An Optimality-Theoretic Account of Compensatory Lengthening and Geminate Throwback in Trukese

Stuart Davis[1] & Gina Torretta

Indiana University & Central Institute for the Deaf

The alternations involved in compensatory lengthening (henceforth CL) and initial gemination by means of "geminate throwback" (henceforth GT) found in Trukese (Micronesian) nouns provide a challenge for a phonological analysis in any theory. In a rule-based approach, the rules needed to account for the Trukese alternations would have exceptions and/or conditions placed on them. For example, Hart's (1991) proposed rule of CL in Trukese fails to apply to nouns that are underlyingly at least trimoraic. Her rule of final mora delinking does not apply if the result would be monomoraic. Moreover, the major analyses of Trukese in derivational nonlinear phonology, that of Churchyard (1991) and Hart (1991), maintain that Trukese is different from other languages in that consonantal moras and vocalic moras must be represented on different tiers. In this paper, we show that the CL and GT alternations and their apparent exceptions do not reflect special rule conditions or actual exceptions but reflect the constraint domination of an optimality-theoretic grammar. We motivate a constraint hierarchy that accounts for the Trukese alternations. Further, in the analysis that we offer in this paper, the division of consonantal moras and vocalic moras onto different tiers is unnecessary. Instead, we contend that the relevant data reflect the splitting of the constraint Max-μ (i.e. every mora in the input has a correspondent in the output, cf. Rosenthal 1997) into Max-C_μ and Max-V_μ , along with a constraint *Mismatch which requires that two moras in a correspondence relation be realized on like segments. Our analysis follows Hart (1991) in viewing Trukese geminate consonants as being underlyingly moraic. (See Davis 1998 for general discussion regarding the moraic status of geminate consonants.)

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[1] Please direct all correspondence to first author.

Let us first consider the data in (1)-(3) below. The data in the first two columns are unsuffixed forms and reflect a pervasive process of final mora deletion. The suffixed forms on the right present evidence for the nature of the final vowel in the underlying representation (UR).[2]

	UR	Form	Gloss	-n = relational
(1)	a. /tipe/	[tiip]	emotions	[tipe-n]
	b. /čúkú/	[čúúk]	basket	[čúkú-n]
	c. /péké/	[péék]	chip	[pékú-n]
	d. /ača/	[aač]	handle, stem	[ača-n]
(2)	a. /omosu/	[omos]	turban shell	[omosu-n]
	b. /mékúre/	[mékúr]	head	[mékúre-n]
	c. /piseki/	[pisek]	goods	[piseki-n]
	d. /sáfeye/	[sáfey]	medicine	[sáfeye-n]
(3)	a. /pečee/	[peče]	foot	[pečee-n]
	b. /tikkaa/	[tikka]	coconut oil	[tikkaa-n]
	c. /etiruu/	[etiru]	coconut mat	[etiruu-n]
	d. /čuučuu/	[čuuču]	urine	[čuučuu-n]
	e. /ttoo/	[tto]	clam sp.	[ttoo-n]
	f. /kkáá/	[kká]	taro sp.	[kkáá-n]
	g. /ččaa/	[čča]	blood	[ččaa-n]

Several questions arise from the comparison of the data in (1)-(3) from an optimality theoretic perspective. First, what constraint is responsible for the deletion of the final short vowel in (1) and (2)? Is this constraint also responsible for the word-final vowel shortening shown by the data in (3)? Moreover, why does CL occur in (1) but not in (3)? To answer these questions we must consider the relevant constraints. We suggest that the constraint involved in final vowel deletion in (1)-(2) and in final vowel shortening in (3) is Free-μ, given in (4)

(4) Free-μ --- A word-final mora must not be parsed as word-final in the output

This constraint is based on the constraint Free-V posited by Prince & Smolensky (1993:101) which they make use of in order to account for the deletion of final vowels in nominal forms in Lardil. The constraint has the effect of favoring the deletion of a word-final mora. It is similar to the constraint *Final-Mora posited by Goodman (1997). The role of the constraint Free-$\mu$is pervasive throughout the phonology of Trukese. This is not only evidenced by the data above, but by the observation based on Trukese sources such as Goodenough & Sugita (1980) that virtually no inflectional suffixes in Trukese end in a vowel in word-final position. When suffixes do surface with a word-final vowel, they can have alternates with a long vowel that surface in nonfinal position. As an example, the second person plural object

