SOME ASPECTS OF THE PROSODIC PHONOLOGY OF TRIPURA BANGLA AND TRIPURA BANGLA ENGLISH

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ABSTRACT

Though attested in very few languages, ternary rhythm has always occupied the center-stage of research in metrical phonology. Scholars experience(d) nightmares trying to explain this 'marked' pattern of metrification in terms of the analytical tools of their respective theories. Many proposals ensued. These include ternarity-specific tools like TERNARY FEET (Halle and Vergnaud 1987, Levin 1988, Dresher & Lahiri 1991, Hewitt 1992, Rice 1992); binary feet with a special parsing mode called Weak Local Parsing (Hayes 1995), Relativized Extrametricality (Hammond 1990); in the Optimality Theory or OT framework, a foot-repulsion constraint *FTFT (Kager 1994). In recent times the analytical perspective on ternary rhythm has witnessed a radical change. Capitalizing on the idea that ternarity is not a primitive of metrical phonology, efforts have been made to derive ternary rhythm with binary feet through interaction of foot alignment (ALL-FT-X) with an anti-lapse constraint (Ishii 1996). However, the entire theoretical artifice is crucially dependent on an appropriate statement of the anti-lapse constraint. One such approach to defining the anti-lapse constraint is the grid-based lapse constraint *LAPSE (Elenbaas 1999, Elenbaas and Kager 1999) which has proved its mettle in offering a principled and unified account of rhythmic ternarity in many a language. A welcome feature of this constraint is that it is not specific to any particular rhythm in the sense that it broadly enforces bounded rhythm, either binary or ternary.

But despite its spectacular success both empirically and typologically, *LAPSE is unable to account for the presence of a word-final triple upbeat in the trochaic system of Tripura Bangla (TB), spoken in the Indian state of Tripura. Explaining this metrical pattern requires a reformulation of the anti-lapse constraint such that only the edges of two prosodic domains – foot and word – function as valid licensors of weak beats. In this respect it differs from the earlier version conveniently renamed *LAPSE(E&K) which allows the strong beat and the word-edge to license weak beats in a grid. The main thrust of the dissertation is the newly defined lapse constraint *LAPSE(DE) where DE stands for *domain edges*. The advantage of *LAPSE(DE) is that it not only succeeds in accommodating the *deviant* facts of TB but also accounts for all the cross-linguistic data that provided the empirical justification to *LAPSE(E&K). More importantly, *LAPSE(DE) scores much better in projecting a factorial typology which is more restrictive than that of *LAPSE(E&K).

The first chapter critically summarizes the origin, and achievements of *LAPSE(E&K), empirical as well as typological. The second chapter highlights the factors necessitating the reformulation of the constraint as *LAPSE(DE). It also demonstrates the typological superiority of the latter. The third chapter argues in favour of prominence-distinction and binary foot parsing in TB with evidence from prosodically conditioned processes of weakening and licensing attested in segmental phonology. The fourth and last chapter extends the new OT approach based on *LAPSE(DE) to Tripura Bangla English (TBE) and also raises a basic theoretical issue of Trochaic lengthening in spite of the absence of underlying vowel length in TBE.

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ACKNOWLEDGEMENTS

I dedicate this thesis to my
TEACHER FATHER, Rajmohan Das,
in Heaven.

PREAMBLE

Tripura Bangla (henceforth TB) does not figure in the standard classification of the dialects of Bangla (cf. Chatterji 1926). This is because the term is a late coinage (since Dhar 1977). Yet there is every reason to accord TB the status of a full-fledged dialect of Bangla.[1]

Tripura is a small hilly state of the Federal Republic of India lying in the northeastern part of the country. Politically, it is separated from the commonly accepted Bangla speaking zone of India i.e. West Bengal with Kolkata (erstwhile Calcutta) as its capital by the intervention of Bangladesh. But linguistically Tripura is very much a part of the greater 'Bengal'. The latter includes parts of Bihar, Orissa, Assam and the entire of West Bengal and Tripura within India and the whole of Bangladesh.

The hilly terrains of Tripura were originally inhabited by the various aboriginal tribes belonging to the Sino-Tibetan and the Tibeto-Burman families. But ever since the partition of Bengal and the creation of East Pakistan in 1947, Tripura witnessed a huge influx of Bengali refugees who spoke various dialects belonging mainly to the bordering districts of East Pakistan (presently Bangladesh). These include the dialects of Cumilla, Dhaka, Moymunshing, Noakhali, Chattagram and Sylhet.

With the passing of time the Bengali settlers outnumbered the indigenous tribes and were in possession of key positions in administration, business, economy and most important of all, political and cultural activities. The hub of such activities

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[1] In the present thesis, TB is often referred to as a language rather than a dialect. This is for the technical reason of avoiding repetition of cumbersome phrases like 'a dialect of Bangla', 'a variety of Bangla' etc. Moreover referring to an independent system as a language is very much in keeping with the current practice in the generative enterprise.

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was the state capital Agartala and more generally, the entire west district that houses it. But Standard Colloquial Bangla (henceforth SCB) being far away, for all practical purposes there was a virtual vacuum in respect of the issue of a common means of communication among the various dialect speaking Bengalis settled in and around the state capital. However being a social animal man cannot but interact with his neighbours.

The language spoken in and around Agartala now displays a predominant presence of the dialects of Cumilla, Dhaka & Moymunshing (and marginally of Noakhali, Chattagram and Sylhet). Out of this cohabitation of dialects over the years there emerged a linguistic amalgamation, which is characterized by certain independent features especially in respect of phonology and morphology. Despite its affinity to the source forms in the various dialects, this emergent variety maintains certain degree of independent identity. This variety is what I, following Dhar (1977), christen as TB. At present TB is the commonly used non-official medium of communication for the non-tribal population of the entire state. This is also the common means of interaction between the various tribes and non-tribes of the state.

