT; McCarthy and Prince 1994), an Optimality Theoretic descendant of Prosodic Morphology (McCarthy and Prince 1986 et seq.) where templatic effects in morphological processes are derived through independently necessary constraints. Root and pattern morphology has not been extensively analyzed using GTT (to the best of my knowledge, the only accounts are Ussishkin 1999, 2000, 2005, Buckley 2003, and Graf 2002). Most GTT accounts assume some version of Ussishkin's (2000, 2005) treatment of Modern Hebrew, which uses a TETU ranking between Input-Output and Output-Output-Faithfulness constraints, as discussed for Coptic in 3.1. One verb class is the base of affixation, and is subject to FAITH-IO, while the other classes are subject to FAITH-OO. The templatic effects of root and pattern morphology are derived by ranking various prosodic constraints between the two sets of faithfulness constraints.

However, an Output-Output approach is not feasible for Coptic. It is the consonantal root, and not an output form, that is the base of affixation for the stative. Nevertheless, it is still possible to construct a GTT analysis of Coptic, without two separate levels of faithfulness. I assume that any alignment constraint for the stative affix is ranked below prosodic constraints on syllable and foot structure, and this ranking leads to a templatic effect: the affix will be placed within the root to optimally satisfy the constraints on syllable and foot structure. This kind of account predicts that the affix will be in the same position among verbs that are formed from the same kind of root, but it will differ across different kinds of roots since an extra consonant causes a difference in the prosodic structure. This prediction is borne out by the data.

In the following sections, I lay out the specifics of the analysis, concentrating on how having a consonantal root as an input can replicate the TETU effect, and on what constraints cause the templatic effects in the statives.

4.1 The Basic Constraints

To begin, I will assume that several constraints are undominated. The first is FTFORM, a constraint that ensures that the left mora of a foot bears stress, i.e., that feet are trochaic.

[8] I assume that the deadjectival infinitives described in 3.2 are not formed productively. Although all of the verbs that conform to the template are deadjectival, not all deadjectival verbs in Coptic conform to the template. This indicates that it might have been a former template for deadjectival verbs, and some deadjectival verbs have changed since, whereas others have not.

Next, I assume that ALL-FT-R is undominated, which ensures that stress falls as far to the right edge as possible in all Coptic words, and that there is no secondary stress.

(20) ALL-FT-R (Align (Ft, R, PrWd, R))
Align the right edge of every foot with the right edge of a prosodic word.
(McCarthy and Prince 1993)

To account for vowel reduction, I propose a modified version of a type of constraint first proposed by Crosswhite (2001).

(21) *Unstressed/mid {e, ɛ, o, ɔ}
No unstressed mid vowels.

Coptic permits only one mid vowel per word, which indicates that *Unstressed/mid was undominated. *COMPLEX^{CODA} is undominated, as well as the set of constraints comprising FAITH-IO. However, there is one exception from this set: O-CONTIGUITY must be ranked low. This is key in allowing the stative affix to infix (i.e., intrude) between root consonants that form a contiguous string.

4.2 Tableaux

In this section, I present tableaux for the biconsonantal, triconsonantal and quadriconsonantal statives.[9] Recall that FAITH-IO is ranked above FTBIN(μ) since the infinitive can surface as a degenerate foot. Tableau (22) demonstrates how a stative cannot have a degenerate foot output.[10]

(22)

/kβ + e/ 'make cool' + STAT	*COMP^{CODA}	FTBIN(μ)	NOCODA	O-CONTIGUITY
☞ a. (kéβ)			*	*
b. (ékβ)	*!		*	
c. (kβé)		*!		

The winning (and attested) candidate is Candidate (a), which violates NOCODA and O-CONTIGUITY. In Candidate (b), the stative affix has been prefixed, so there is no violation of O-CONTIGUITY, but there is an unacceptable complex coda. Candidate (c) is the crucial contrast to Candidate (a). For it not to win, the ranking in (23) must hold.

(23) FTBIN(μ) >> NOCODA, O-CONTIGUITY

[9] The derivation of the infinitive remains the same as in Tableau (9).
[10] I assume there are lexical rules that properly associate the correct form of the stative affix with the correct root. To the best of my knowledge, there are no prosodic generalizations about what quality of affix corresponds to what form.

Ranking FTBIN(μ) over O-CONTIGUITY partially accounts for the TETU effect by allowing foot structure to take precedence over faithfulness in one specific case, causing an unmarked (bimoraic) foot form to "emerge" in the stative. It does not emerge in the infinitive because there is no potential infinitive candidate that can violate O-CONTIGUITY and be optimal. The input to the infinitive does not contain any affixal material that can intrude within the portion of the output standing in correspondence, and any non-affixal material that intrudes would violate DEP and thus the higher-ranked set of faithfulness constraints.