[2] The Trukese sources include Goodenough & Sugita (1980) and Dyen (1949, 1965). Please refer to these sources for a general discussion of the morhphology and phonology of the language. Note that only the first part of a geminate consonant can surface in the coda except in word final position. Regarding the transcription symbols used for vowels, we follow Trukese orthography in using á, é, ó, and ú which represent [æ], [ʌ], [ɔ] and [ɨ], respectively. Other transcription symbols have their familiar usage.

suffix surfaces as [-kemi] when in word-final position but as [-kemii-] when another suffix follows it. Further, many other suffixes show an alternation between a consonant-final form when in word-final position and a vowel-final form when another suffix follows. Thus, the first person inclusive object marker is [-kič] when in word-final position but [-kiče-] when another suffix follows. The alternations exemplified in these suffixes and their pervasiveness reflect the influence of the constraint Free-μ in Trukese.

As for the data in (1) displaying CL, they reflect the satisfaction of two constraints. First, when CL occurs the constraint Max-μ given in (5) is satisfied. (Assume the version of Optimality Theory known as Correspondence Theory, as in McCarthy & Prince 1995 and Benua 1995.)

(5) Max-μ -- Every mora in the input has a correspondent in the output (cf. Rosenthal 1997:146)

To see how the data in (1) satisfy Max-μ, consider the form in (1a), /tipe/, realized as [tiip]. Both its underlying and surface moraic structure are shown in (6a) and (6b), respectively.

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(6)   a.  μi   μj              b.  μi μj
          |    |                    \/
         /t i  p e/               [t i p]
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The comparison between the input and output moraic structure in (6) shows that the mora (μ_j) on the underlying final vowel in (6a) is realized on the first vowel in (6b), thus respecting Max-μ. As a consequence, the initial vowel surfaces as long displaying CL. Case (6) also illustrates the constraint MinimalWord, given in (7).

(7) MinimalWord (MinWd) -- Prosodic words must be minimally bimoraic.

This constraint stems from work on prosodic morphology starting with McCarthy & Prince (1986). It requires words to be bimoraic.[3] If CL did not occur in (6), or for any of the data in (1), then MinWd would be violated since the resulting form, for example, [tip] in (6), would be monomoraic. Consequently, CL occurs in (1) satisfying both MinWd and Max-μ.

Given the discussion on CL above, the lack of CL displayed by the data in (2) is interesting. Clearly, the output forms in (2) violate Max-μ since there is one less mora in the output than in the input. The output does not violate MinWd since the output does contain two moras. Since Max-μ is violated in (2) then there must be a higher ranking constraint that compels its violation. We suggest that the constraint that compels its violation is Weight-Identity given in (8), modified from McCarthy (1996). The constraint requires that corresponding segments have identical weight. The constraint is used by Rosenthal (1997) who terms it Ident-IO(μ).

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[3]The MinimalWord constraint can best be understood as an affect of a constraint that disallows degenerate (i.e. monomoraic) feet. The constraint is undominated in Trukese nouns, the focus of this paper. It is not, however, undominated in verbal forms. This may reflect a difference in foot requirements between nouns and verbs.

(8) Weight-Identity (Wt-Id) -- Corresponding segments have identical weight.

On this view, the possible output forms with CL, such as [omoos] for (2a) and [piseek] for (2c), are eliminated because the second vowel of these output forms is long while the corresponding input vowel is short. The fact that the winning candidates in (2) all have a short second vowel provides an argument for the ranking of Wt-Id over Max-μ shown in (9).

(9) Wt-Id >> Max-μ

The tableau in (10) shows how this ranking picks out the winning candidate for (2a).

(10) /omosu/ -- [omos] 'turban shell' (2a)

$\mu_i\ \mu_j\ \mu_k$ /omosu/	Wt-Id	Max-μ
☞ $\mu_i\ \mu_j$ a. omos		*
$\mu_i\ \mu_j\mu_k$ b. omos	*	

The winning candidate in (10a) respects Wt-Id but violates Max-μ. It violates Max-μ since the third mora of the underlying form (μ_k) has no output correspondent. The losing candidate with CL in (10b) violates Wt-Id but respects Max-μ. It violates Wt-Id since the short second vowel in the input corresponds to the long (bimoraic) second vowel of the output. The constraints have to be ranked as shown since the reverse ranking would wrongly pick out (10b) as the winner.