Being a native speaker of TB and at the same time a student of linguistics, the question as to what could be the phonological profile of this variety of Bangla has always intrigued me and the present research has provided an opportunity to search for an answer. Though I started out tentatively with an intention to look at the segmental phonology of TB, a preliminary survey of the metrical pattern of the latter has revealed that it has a regular ternary rhythm, which is a marked variety in the metrical systems of the world currently known – the unmarked being the binary rhythm. This finding has forced a redefinition of the agenda of the present research with the focus shifted to the more strictly theoretical issue of providing an account to

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ternarity in general especially within the framework of Optimality Theory (henceforth OT). Consequently in the present thesis more attention is paid to iron out theoretical complexities standing in the way of a maximally generalized (OT) account of ternarity than to project a comprehensive phonological profile of any particular language.

Not much work is available in the metrical literature today, which specifically addresses the issue of ternarity within OT. Kager (1994), Ishii (1996), Elenbaas (1996, 1999) and Elenbaas and Kager (1999) perhaps exhaust the list. Of these the most relevant and updated work is certainly Elenbaas and Kager (1999), which incorporates the major insights of all the other works excepting those of Kager (1994). The latter being one of the earliest OT attempts to give a non-processual explanation to ternarity, proposes a constraint whose only purpose is to keep binary feet away from each other by one syllable so that an effect of ternarity obtains on the surface. Such purpose specificity contradicts the universal character of constraints, which are supposedly part of the Universal Grammar (henceforth UG). All the subsequent work cited above have therefore tried to eliminate this foot-repulsion constraint *FTFT. The quanta of success of these are summarized in Elenbaas and Kager (1999). Consequently, in the present thesis the latter is treated as a summa of the major critical activities in OT to account for ternary rhythm.

Elenbaas and Kager (1999) have argued very persuasively for getting rid of the foot-repulsion constraint *FTFT. Theirs is in fact an improvement on Ishii's (1996) idea that explanation of ternary rhythm, -- the latter being no primitive of the metrical systems of the world languages -- does not require a ternarity-inducing mechanism such as ternary feet or special parsing modes like Weak Local Parsing (Hayes 1995) or the ternarity-specific OT constraint *FTFT. 'Instead ternarity

emerges by LICENSING, involving interactions of the anti-lapse constraint *LAPSE (banning long sequences of unstressed syllables; Selkirk 1984) with standard foot-alignment constraints (ALL-FT-X, ALIGN-Y; McCarthy and Prince 1993b).' (Elenbaas and Kager 1999: 274) This new grid-based rhythmic theory looks upon ternarity as a kind of underparsing, which is licensed by an anti-lapse constraint, and induced by standard foot alignment.

But the theory of Elenbaas and Kager (1999) is crucially dependent on an appropriate restatement of the anti-lapse constraint. The authors offer this reformulation as the following.

1. *LAPSE
   Every weak beat must be adjacent to a strong beat or the word-edge.

With this redefined anti-lapse constraint according to which every stressed syllable and the word-edge are valid licensors of weak beats, the authors succeed in explaining a wide range of cross-linguistic metrical facts. The latter include systematic ternary systems as in Cayuvava & Chugach, and occasional ternarity displayed in Sentani & Finnish. The authors then go on to project a factorial typology of the grid-based anti-lapse constraint and demonstrate the superiority of the same in predicting a highly restrictive set of logical possibilities, which include very few unattested systems.

This is certainly a remarkable achievement on the part of any theory in terms of both economy and generalization – the two trademark principles of the generative enterprise. But despite this, the theory of Elenbaas and Kager (1999) lands itself in real trouble when applied to explain the facts of TB.

Stated briefly, in TB trochees are constructed from left to right with initial main stress (in words having only light sequences). Stress falls on every third syllable and iterative footing takes place provided there are minimally five syllables in a word.

In other words, while word-medially the distance between two licensors is strictly limited to a maximum of two syllables, in word-final positions this limit increases to three syllables in words having four and seven syllables (cf. 2b, 2e).

2. a. (bá.ta.)ʃa   'type of candy'
   b. (ɔ́.na).ba.di   'uncultivated'
   c. (ɔ́.ʃɔ).hɔ.(zù.gi)   'non-cooperative'
   d. (ɔ́.ʃɔ).hɔ.(zù.gi).ta   'non-cooperation'
   e. (ɔ́.no).nu.(grɔ̀.ho).nì.yɔ   'unacceptable'
   f. (ɔ́.no).nu.(grɔ̀.ho).ni.(yɔ̀.ta)   'unacceptability'

What licenses this extra beat word-finally in (2b) and (2e)? The anti-lapse constraint of Elenbaas and Kager (1999) as stated in (1) has no answer for this.

Finding an answer to the question has therefore become a part of the core agenda of the present research. Investigations carried out in course of the present study reveal that the much sought-after solution lies in reformulating the crucial anti-lapse constraint once again to include foot-edge as one of the licensors of the weak beats, the other being word-edge. In this restated version strong beat or foot-head has no role as a licensor. Only the two domain edges – foot-edge and word-edge -- can license weak beats. We distinguish the two versions of the constraint by referring to that of Elenbaas and Kager (1999) as *LAPSE(E&K) and to ours as *LAPSE(DE).

3. *LAPSE(DE)

  Every weak beat must be adjacent to either a *directional foot-edge* or word-edge.

By *directional foot-edge* we mean that only one edge of a foot is capable of licensing a weak beat. This particular edge is language specific and is determined by the highest ranked of the four alignment constraints: ALIGN-L/R, ALL-FT-L/R. There is however a basic difference between these two types of alignment constraints. ALIGN constraints indicate that the direction of footing is always opposite of the value of L or

R. That means, if ALIGN-L tops the list of the alignment constraints iteration proceeds towards *right* and conversely, if ALIGN-R is the highest ranked alignment constraint feet are constructed iteratively towards *left*. By contrast, the edge-oriented alignment constraints ALL-FT-L/R when ranked highest among the alignment constraints dictate that the direction of footing is identical to the value of L or R. Stated differently, when ALL-FT-L tops the list, footing is directed towards *left*; and when ALL-FT-R is at the top, footing proceeds towards *right*. The term *directional foot-edge* refers to the edge of the foot, which coincides with the direction of footing determined through the procedures stated above.