However, the TETU effect cannot be characterized as a difference between derived and non-derived words. In the prefixal verbal morphology, affixes attach to an infinitive without any templatic effects (see (1)). The crucial difference there is that the alignment constraints on the prefixes must outrank the constraints on prosodic structure that are responsible for templatic effects (like FTBIN(μ)), so that the prefixes are placed at the left edge of the infinitive no matter what prosodic shape may result. However, the alignment constraint on the stative affix is ranked below the constraints that are responsible for templatic effects, as discussed above, so the affix can be placed to optimally satisfy those constraints. The TETU effect results, therefore, from O-CONTIGUITY and the affix alignment constraint being ranked below the template-replicating prosodic constraints, and is thus achievable with a consonantal root input and one dimension of faithfulness.

One of the goals of this section is to characterize the set of prosodic constraints that result in templatic effects, so returning to (22), it is FTBIN(μ) and *COMPLEX^{CODA} that are doing the work. They ensure that the stative affix [e] must be infixed between the two root consonants, and not suffixed or prefixed, giving the effect of a CeC template for any biconsonantal root. In the next tableau for the triconsonantals, there will be several different options for placing the affix.

(24)

/stm + ɔ/ 'listen' + STAT	*Unstr/mid	ONSET	*COMPLEX^{ONSET}	NOCODA
☞ a. (sɔ́.tM)				
b. (sT́.mɔ)	*!			
c. (ɔ́.stM)		*!	*	
d. (stɔ́m)			*!	*

The optimal candidate is Candidate (a), which violates none of the constraints. In Candidate (b), the stative affix is suffixed, and *Unstressed/mid is violated. Candidate (c) is a well-formed moraic trochee with the affix prefixed, but its syllable structure is much more marked than Candidate (a). A similar candidate is Candidate (d), which is also a good moraic trochee, but is eliminated on the grounds of poor syllable structure.. Thus, the templatic effects in the triconsonantals are more complex than for the biconsonantals, resulting from a mix of stress-related constraints like *Unstr/mid, and syllable structure constraints like *COMPLEX^{ONSET} and ONSET.

The quadriconsonantal stative example is Tableau (25).

(25)

/wstn + o/ ‘broaden’+ STAT	ALL FTR	FTBIN(μ)	*COMPLEX^{ONS}	PARSEσ	NO CODA
☞a. wS.(tón)				*	*
b. (wós).tN	*!			*	*
c. (wós.tN)		*!			*
d. (wó.stN)			*!		

Candidate (a), the attested form, is optimal. Candidate (b) has the stative affix infixed in the initial syllable but violates ALL-FT-RIGHT. Candidate (c) is a heavy-light trochee, and it can be ruled out by ranking FTBIN(μ) over PARSE-σ. Candidate (d) is a well-formed moraic trochee, but it violates *COMPLEX^{ONSET}, requiring that this constraint be ranked above PARSE-σ and NOCODA. From this tableau, the ranking in (26) can be concluded (recall that FTBIN(μ) has already been demonstrated to be ranked above NOCODA.)

(26) *COMPLEX^{ONSET}, FTBIN(μ) >> PARSE-σ, NOCODA

Again, a mixture of markedness constraints causes templatic effects. FTBIN(μ), ONSET, *COMPLEX^{ONSET} and ALL-FT-R all combine to restrict the affix to one optimal position.

(27) contains a summary ranking of the constraints.

(27) {ALL-FT-R, *Unstr/mid, *COMPLEX^{CODA}, FAITH-IO}

ONSET FT-BIN(μ) *COMPLEX^{ONSET}

O-CONTIGUITY NOCODA PARSE-σ

All of the constraints in the top two tiers (except for FAITH-IO) have a hand in causing templatic effects in Coptic root and pattern morphology.

5. Conclusion

I have demonstrated that the base for Coptic root and pattern morphology must be a consonantal root, and not an output form. All the phonological properties of the stative are predictable from the number of root consonants. Moreover, I have argued that the infinitive, which initially seemed to participate in the root and pattern morphology, is actually lexically listed with all its vowels. I developed an Optimality Theory analysis along these lines, with a consonantal root and a vocalic affix as the input for the stative, and a non-consonantal root monomorphemic input for the infinitive. An apparent TETU effect was shown to follow despite not assuming two levels of faithfulness, and a variety of prosodic and phonotactic constraints were characterized as determining the templatic effects exhibited by the stative forms.

There is already a substantial body of research that supports the role of the consonantal root, and there are also several combined accounts where both output-based and root-based processes play a role (Rose 2003, Davis and Zawaydeh 2001). It is one of the combined accounts that may be the best direction for future research on Coptic. Davis and Zawaydeh (2001) propose that Arabic hypocoristics are based on a consonantal root that has been extracted from the full name, i.e., an output root. While there is no direct evidence for this occurring in Coptic, there are several indirect arguments for this kind of account. As the present analysis stands, the consonantal roots are part of the lexicon but are only used by the stative. If roots were extracted from infinitives, they would no longer need to be in the lexicon at all. This account would also provide a reason why the infinitive and the stative associated with same meaning have the same consonants, which, in my analysis, is most likely a diachronic byproduct of the root and pattern morphology having been more pervasive in the past. Finally, if roots were extracted from the infinitive, then the infinitive would be in some sense the conjugation base for the stative, which would provide a more unified account of verbal morphology.