In our discussion of the forms in (2), one candidate that we have not yet discussed is the faithful one. If we consider the example in (2a), the faithful candidate would be [omosu]. This candidate differs from the winning candidate [omos] in that it violates the constraint in (4), Free-μ. The faithful candidate does not violate the constraint Max-μ which is violated by the winning candidate. Thus, in order for [omos] to be the winning candidate, the constraints Free-μ and Max-μ must be ranked as in (11). This is shown by the tableau in (26).

(11) Free-μ >> Max-μ

(12) /omosu/ -- [omos] 'turban shell' (2a)

$\mu_i\ \mu_j\ \mu_k$ /omosu/	Free-μ	Max-μ
☞ $\mu_i\ \mu_j$ a. omos		*

$\mu_i\ \mu_j\mu_k$ b. omosu	*	

Clearly, the reverse ranking would wrongly result in (12b) being the winning candidate. Since (12a) is the actual winner, the tableau in (12) constitutes an argument for the ranking in (11).

While the data in (2) motivate the ranking of Wt-Id over Max-μ as well as Free-μ over Max-μ, they do not provide any evidence regarding the relative ranking between Wt-Id and Free-μ. However, crucial evidence regarding their ranking comes from the data in (3). These data end in an underlying long vowel yet surface with the corresponding vowel as short. This means that Free-μ is respected at the expense of a violation of Wt-Id. This establishes the ranking in (13) as shown by the tableau in (14) illustrating the form in (3a)

(13) Free-μ >> Wt-Id

(14) /pečee/ -- [peče] 'foot' (3a)

$\mu_i\mu_j\mu_k$ /pe če/	Free-μ	Wt-Id
$\mu_i\ \mu_j\mu_k$ a. pe če	*!	
☞ $\mu_i\ \mu_j$ b. peče		*

Candidate (14a) respects Wt-Id but violates Free-μ since a word-final mora is parsed in word-final position in the output. Candidate (14b) respects Free-μ but violates Wt-Id. Since (14b) is the winner then the ranking between the two constraints must be as shown in (13). An interesting candidate not shown in (14) is that in (15).

(15) $\mu_i\mu_k\mu_j$
pe če [peeče]

This candidate technically respects Free-μ since the word-final underlying mora (μ_k) does not surface in word-final position. It also respects low-ranking Max-μ which the winning candidate in (14b) violates. However (15) does not surface because it has two violations of Wt-Id. This is shown in the more comprehensive tableau in (16).

(16) /pečee/ -- [peče] 'foot' (3a)

$\mu_i\mu_j\mu_k$ /pe če/	Free-μ	Wt-Id	Max-μ

$\mu_i \mu_j \mu_k$ a. pe če [pečee]	*!		
☞ $\mu_i \mu_j$ b. peče [peče]		*	*
$\mu_i \mu_k \mu_j$ c. pe če [peeče]		**!	

The candidate in (15) shown in (16c) in the tableau respects both Free-μ and Max-μ but it is eliminated because it crucially has two violations of Wt-Id. The first vowel in (16c) is long on the surface but underlyingly short; the second vowel of (16c) is short on the surface but underlyingly long. These two violations of Wt-Id is what eliminates it in comparison to the winning candidate in (16b) that only has one violation of Wt-Id. The tableau in (16) then provides another argument for the ranking in (9) of Wt-Id over Max-μ. The reverse ranking of these two constraints in (16) would wrongly predict that (16c) should be the winner.

To summarize, the tableaux presented above establish the following constraint ranking in (17), expressed more succinctly in (18).

(17) Free-μ >> Wt-Id (14) & Wt-Id >> Max-μ (10), (16)

(18) Free-μ >> Wt-Id >> Max-μ

The ranking of Free-μ over Max-μ is established both by the tableau in (12) and the transitivity relation of (18). With this as background let us now consider the constraint interaction of forms displaying CL in (1).