The immediate advantage of this new interpretation of the anti-lapse constraint is that it straightway captures the so-called *deviant* forms of TB noted in four and seven syllable words. Of the three word-final weak beats in such words, the one within the foot is taken care of by the undominated constraints FT-BIN (stipulating that feet are binary) and TROCHEE (requiring that feet are only left headed in TB). The medial of the three weak beats is licensed by the *right* edge of the adjacent foot. The last weak beat standing at the (right) word-edge is taken care of by the other licensor namely, word-edge. The second advantage of this new approach to rhythmicity is that it successfully explains the entire cross-linguistic data, which provided the empirical justification for the theory of Elenbaas and Kager (1999). Finally to top the list, *LAPSE(DE) produces a more restrictive factorial typology than that of *LAPSE(E&K). *LAPSE(DE) eliminates 'Iambic Cayuvava' overgenerated by *LAPSE(E&K). *LAPSE(DE) also unifies the factorial typology by getting rid of certain asymmetric possibilities emerging within the family of bidirectional loosely aligned ternary systems.

The new OT explanation of ternarity that we propose here thus emerges as a general theory of rhythmicity that transcends the limitations of any individual languages including TB. This theory is therefore capable of predicting any system that attests ternary rhythm. That this expectation is not baseless is proved by its successful explanation of the stress distribution pattern noted in Tripura Bangla English (or TBE)[2]. There exists a spectacular similarity between the metrical patterns of TBE and TB. For example consider the following set of light sequences from TBE.

4. a. ći.ne.ma
   b. Ǻ.me.ri.ca
   c. phý.si.o.lò.gy
   d. psý.cho.lo.gì.ca.lly
   e. phý.si.o.lò.gy.ca.lly

The accentuation pattern exhibited by these words of three to seven syllables replicates the pattern of stress distribution noted in TB words of similar make-up in (2) above. The reason for this is that in both TB and TBE an identical constraint hierarchy obtains which accounts for the metrical systems of both. The same observations hold even when the analysis is extended to the sequences containing heavy syllables also. This finding, we presume, will make significant contributions to second language pedagogy of English in India even though proposing any remedial measures is beyond the concern of the present research.

As far as the words containing both heavy and light syllables are concerned, an interesting phenomenon comes to light. Vowels in the stressed syllables of word-medial (ˋLL) feet and word-final (ˋH) feet lengthen in TBE even though the vowels in identical contexts both in the L1 (i.e. TB) and L2 (i.e. English) of the speakers of TBE are presumably short.

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[2] By TBE I mean the variety of English spoken by the educated native speakers of TB.

5.   English   TBE

[ì:.kə.nɔ́.mik]   [í.kɔ.no.mì:k]   'economic'

[ˈæ.nə.lí.tik]   [ɛ́.na.li.ʈì:k]   'analytic'

[ì:kə.nɔ́.mi.kl]   [í.kɔ.nɔ̀:.mi.kɛ̀:l]   'economical'

[ˈæ.nə.lí.ti.kl]   [ɛ́.na.lì:.ʈi.kɛ̀:l]   'analytical'

TB

[ɔ́.ma.no.ʃìk]   'inhuman'

[ɔ́.no.nù.kɔ.rɔ̀n]   'non-imitation'

In fact all English vowels including diphthongs are treated as short in TBE. In the face of it, instances of *lengthening* in (5) especially within a trochaic system, throw into jeopardy the canonical assumptions of durational asymmetry between iambic and trochaic patterns subsumed in the famous 'Iambic-Trochaic Law' (Hayes 1991). The present thesis however does not make any attempt to resolve the issue and leaves it for future research.   At this point a pertinent question crosses the inquisitive mind regarding the theoretical framework of the present study. It must have become obvious from the preceding discussion that I have chosen OT as the mode of grammar to account for the metrical phenomena under investigation. The reason for it has partly to do with the current practice in generative phonology in general, and partly to the fact that the revised rhythmic theory being proposed in the present thesis seeks in all earnestness only to improve upon the theory of Elenbaas and Kager (1999) without any pretensions to overhaul the theoretical apparatus adopted by the latter. Consequently, instead of justifying the analytical superiority of OT, which has

become clichéd by now particularly in phonological research, it is sensible to present a brief account of the actual nature of the grammar subsumed under OT and its modus operandi. The following account is based on Coetzee's (1999) summation of the salient features of OT.

It is a common assumption in generative linguistics that the phonological component of a grammar is responsible for mapping phonological forms (underlying forms) to the output (surface forms). In traditional generative phonology this mapping was achieved via several phonological rewrite rules. As the output of each rule represented the input for the next rule in line, the phonological component then had several levels. Phonological rules were thus to a great extent independent from the final representations. Since the beginning of generative phonology, it has become clear that the restrictions on the actual final output form also play some part in the phonological process. These restrictions have been formulated as well-formedness conditions. However, there has never been a clear guideline as to the division of powers between rewrite rules and well-formedness conditions, and the latter have steadily gained ground over the years.

OT proposes a totally different organization of the phonological component that finally secures the victory for the well-formedness conditions (or constraints as they as they are known in OT) over rewrite rules. In OT, the phonological component of the grammar consists of a generator (GEN), a set of universal constraints (CON), and an evaluative function (EVAL). The phonological input (underlying form) is fed into GEN, which generates candidate output forms (surface representations). GEN is envisaged as being very powerful and productive. It puts out an infinite number of possible candidates. CON refers to a set of universal constraints on surface representations. Every language orders these universal constraints into a hierarchy

that represents the phonological reality of that language. Variation between languages is then accounted for by this language specific ranking of the universal constraints. EVAL utilizes this language specific ranking of CON to evaluate all the candidates presented by GEN, and choose the best (optimal) candidate that will actually occur as the surface form.

Evaluation of the optimal candidate always witnesses two conflicting forces at work. On the one hand there is the requirement that the output should be identical to the input (i.e. it should be faithful to the input). On the other hand, there are several requirements as to what form a surface representation in the specific language may have. The optimal candidate will be the one that best satisfies both of these requirements. From the phrase 'best satisfies', a very important notion of OT arises, namely that all constraints are violable. The optimal candidate will not be the one that satisfies all the constraints, but the one that has the minimal violation. This concept of minimal violation is central to OT and deserves a few comments. 'Minimal' does not mean the smallest number of violations. Constraints are ranked, and the candidate with minimal violation will be the one whose highest violation is the lowest in the constraint hierarchy. If one candidate violates several low ranking constraints, it will still be optimal as opposed to another candidate that might violate only one high-ranking constraint.