References

Bat-El, Outi. 1994. Stem modification and cluster transfer in Modern Hebrew. Natural Language and Linguistic Theory 12: 571-596.

Bat-El, Outi. 2003a. The fate of the consonantal root and the binyan in Optimality Theory. Recherches Linguistiques de Vincennes 32: 31-69.

Bat-El, Outi. 2003b. Semitic verb structure with a universal perspective. In Joseph Shimron, ed., 29-60.

Benmamoun, Elabbas. 2003. The role of the imperfective template in Arabic morphology. In Joseph Shimron, ed., 99-114.

Benua, Laura. 2000. Phonological Relations Between Words. New York: Garland.

Buckley, Eugene. 2003. Emergent vowels in Tigrinya templates. In Research in Afroasiatic Grammar II, ed. Jacqueline Lecarme, 105-125. Philadelphia: John Benjamins.

Coleman, John. 1996. Declarative syllabification in Tashlhiyt Berber. In Current Trends in Phonology: Models and Methods, ed. Jacques Durand and Bernard Laks, 177-218. Salford, Manchester: European Studies Research Institute.

Crosswhite, Katherine. 2001. Vowel Reduction in Optimality Theory. New York: Routledge.

Davis, Stuart and Bushra Adnan Zawaydeh. 2001. Arabic hypocoristics and the status of the consonantal root. Linguistic Inquiry 32: 512-520.

Dell, François and Mohamed Elmedlaoui. 1985. Syllabic consonants and syllabification in Imdlawn Tashlhiyt Berber. Journal of African Languages and Linguistics 7: 105-130.

Dell, François and Mohamed Elmedlaoui. 1992. Quantitative transfer in the nonconcatenative morphology of Imdlawn Tashlhiyt Berber. Journal of Afroasiatic Languages 3: 89-125.

Depuydt, Leo. 2005. Sounds, syllables and strokes: the syllabic superlineation system in Sahidic Coptic manuscripts. Paper presented at the North American Conference on Afroasiatic Linguistics 33, Philadelphia, PA, March 2005.

Graf, Dafna. 2002. A study on nominal reduplication in Modern Hebrew. Ms., University of Leiden. ROA 717.

Lambdin, Thomas O. 1983. Introduction to Sahidic Coptic. Macon, GA: Mercer University Press.

Layton, Bentley. 2000. A Coptic Grammar with Chrestomathy and Glossary: Sahidic Dialect. Wiesbaden: Harrossowitz.

McCarthy, John. 1979. Formal problems in Semitic phonology and morphology. Doctoral dissertation, MIT, Cambridge, Mass.

McCarthy, John. 1993. Template form in prosodic morphology. In Papers from the Third Annual Formal Linguistics Society of Midamerica Conference, 187-218. Indiana University Linguistics Club, University of Indiana, Bloomington.

McCarthy, John, and Alan Prince 1986. Prosodic morphology. Ms., University of Massachusetts, Amherst, and Brandeis University.

McCarthy, John and Alan Prince. 1993. Generalized alignment. Ms., University of Massachusetts, Amherst and Rutgers University. ROA 7.

McCarthy, John and Alan Prince. 1994. The emergence of the unmarked: optimality in prosodic morphology. In Proceedings of NELS 24, 333-379. GLSA, University of Massachusetts, Amherst.

Prince, Alan and Paul Smolensky. 1993/2004. Optimality Theory: Constraint Interaction in Generative Grammar. Malden, MA: Blackwells. (Originally published 1993, ms. Rutgers University and Johns Hopkins University. ROA 537.)

Reintges, Chris. 1994. Egyptian root-and-pattern morphology. Lingua Aegyptia 4: 213-244.

Reintges, Chris. 2004. Coptic Egyptian (Sahidic Dialect): A Learner's Grammar. Köln: Rüdiger Köppe.

Rose, Sharon. 2003. The formation of Ethiopian Semitic internal reduplication. In Joseph Shimron, ed., 79-98.

Shimron, Joseph, ed. 2003. Language Processing and Acquisition in Languages of Semitic, Root-Based Morphology. Philadelphia: John Benjamins.

Ussishkin, Adam. 1999. The inadequacy of the consonantal root: Modern Hebrew denominal verbs and output-output correspondence. Phonology 16: 401-442.

Ussishkin, Adam. 2000. The emergence of fixed prosody. Doctoral dissertation, University of California, Santa Cruz.

Ussishkin, Adam. 2005. A fixed prosodic theory of nonconcatenative templatic morphology. Natural Language and Linguistic Theory 23: 169-218

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