CL occurs in (1), but as seen from the data in (2) and the tableau in (10), CL does not normally occur when a final vowel deletes. The reason why CL occurs in (1) is to avoid an output that would be monomoraic. The data in (1) thus provide evidence that the constraint MinWd in (7) is high ranking. Clearly, MinWd has to be higher ranked than Wt-Id as is depicted below by the tableau in (19) for the word [tiip] in (1a).

(19) /tipe/ -- [tiip] 'emotions' (1a)

μ_i μ_j /t i p e/	Free-μ, MinWd	Wt-Id
μ_i μ_j a. t i p e	*! (Free-μ)	
μ_i b. t i p	*! (MinWd)	

☞ $\mu_i\mu_j$ c. t i p		*

The tableau in (19) establishes the ranking of MinWd over Wt-Id. This is shown in (20).

(20) MinWd >> Wt-Id

If the constraints had the reverse ranking then (19b) would be the winner, as seen by the Tableau in (21). (💣 indicates an unintended winner.)

(21) /tipe/ -- [tiip] 'emotions' (1a)

μ_i μ_j /t i p e/	Free-μ	Wt-Id	MinWd
μ_i μ_j a. t i p e	*!		
💣 μ_i b. t i p			*
$\mu_i\mu_j$ c. t i p		*!	

While the tableaux in (19) and (21) establish the ranking of MinWd over Wt-Id, they do not inform us about the ranking between Min-Wd and Free-μ. Crucial data that shed light on the ranking between MinWd and Free-μ come from (22).

(22)

UR	Form	Gloss	*output
a. /maa/	[maa]	behavior	*ma
b. /téé/	[téé]	islet	*té
c. /oo/	[oo]	omen	*o
d. /soo/	[soo]	precipitate	*so
e. /núú/	[núú]	unripe coconut	*nú

The data in (22) show that the constraint Free-μ is not satisfied so as to prevent an output that would be monomoraic. This suggests that MinWd outranks Free-μ as in (23). The tableau in (24) which shows the evaluation of candidates for (22a) motivates this ranking. (In (23) we do not consider the candidate [$ma_{\mu j \mu i}$] from /$ma_{\mu i \mu j}$/. We assume that either such a form is not produced by GEN or it is ruled out by an undominated constraint that requires moraic linearity within a single segment.)

(23) MinWd >> Free-μ

(24) /maa/ -- [maa] 'behavior' (22a)

/maa/	MinWd	Free-μ

F a. maa		*
b. ma	*!	

Thus, if we add the constraint MinWd to the ranking in (18) we arrive at the ranking shown in (25).

(25) MinWd >> Free-μ >> Wt-Id >> Max-μ

The constraint ranking in (25) readily accounts for the data in (26) displaying an initial geminate consonant. A tableau for (26a) is shown in (27).

(26)	UR	Form	Gloss	-n = relational
	a. /fféne/	[ffén]	advice	[fféne-n]
	b. /nnét̪ú/	[nnét̪]	shrub sp.	[nnét̪ú-n]
	c. /ffébNú/	[ffébN]	love	[ffébNú-n]

(27) /fféne/ -- [ffén] 'advice' (26a)

$\mu_i \mu_j \mu_k$ /ff é ne/	MinWd	Free-μ	Wt-Id	Max-μ
$\mu_i \mu_j \mu_k$ a. ff éne		*!		
$\mu_i \mu_j \mu_k$ b. ff é n			*!	
F $\mu_i \mu_j$ c. ff én				*

The faithful candidate in (27a) is eliminated because it violates high-ranking Free-μ. The candidate in (27b) with CL is eliminated because of its violation of Wt-Id; the long second vowel in the output corresponds with a short vowel in the input. The winning candidate in (27c) only violates low ranking Max-μ. It does not violate MinWd since the geminate consonant is treated as moraic.

The constraint ranking in (25) also accounts for the data in (3e-g) repeated below in (28). A tableau showing the possible output candidates for (28a) is given in (29).