Coming to the notational conventions of OT, constraints are indicated by abbreviations and acronyms and are always printed in small caps. ≫ indicates a dominance relation between constraints e.g. ONS ≫ MAX means the constraint ONS is ranked higher than MAX. The evaluation process of EVAL is given in a tableau where candidate outputs are represented in the leftmost column, with the constraint

hierarchy in the top row. A dominance relation between two candidates is indicated by a solid vertical line between columns, while two constraints on the same hierarchical level are separated by a broken line. A violation of a constraint is indicated by an asterisk in the relevant cell of the tableau. An exclamation mark indicates a non-optimal candidate's fatal violation, i.e. the violation that disqualifies it from the race for optimal status. Irrelevant cells (cells below the fatal violation) are shaded.[3] The optimal candidate is indicated by a pointing hand to its left.

The thesis is designed as follows: In Chapter I, I present a summa of the findings and achievements of Elenbaas and Kager (1999). In Chapter II a detailed argumentation is put forward for the reformulation of the anti-lapse constraint to accommodate the facts of TB. It also contains a comparative assessment of the two theories of rhythmicity based respectively on *LAPSE(E&K) and *LAPSE(DE) in producing the grammatical forms in the metrical systems of some selective languages attesting ternarity. The chapter also presents a revised and *more* restrictive factorial typology of ternary rhythm. In the last section I extend the OT analysis of TB to sequences having both light and heavy syllables showing in particular that rhythmic ternarity can be hampered only under pressure from the demand for stressing heavy syllables. Discussion in Chapter III supplies evidence from segmental phonology in favour of constructing binary feet and making distinctions of at least two levels of prominence -- primary and secondary -- in TB. Chapter IV presents an OT analysis of TBE highlighting the fact that the metrical pattern of the latter attests a strong influence of TB and is explainable by the same constraint hierarchy that holds for TB.

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[3] In the present thesis shading of irrelevant cells is avoided for some technical reasons relating to photocopying.

The chapter comes to an end by stating the phenomenon of *trochaic lengthening* noted in TBE, which contradicts the basic assumptions of 'Iambic-Trochaic Law'.

CHAPTER I

A CRITICAL SUMMARY OF ELENBAAS & KAGER (1999*)*

1.0 Introduction

Every natural language observes a certain pattern of distributing prominence among syllables within words. Such patterns broadly fall into two categories: binary and ternary. In binary rhythm, which is commonly assumed to be the unmarked pattern, every stressed syllable is followed by an unstressed one. Warao (Osborn 1966) and Pintupi (Hansen & Hansen 1969) are typical examples of binary rhythm. Ternary rhythm differs from binary rhythm in stressing every third syllable in a word. This is a marked pattern of metrification instantiated by only a small group of languages including Cayuvava (Key 1961), Chugach Alutiiq (Leer 1985), Estonian (Kager 1994, Hayes 1995, among others) and possibly Winnebago (Miner 1979). For illustration consider the following examples cited in Elenbaas and Kager (1999) (henceforth E&K).

1. *Binary rhythm*
  a. [(ˊσσ)(ˋσσ)(ˋσσ)(ˋσσ)σ]
    yú.ma.ɹ̠ì̠ŋ.ka.mà.ra.tʲù.ɹa.ka   'because of mother-in-law'   (Pintupi)

b. [σ(ˋσσ)(ˋσσ)(ˋσσ)(σ́σ)]
　enàhoròahàkutái　　　　　　　　'the one who caused him to eat'　　(Warao)

2. *Ternary rhythm*
a. [(σσ́)σ(σσ́)σ]
　a.kú.tar.tu.nír.tuq　　　　　　　'he stopped eating *akutaq*'　　(Chugach)
b. [σ(σ́σ)σ(σ́σ)σ][4]
　ma.rà.ha.ha.é.i.ki　　　　　　　'their blankets'　　　　　　(Cayuvava)

In the examples of binary rhythm in (1) stress falls on every alternate syllable starting at a particular edge of the word – left in (1a) and right in (1b). By contrast stress is assigned to every third syllable in the examples in (2) and the scansion moves rightwards in (2a) and leftwards in (2b). Let us not be concerned with the foot type distinction (iambs vs. trochees) at this stage.

　　　To offer a principled and unified account to the varying metrical patterns attested in the languages of the world has always remained a challenge for phonologists. As we all know, the advent of every new theory with the supposedly improved package of analytical tools warrants a reanalysis of different linguistic phenomena in the light of the fresh theoretical insights. In this light, metrical pattern has also been studied from various theoretical perspectives: rule-based derivational approach, early OT analysis, recent OT analysis with refined statements of certain crucial constraints etc. etc. A journey through these different phases of theoretical, and its corollary, analytical sophistications educates us about how human critical acumen succeeds in evolving a progressively perfect as well as a maximally generalized explanation of this natural linguistic phenomenon. Consideration of these various approaches to ternarity serves as a theoretical background

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[4] E&K follow the original author (Leer 1985) in not marking any primary-secondary stress distinction.

to our main proposal in this thesis. As the title of the thesis suggests, we are concerned here with providing an explanation to the kind of rhythmic ternarity noted in TB. TB agrees with other ternary systems in allowing two weak beats in between stresses. But it differs from the canonical ternarity in allowing three weak beats word-finally in words of $3n+1$ (i.e. four and seven) syllables. This *unusual* metrical pattern, which is predicted not to exist by the existing theories, will force a redefinition of a core constraint, which is the thrust of the next chapter where an explanation of the TB pattern and the demonstration of the shortcomings of the existing ones are attempted. In the current chapter we present an overall picture of how ternarity is treated in pre-OT, early OT and late OT dispensations. In this respect we are heavily dependent on E&K.

This chapter is organized in the following way. §1.1 prepares the ground for later discussion by introducing in brief the treatment of rhythm in rule-base metrical theory. §1.2 introduces the OT mechanism of explaining linguistic rhythm illustrating it with simple binary patterns (§1.2.2). A brief discussion explaining the theoretical and analytical superiority of OT over derivational approaches (§1.2.1) precedes this. In §1.3 the OT analysis is extended to ternary rhythm with §1.3.1 telling us how the Hayesian parametric option of Weak Local Parsing got translated into a ternarity-specific foot-repulsion constraint *FTFT. §1.3.2 argues against the foot-repulsion constraint as lacking independent motivation and consequently introduces the rhythmic anti-lapse constraint *LAPSE. This subsection also constructs the core constraint hierarchy for deriving systematic ternarity effect in Cayuvava. §1.4 applies this rhythmic theory to other languages: to the regular ternary rhythm in Chugach (§1.4.1); to occasional ternary patterns in Sentani (§1.4.2) and Finnish (§1.4.3). §1.5 is devoted to a factorial typology

showing that typological variations can be rightly predicted on the basis of alteration of the ranking order of the small set of constraints that generate ternarity. §1.5.1 factors out the basic typology of *LAPSE based on reranking. Various binary systems are predicted and analyzed in §1.5.2. §1.5.3 illustrates all possible typological variations within ternary patterns such as unidirectional (§§1.5.3.1-2), bidirectional (in the three subsections of §1.5.3.3). §1.6 sums up the major findings.

1.1 Rhythm in rule-based theory

In the rule-based metrical theory (Hayes 1981, 1995, Halle and Vergnaud 1987 among others), analysis of rhythm – whether binary or ternary – is crucially dependent upon certain parameters and cross-linguistic variation in rhythmic patterns is the consequence of fixing particular values for these parameters. For binary rhythm the three parameters include *foot type*, *iterativity* and *directionality*. Every language makes a selection of the appropriate foot type from the universal inventory – head initial (TROCHEES) or head final (IAMBS). Both the examples of binary rhythm from Pintupi and Warao in (1) and Cayuvava in (2b) select trochaic feet. On the other hand Chugach (2a) opts for iambic feet. The second parameter specifies whether foot construction is iterative or non-iterative. An iterative pattern insists on parsing maximal number of syllables into well-formed feet, which according to Hayes (1995) are always binary. Both Pintupi and Warao exemplify iterative foot construction. Interestingly in the words cited from Pintupi and Warao (1) one syllable remains unparsed in each and they stand at the opposite ends with respect to one another. The appropriate word-edge, which an unparsed syllable can occupy, is determined by the third parameter *directionality*, governing the direction of

foot construction. In Pintupi foot construction starts at the left edge and moves towards the right. In Warao the picture is just the reverse.

An intriguing situation confronts one while attempting to determine iterativity and direction of foot construction involved in the two examples in (2). Unlike in the examples of binary foot formation in (1), in (2) the binary feet are interspersed with one intervening syllable resulting in a ternarity effect on the surface. Again given that the unparsed syllable occupies the right edge of the word, it is not difficult to ascertain that in Chugach feet are constructed left-to-right. The picture however becomes puzzling in (2b) where one syllable stands unparsed on each edge of the Cayuvava word. The key to the mystery lies once again in the rhythmic ternarity that the language observes. This tells us that alternation in Cayuvava begins at the right edge and moves towards the left. To derive such ternarity effect with binary feet, Hayes (1995) proposes an additional parameter based on parsing mode: Foot Parsing Locality Parameter. One of the values of this parameter is Weak Local Parsing (henceforth WLP)[5]. Selection of this parametric value forces an intervention of one unparsed syllable between two binary feet. The result is rhythmic ternarity.

In sum, the rule-based account of metrical patterns makes use of at least four parameters: *foot type*, *iterativity*, *directionality* and *foot parsing locality*. Of these, the first three are common for both binary and ternary rhythms while the fourth is specific for deriving ternary effect through spacing out of otherwise successive binary feet.

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[5] In his rule-based theory Hayes implements ternary rhythm by a foot parsing locality parameter whose two values as defined in Hayes (1995: 308) are: a) *Strong Local Parsing*: When a foot has been constructed, align the window for further parsing at the next unfooted syllable (*unmarked value of the parameter)*; b) *Weak Local Parsing*: When a foot has been constructed, align the window for further parsing by skipping over a light syllable, where possible (*marked value of the parameter*). A binary rhythmic system selects the first while a ternary rhythm is the consequence of opting for the latter.

1.2 A constraint-based analysis of binary rhythm

1.2.1 Why OT?

Every new theory is a consummation of two essential aspects of critical inquiry:

fundamental insights of the existing theory and new propositions born out of an urge to

make good the shortcomings of the existing one. OT is no exception. As a development

of Generative Grammar OT shares its focus on formal description and the quest for

universal principles on the basis of empirical research of linguistic typology and first

language acquisition. OT, however, radically differs from earlier generative models in

various ways by way of improving upon them. To accommodate cross-linguistic variation

within a theory of UG, pre-OT models assumed parametric variation of inviolate

principles. Such a straightjacket approach to UG is incompatible with the empirically

attested diversity of human languages. OT therefore assumes that UG consists of

universal constraints, which are by nature violable. Cross-linguistic variation thus

becomes accountable in terms of language specific re-ranking of universal constraints.

Again, the rule-based derivational models suffer from what is known as *Duplication*

Problem (Kenstowicz and Kisseberth 1977). Such a theory fails to explain that the

'dynamic' phonology of a language (i.e. structural changes brought about by the

collective rewrite rules) is closely related to the 'static' phonology (i.e. the structural

conditions holding for all lexical items: *Morpheme Structure Constraints*). For example a

rule of vowel epenthesis breaking up a consonant cluster arising by morpheme

concatenation satisfies a goal generally respected by all morphemes of the language. The

output goal of the epenthetic rule is thus mirrored in the general morpheme structure of

the language. But the grammar fails to take any formal recognition of this underlying

similarity. In OT such a problem is never encountered, as the grammar neither imposes any structural conditions on lexical forms nor does it employ any rewrite rules to achieve surface well-formedness. OT mechanism operates by evaluating surface forms through universal well-formedness constraints. Being surface oriented OT thus is better advantaged to explain conspiracies: multiple processes triggered by a single output-oriented goal. Finally, as a corollary to renouncing rewrite rules and input specifications OT also eliminates derivations, replacing these by parallelism: all constraints pertaining to some type of structure are evaluated within a single hierarchy. This improves the grammar in terms of simplicity and economy.