(28)	UR	Form	Gloss
	a. /ttoo/	[tto]	clam sp.
	b. /kkáá/	[kká]	taro sp.
	c. /ččaa/	[čča]	blood

(29) /ttoo/ -- [tto] 'clam sp.' (28a)

$\mu_i \mu_j \mu_k$ /tt o/	MinWd	Free-μ	Wt-Id	Max-μ

$\mu_i\mu_j\mu_k$ a. tt o		*!		
F $\mu_i\mu_j$ b. tt o			*	*

The two candidates shown in the tableau in (29) are the two strongest competitors given the input /ttoo/. The candidate in (29a) is completely faithful to the input. It respects all relevant constraints except Free-μ. The candidate in (29b) violates both Wt-Id and Max-μ. It violates Wt-Id since the short vowel in its output corresponds to a long vowel in the input. And it violates Max-μ because the final underlying mora (μ_k) fails to surface. Despite violating more constraints than its competitor, (29b) is nonetheless the winning candidate since it violates only constraints ranked lower than Free-μ. Thus we see that the constraint ranking established in (25) readily accounts for the data with geminate consonants in (26) and (28).

So far in considering Trukese data with geminate consonants we have only considered cases where the geminate consonant is underlyingly in initial position. Trukese also allows geminate consonants to occur word-medially but never in word-final position. This leads to a very interesting situation in words where a geminate consonant precedes a word-final vowel. Consider the data in (30).

(30)	UR	Form	Gloss	-n = relational
	a. /múnnú/	[mmún]	upper back	[múnnú-n]
	b. /kunnu/	[kkun]	rotation	[kunnu-n]
	c. /m^{w}účču/	[m^{w}m^{w}úč]	end, finish	[m^{w}účču-n]
	d. /makke/	[mmak]	writing	[makke-n]

In these forms, the final short vowel deletes in order to satisfy the constraint Free-μ. One might then expect the output of (30) to contain a word-final geminate such as [múnn] for (30a), but because Trukese has an undominated constraint against word-final geminates as stated in (31), no output can surface with a word-final geminate.

(31) No Word-final Geminates (*Gem#) -- Geminates are disallowed in word-final position.

The constraint in (31) accounts for a common phenomenon whereby languages with geminates do not allow them in word-final position. Languages other than Trukese where this constraint is undominated include Japanese and Italian. Given the undominated constraint in (31) along with the constraint ranking already established in (25), let us consider the evaluation of output candidates for /múnnú/ 'upper back' in (30a). This is shown by the tableau in (32)

(32) /múnnú/ -- [mmún] 'upper back' (30a)

μ_i $\mu_j\mu_k$ /mú nnú/	*Gem#	MinWd	Free-μ	Wt-Id	Max-μ

$\mu_i\mu_j$ μ_k a. mú nn ú [múnnú]			*!		
$\mu_i\mu_j$ b. mú nn [múnn]	*!				*
μ_i c. mún [mún]		*!		*	**
💣 $\mu_i\mu_k$ d. mú n [múún]				**	*
F μ_l μ_i e. mm ú n [mmún]				**	*
μ_l $\mu_i\mu_k$ f. mm ún [mmúún]				***!	

The constraints and their ranking that we have motivated so far do not pick out a unique winner for the input /múnnú/. Both candidates (32d) and (32e) are chosen. The first candidate in (32a) is faithful to the input but it is eliminated because of its violation of Free-μ. Both (32b) and (32c) violate undominated constraints. (32b) violates the constraint against word-final geminates while (32c) being monomoraic violates the minimal word constraint. The interesting candidates are the last three which respect the higher ranking constraints. These candidates are similar in that they all display the loss of the final vowel and the degemination (or demoraification) of the last consonant. (32d) makes up for the lost of the final vowel by the compensatory lengthening of the preceding vowel, similar to (1). (32e) makes up for the degemination of the last consonant by geminating the initial consonant. This is what Churchyard (1991) terms "gemination throwback" (henceforth, GT). The candidate in (32f) makes up for both the loss of the final vowel and degemination of the last consonant by displaying CL and GT. (32d) has two violations of Wt-Id and one violation of Max-μ. It has two violations of Wt-Id because the surface long vowel corresponds to a short vowel in the input while the single final consonant corresponds to a geminate (moraic) consonant in the input. With respect to Max-μ, as shown by the moraic subscripts, we contend that in (32d), the one violation of Max-μ is from the underlying mora μ_j of the geminate consonant. That is, candidate (32d) violates Max-μ because the mora from the underlying geminate (μ_j) does not have an output correspondent. This means that the additional mora on the output vowel in (32d) originates from the deleted final vowel. The candidate in (32e) also has two violations of Wt-Id and one violation of Max-μ. It has two violations of Wt-Id because the final nongeminate (nonmoraic) consonant in the output corresponds to an underlying (moraic) geminate consonant while the initial geminate consonant of the output corresponds to a single consonant in the input. Additionally, (32e) violates Max-μ because the mora of the final vowel of the input does not have an output correspondent. The implication of this is that the mora that surfaces on the initial geminate (μ_j) originates from the medial geminate of the input. The candidate in (32f) completely respects Max-μ. However, it is eliminated because it has three violations of higher ranking Wt-Id. The violations of Wt-Id are incurred by the initial geminate of the output which is underlyingly short, the long vowel of the output which is short in the input, and the final single consonant which is a geminate underlyingly. While the constraints in the tableau in (32) properly eliminate (32a), (32b), (32c), and (32f), it does not decide between candidates (32d) and (32e).