Summarizing the essential factor(s) active in ushering in the transition in the theoretical perspective from a processual to a non-processual one Coetzee (1999: 99-100) writes:

> The phonological component of a grammar is responsible for mapping phonological input forms (underlying forms) to the correct output (surface forms). In traditional generative phonology this mapping was achieved via several phonological rewrite rules. As the output of each rule represented the input for the next rule in line, the phonological component then had several levels. Phonological rules were thus to a great extent independent from the final surface representation. Since the beginning of generative phonology, it has become clear that restrictions on the actual final output form also play some part in the phonological process. These restrictions have been formulated as well-formedness conditions. However, there has never been a clear guideline as to the division of powers between rewrite rules and well-formedness conditions, and the latter have steadily gained ground over the years.

The basic tenets of OT are succinctly put in the following paragraph quoted from E&K (: 276).

> Rule-based theory is challenged by OT (Prince & Smolensky 1993, McCarthy & Prince 1993a, b), a constraint-based theory abandoning serial derivations and rewrite rules. Instead, it defines phonological patterns in terms of harmony (or

relative well-formedness of the output), as evaluated by constraints. Grammars are defined as language-particular rankings of a set of universal constraints. Constraints are violable, but violation must be minimal, and occurs only in order to avoid violation of higher-ranking constraints. The optimal candidate is selected from a (potentially infinite) set of output candidates, by strictly hierarchically ranked constraints. Selection involves recursive evaluation, starting at the top-ranked constraints and proceeding by lower-ranked ones, until only one candidate remains.

1.2.2 OT analysis of binary rhythm

In the changed perspective 'defining a non-derivational counterpart of rule-based notion of DIRECTIONAL foot construction' has become a major challenge. McCarthy and Prince (1993b) however find an answer to this by using a set of three constraints involving binary foot size (FTBIN), exhaustive parsing of syllables by feet (PAPSE-σ) and the vicinity of feet with respect to an edge of the Prosodic Word (ALL-FT-X).

3. (E&K (4))
    a. FTBIN
       Feet must be binary under syllabic or moraic analysis.

    b. PARSE-σ
       All syllables must be parsed by feet.

    c. ALL-FT-L
       Align (FT-L, PrWd-L)[6]
       'The left edge of every foot coincides with the left edge of some PrWd.'

By ranking these potentially conflicting constraints E&K show how they can successfully account for the metrical pattern of Pintupi, as instantiated in the following set of examples in addition to the one in (1a).

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[6] Though defined indistinctively here, in the latter part of the paper E&K use the two constraints for separate purposes. Unlike Align-L, ALL-FT-L is a gradient constraint and the degree of its violation is directly proportional to the sum of violations for each individual foot contained within a word.

4. (E&K (3))
a. [(σ́σ)σ]   tʲútaya   'many'
b. [(σ́σ)(ˋσσ)]   máɭawàna   'through (from) behind'
c. [(σ́σ)(ˋσσ)σ]   púɭiŋkàlatʲu   'we (sat) on the hill'

The ranking argument among the proposed constraints for Pintupi goes like this: Pintupi metrics makes a strong demand for maximal parsing by binary feet. This can be achieved by ranking FTBIN above PARSE-σ. Violation of PARSE-σ is a must in a word having odd number of syllables since the last syllable cannot be optimally parsed by a binary foot. But as is characteristic of OT all violations must be minimal and only to avoid violation of higher-ranking constraints. This means any candidate having more than one violation mark for PARSE-σ will never be selected. Maximal parsing thus ensures a near complete alternating pattern. The remaining constraint ALL-FT-L implements the orientation of the feet towards the left. But it also makes a rather strong requirement that all feet be aligned with the left edge of the PrWd. Such a demand can never be fulfilled by any optimal parse for Pintupi as the language allows rhythmic alternation and hence enforces multiple feet per word. Consequently, ALL-FT-L must be dominated by PARSE-σ. Once again by virtue of the principle of minimal violation ALL-FT-L exercises a subtle pressure on the optimal parse to have its feet as close as possible to the left edge of the PrWd measured by the numbers of syllables. The projected ranking for the binary rhythm in Pintupi is as in (5) below.

5. FTBIN ≫ PARSE-σ ≫ ALL-FT-L

The tableau in (6) displays this interaction. In the column below ALL-FT-L, each violation mark denotes a distance of one syllable between some foot and the left edge of the PrWd while spaces separate the violations of individual feet.

6.

/puɭiŋkalatʲu/	FT-BIN	PARSE-σ	ALL-FT-L
☞ a. (pú.ɭiŋ).(kà.la).tʲu		*	**
b. (pú.ɭiŋ).ka.(là.tʲu)		*	***!
c. pu.(ɭíŋ.ka).(là.tʲu)		*	* **!*
d. (pú.ɭiŋ).ka.la.tʲu		**!*	
e. (pú.ɭiŋ.ka.la.tʲu)	*!		
f. (pú.ɭiŋ).(kà.la).(tʲˤu)	*!		** ****

The undominated status of FTBIN is justified by the rejection of the candidates (6e, f) both of which satisfy PARSE-σ (through exhaustive parsing) but at the expense of the higher ranked constraint. Again the dominance of PARSE-σ over ALL-FT-L is substantiated by the rejection of (6d) even though it fully satisfies the alignment constraint by having only one foot at the left most edge of the PrWd. No candidate can see the light of day in Pintupi that has more than the minimal violation mark on the count of PARSE-σ. Then all the remaining three candidates have one violation of PARSE-σ each. The onus of breaking the tie therefore shifts to the next constraint down the constraint hierarchy, ALL-FT-L. Being a gradient constraint it selects the one which has the lowest number of violation marks i.e. the one that has its feet maximally close to the leftmost edge of the PrWd.

To sum up, the constraint ranking required for explaining binary alternation in all languages is FTBIN ≫ PARSE-σ ≫ ALL-FT-X where 'X' is an edge (L or R).

1.3 Extending OT analysis to ternary rhythm

As already noted in §1.1 explaining ternary alternation by binary feet requires an additional parametric selection of WLP, which prevents back-to-back foot construction. This does not however explain the presence of an unparsed syllable at the beginning of alternation in a purely ternary language like Cayuvava where primary stress falls on the antepenult and the alternation proceeds ternarily leftwards. Inclusion of a special parsing provision of final syllable extrametricality along with WLP can analyze Cayuvavan ternarity. This explanation is based on Hayes (1995). Thanks to WLP a syllable is skipped each time after a foot has been constructed. With binary feet, WLP yields inter-stress intervals of two syllables. This automatically accounts for the double upbeat present in words of five or eight (i.e. $3n+2$) syllables where the initial syllable remains unfooted even though there would have been room to form a binary foot.

7. (E&K (10))
a. i.<u>ki</u>.(tà.pa).<u>re</u>.(ré.pe).ha   *with WLP and final syllable extrametricality*
   'the water is clean'

b. *(i.kì).(tà.pa).<u>re</u>.(ré.pe).ha *because of WLP*

This rule-based analysis of Cayuvavan ternarity serves as a background for discussion of two OT analyses of the same. Introducing these OT accounts of ternary rhythm E&K (: 279) write:

> The first, which will eventually be rejected, is based on a direct counterpart of WLP, a foot-repulsion constraint *FTFT (Kager 1994). The second analysis uses a grid-based anti-lapse constraint (*LAPSE; Selkirk 1984, Elenbaas 1999). Unlike *FTFT, *LAPSE is not a constraint specifically designed to account for strict ternarity. Its scope is wider, generalizing to bounded systems, including basically binary rhythmic systems with occasional ternarity….

1.3.1 A foot-repulsion constraint: *FᴛFᴛ

E&K have three predecessors in respect of attempting a constraint-based analysis of the Cayuvavan type of ternarity: Kager (1994), Ishii (1996) and Elenbaas (1999). While the major findings of Elenbaas (1999) understandably reappear in E&K, the explanations found in the earlier two are discarded by the latter although for totally different reasons. Ishii (1996) correctly understands the problem stemming from the ternarity-specific character of *FᴛFᴛ but fails on account of its inability to appropriately formulate the anti-lapse constraint using, instead, a parsing-based constraint Pᴀʀsᴇ-2. In the present discussion we shall not consider Ishii's ideas in great detail. Instead, in the remainder of this subsection we shall see how E&K argue against *FᴛFᴛ, as proposed in Kager (1994), before finally discarding it.

Being an early attempt at constraint-based analysis of Cayuvava, the theoretical priorities were directed towards finding exact OT analogues for the derivational mechanisms (namely parameter setting) in the form of ranked constraints. Consequently, all the relevant constraints proposed for Cayuvava in Kager (1994) were just the metamorphosed versions of various parameters found in Hayes (1995).

8. (E&K (14))

Rule-based analysis	*OT analysis*	
Extrametricality	Nᴏɴ-Fɪɴ	(≫ Pᴀʀsᴇ-σ, Aʟʟ-Fᴛ-R)
Parsing mode (WLP)	*FᴛFᴛ	(≫ Pᴀʀsᴇ-σ)
Iterativity	Pᴀʀsᴇ-σ	(≫ Aʟʟ-Fᴛ-R)
Directionality	Aʟʟ-Fᴛ-R	(≫ Aʟʟ-Fᴛ-L)

Nᴏɴ-Fɪɴᴀʟɪᴛʏ (Nᴏɴ-Fɪɴ) redefines extrametricality as an OT constraint, prohibiting construction of a foot on the rightmost edge of the PrWd. Aʟʟ-Fᴛ-R is the converse of

ALL-FT-L requiring feet to be maximally aligned towards the *right* edge of the PrWd. But

the most important constraint for deriving ternarity is *FTFT, a counterpart of Hayesian

WLP.

9. (E&K (11))
   *FTFT
    Feet must not be adjacent.

Since both extrametricality and inter-foot underparsing are primarily responsible for

achieving ternarity in Cayuvava, their corresponding constraints NON-FIN and *FTFT

must remain undominated in the ranking in an OT grammar of the language. Subject to

the satisfaction of these constraints, parsing must be 'maximally dense'. In other words,

immediately next in the ranking order stands PARSE-σ. Coming to the issue of edge

orientation the *a priori* selection would be a foot-alignment constraint referring to the left

edge of the PrWd.   But in reality it is just the reverse. This is evidenced by words having

a length of ($3n+2$) (i.e. five, eight syllables etc.) where two syllables remain unparsed

word-initially as opposed to one, word-finally (cf. 11a). The proposed foot-alignment

constraint is therefore ALL-FT-R. Cayuvava prefers to have rhythmic alternation (through

multiple feet) rather than having *all* feet strictly aligned with the right edge of the PrWd.

This means the constraint looking after maximal parsing, namely PARSE-σ, overrides the

foot alignment constraint. The complete ranking for Cayuvavan rhythmic ternarity is

therefore as in (10) which is tested out in (11).

10. (E&K (12))
*FTFT, NON-FIN ≫ PARSE-σ ≫ ALL-FT-R

11. (E&K (13))

/ikitaparerepeha/	*FTFT	NON-FIN	PARSE-σ	ALL-FT-R
☞ a. i.ki.(tà.pa).re.(ré.pe).ha			****	* ****
b. i.(kì.ta).pa.re.(ré.pe).ha			****	* ****!*
c. i.(kì.ta).pa.(ré.re).pe.ha			****	** ***!**
d. i.ki.ta.pa.re.(ré.pe).ha			*****!*	*
e. (ì.ki).(tà.pa).re.(ré.pe).ha	*!		**	* **** ******
f. (ì.ki).ta.(pà.re).re.(pé.ha)		*!	**	*** ******
g. (ì.ki).(tà.pa).(rè.re).(pé.ha)	*!**	*!		** **** ******