In comparing (32d) and (32e), we notice that given the moraic subscripts shown, (32d) displays the realization of the vocalic moras but not the consonantal ones while (32e) achieves the realization of the consonantal mora but not all the vocalic ones. This suggests that the constraint Max-μ can be divided into the two specific constraints Max-μ_v and Max-μ_c given in (33) and (34), respectively. (cf. Goodman 1997)

(33) Max-μ_v -- Every vocalic mora in the input must have a correspondent in the output.

(34) Max-μ_c -- Every consonantal mora in the input must have a correspondent in the output.

As shown in the short tableau in (35), (32d) respects Max-μ_v but violates Max-μ_c ; (32e) respects Max-μ_c but violates Max-μ_v. Since (32e) is the actual winner then Max-μ_c must outrank Max-μ_v as shown in (36).

(35) /múnnú/ -- [mmún] 'upper back' (30a)

$\mu_i\mu_j$ μ_k /mú nnú/	Max-μ_c	Max-μ_v
$\mu_i\mu_k$ 32d. m ú n	*!	
☞ μ_j μ_i 32e. mm ún		*

(36) Max-μ_c >> Max-μ_v

It is the ranking in (36) that results in the geminate throwback effect. The consonantal mora needs to be realized, but it cannot be realized on a final consonant, thus it surfaces on the only other alternative, the initial consonant.

An important point that emerges from the analysis is that an input consonantal mora can only be realized on a consonant while an input vocalic mora can only be realized on a vowel. This is clear for the winning candidate in the tableau in (35) where the consonantal mora in the output has a correspondent in the input that is on a consonant whereas the vocalic mora of the output has a correspondent in the input that is on a vowel. To account for this we suggest that there is a constraint *Mismatch given in (37) that is high-ranking in Trukese.

(37) *Mismatch -- Two moras in a correspondence relation must be realized on like segments.

Evidence for the reality of this constraint comes from the data considered earlier in (22) with the relevant forms repeated below in (38). In (38), though, we consider a different type of wrong output from (22) in the rightmost column.

(38)

	UR	Form	Gloss	*output
	a. /maa/	[maa]	behavior	*mma
	b. /téé/	[téé]	islet	*tté
	c. /soo/	[soo]	precipitate	*sso
	d. /núú/	[núú]	unripe coconut	*nnú

If there is no constraint like *Mismatch then the actual candidate selected by the Trukese constraint ranking would be one like that in the right hand column of (38). This is seen by the tableau in (39).

(39) /maa/ -- [maa] 'behavior' (38a)

$\mu_i\mu_j$ /m a/	Free-μ	Max-μ_v
a. $\mu_i\mu_j$ m a	*!	
💣 b. μ_j μ_i mm a		

The candidate with the initial geminate in (39b) seems ideal. It avoids a violation of Free-μ while at the same time respects Max-μ_v since both vocalic moras in the input have output correspondents. Consequently, there must be some constraint that rules out (39b) that is higher ranking than Free-μ. We suggest that this other constraint is the *Mismatch constraint in (37) and that it is undominated. The tableau in (40) shows how *Mismatch picks out the winning candidate for data like that in (38).

(40) /maa/ -- [maa] 'behavior' (38a)

$\mu_i\mu_j$ /m a/	*Mismatch	Free-μ
☞ a. $\mu_i\mu_j$ m a		*
b. μ_j μ_i mm a	*!	

Candidate (40b) violates *Mismatch since an input vocalic mora has an output correspondent mora that is realized on a consonantal element.

The effect of the *Mismatch constraint is not only shown by data like that in (38) but also in the case of CL shown by the data in (1). If we consider a form like that in (1a), /tipe/ 'emotions', an output that is not considered in the tableau in (19) is [ttip]. This form is just as good as the winning candidate [tiip]. This is shown by the tableau in (41).

(41) /tipe/ -- [tiip] 'emotions' (1a)

μ_i μ_j /t i p e/	MinWd	Free-μ	Wt-Id	Max-μ_v
💣 $\mu_j\mu_i$ a. tt i p			*	
☞ $\mu_i\mu_j$ b. t i p			*	

Clearly, a constraint is needed to rule out the output in (41a) with an initial geminate. We suggest that the relevant constraint is the high-ranking *Mismatch constraint stated in (37). Candidate (41a) would violate this constraint since the initial consonantal mora in the output has a vocalic mora correspondent in the input. (41b) does not violate this constraint since both vocalic moras in the input have an output correspondent that is vocalic. Thus (41b) is the winning candidate.

It is worth noting that the role of *Mismatch just discussed for (41) and seen by the tableau in (40) solves the most problematic aspect of the analyses of Trukese CL and GT in Churchyard (1991) and Hart (1991). These researchers adopt an analysis where there are separate tiers for consonantal moras and vocalic moras. While this works for the Trukese data, the expectation is that we should see the effect of these two different tiers in most languages but we do not. On the analysis presented here *Mismatch would be a universal constraint. Its effects, are not felt in many languages because of the restriction on where geminate consonants (which, according to Hayes 1989 are the only underlying moraic consonants) can occur. They normally only surface intervocalically due to independent constraints. But in Trukese where there is an abundance of underlying initial geminate consonants, we would expect to see the effects of *Mismatch and we do. In our analysis, the phenomenon of GT is a consequence of the ranking of Max-μ_c over Max-μ_v along with undominated *Mismatch. There is no need for separate tiers for consonantal moras and vocalic moras. Thus we end up with the ranking in (42) for Trukese.

(42) MinWd, *Gem#, *Mismatch >> Free-μ >> Wt-Id >> Max-μ_c >> Max-μ_v

In conclusion, we see three major points that emerge from our optimality-theoretic analysis of Trukese that we want to emphasize. Firstly, as noted by Hart (1991), Trukese provides a compelling case for the underlying moraicity of geminate consonants. Secondly, there is no need for separate tiers for consonantal and vocalic moras as proposed by Churchyard (1991) and Hart (1991). Rather as discussed, Trukese provides evidence for the division of the constraint Max-μ into Max-μ_c and Max-μ along with the constraint *Mismatch that requires corresponding moras to be realized on like segments.

As a final point, the Trukese data strongly suggest the superiority of constraint ranking over phonological rules. If the phenomena presented in this paper were expressed as rules there would be exceptions and/or conditions on most of the rules. For example, the rule of CL fails to apply to nouns that are underlyingly at least trimoraic, and the rule of final mora delinking applies except if the result would be monomoraic. These types of exceptions to and restrictions on rules can be seen as reflecting the constraint domination of an optimality-theoretic grammar. The failure of final mora delinking is due to high ranking MinWd, and the failure of CL to apply to nouns that are underlyingly trimoraic or longer is due to the interaction of MinWd, Wt-Id and Max-μ_v. The fact that a single constraint ranking, as in (42), along with flexibility between the two lowest (active) constraints can simultaneously account for the complex data found in Trukese CL and GT as well as the variation they display, strongly supports the optimality-theoretic conception of phonology.

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Department of Linguistics
Indiana University
Bloomington, IN 47405

davis@indiana.edu

Central Institute for the Deaf
818 South Euclid
St. Louis, MO

gtorretta@cid.wustl.edu