The above OT grammar for Cayuvava ternary rhythm presents a neat picture with the undominated foot-repulsion constraint *FTFT. But this surface neatness disguises a major theoretical loophole relating to the justification of *FTFT. There is no independent motivation for proposing this constraint other than to keep binary feet apart by at least one intervening syllable. The indirect objective behind such a constraint is therefore to derive ternary effect on the surface with binary feet. Stated differently, *FTFT is also a typically ternarity-specific tool like TERNARY FEET (Halle & Vergnaud 1987, Levin 1988, Dresher & Lahiri 1991, Hewitt 1992, Rice 1992) or binary feet in combination with WLP (Hayes 1995) or Relativised Extrametricality (Hammond 1990)[7]. But as E&K argue, no ternarity-inducing mechanism is required to analyze ternarity. Instead ternarity is better explained as emerging from 'LICENSING, involving interactions of the anti-lapse constraint *LAPSE (banning long sequences of unstressed syllables; Selkirk 1984) with standard foot-alignment constraints (ALL-FT-X, ALL-FT-Y; McCarthy and Prince 1993b)'. (E&K: 274) The proposed anti-lapse constraint is not ternarity-specific, in the

---

[7] '…..Hammond (1990) … argues that Weak Local Parsing and extrametricality are functionally related: both produce parses in which binary feet are followed by a single unparsed syllable, either at the right edge of a word, or at the right edge of a foot. This is 'relativised extrametricality', that is relativised to a domain (foot or PrWd).' (E&K: 279)

sense that it broadly enforces bounded rhythm, either binary or ternary. E&K presents

various types of evidence (from analyses of particular languages as well as typological)

in support of this new constraint by way of demonstrating its superiority over the foot-

repulsion constraint *FTFT.

1.3.2 A rhythmic anti-lapse constraint: *LAPSE

Introducing the anti-lapse constraint E&K (: 281) write:

> We conceive of ternarity as a basically RHYTHMIC phenomenon, which involves an organization of strong and weak beats in ternary intervals. … [W]e assume that linguistic rhythm is represented as a hierarchical organization of elements on the GRID. In bounded stress systems, strong beats are spaced one or two syllables apart with an overall periodical tendency towards even spacing, either binary or ternary. Inter-stress distances are restricted both by upper and lower bounds. When inter-stress distance is too short, i.e. when two strong beats are adjacent, a rhythmic CLASH arises. When two strong beats are too far apart, there is a rhythmic LAPSE. Clashes and lapses are disfavoured in bounded stress systems.

E&K however are not the first in forming such a rhythmic view of bounded stress system.

In fact, as the authors acknowledge, theirs is a cumulative development of the insights

expressed in Liberman (1975), Liberman & Prince (1977), Prince (1983) and most

importantly in Selkirk (1984). Selkirk (1984: 52) proposes a Principle of Rhythmic

Alternation, with an Anti-clash Provision and an Anti-lapse Provision.

12. (E&K (15))

The Principle of Rhythmic Alternation

   a. *Anti-clash Provision*
   Every strong position on a metrical level *n* should be followed by at least one
   weak position on that level.
   b. *Anti-lapse Provision*
   Any weak position on a metrical level *n* may be preceded by at most one weak
   position on that level.

It should be noted that the Anti-lapse Provision of Selkirk (1984) broadly defines the rhythmic margins of bounded systems, accommodating both binary and ternary styles of alternation. Capitalizing on this generalized (as opposed to specific) character of this provision E&K adapt it to a constraint *LAPSE (originally proposed by Elenbaas 1999):

13. (E&K (17)) *LAPSE
      Every weak beat must be adjacent to a strong beat or the word edge.

*LAPSE does not involve any counting of weak beats. This absolutely rhythmic constraint is based on the notion of licensing. Explaining this aspect of *LAPSE, E&K (: 282) write:

> All that *LAPSE does is to check the linear adjacency of a weak beat with respect to rhythmic landmarks: either a strong beat or an edge. In this view, strong beats and edges become the LICENSORS of weak beats. As is well known, stressed syllables and word edges function as licensors in a range of phenomena in both segmental and metrical phonology….

In brief, a weak beat which is neither adjacent to a strong beat or the word-edge violates *LAPSE. Such a situation in fact arises wherever there is a sequence of three weak beats as the following evaluation chart based on E&K (: 283) shows.

14. (E&K (18)) *Evaluations by *LAPSE*

	two weak beats	marks	three weak beats	marks
Initial	x	√	x	*
	[x x x …		[x x̱ x x …	
Final	x	√	x	*
	… x x x]		… x x x̱ x]	
Medial	x x	√	x x	*
	… x x x x …		… x x x̱ x x …	

In (14) all violations of LAPSE occur only in respect of sequences of three weak beats irrespective of their positions in the word as opposed to none in case of sequences

having two weak beats. (The violating weak beat appears with an underline.) Thus it may seem that the proposed anti-lapse constraint is also as good as any ternarity-specific one, apparently undermining the central claim of E&K that systematic ternarity needs no ternarity-specific tools. Such a charge however stands nullified as soon as one refers to E&K's analyses of two other bounded languages, Sentani and Finnish (presented later), where *LAPSE functions only to impose an upper limit on inter-stress intervals, instead of enforcing iterative ternary rhythm. In these languages local ternary patterns appear due to various interacting constraints. Discounting further any direct relation between *LAPSE and ternarity the authors add (E&K: 283):

> The relation between *LAPSE and ternarity is fairly indirect. *LAPSE broadly determines a minimum of rhythmic organization on the grid, leaving room for both binarity and ternarity, the choice between which is made by other constraints. The general idea is that ternarity is a state in which lapses are avoided, while the number of feet is also *minimized*. (In contrast, the number of feet is *maximized* under binarity, due to PARSE-σ.)

Minimization of the number of feet is fraught with the danger of incurring *LAPSE violations. It remains therefore to be seen how the grammar reconciles these conflicting situations the result of which is predicted to be ternarity.

To answer this question E&K invoke Ishii's (1996) idea that ternarity arises by the interaction of foot alignment and an anti-lapse constraint. That is, ALL-FT-X reduces the number of feet to the bare minimum still allowed by the anti-lapse constraint and the result is ternarity. As far as the grammar is concerned it is obvious therefore that *LAPSE must dominate ALL-FT-X in patterns exhibiting ternarity.

Let us now demonstrate how ALL-FT-X achieves this 'underparsing' goal. Any foot that is not strictly edge-adjacent violates the alignment constraint. Hence, the more

feet, the more violations will arise for ALL-FT-X as is shown in the following trochaic parsings of a six-syllable string:

15. (E&K (19))

a.
```
     x     x     x                    b.        x        x
     x  x  x  x  x  x                           x x x x x x
     (σ σ) (σ  σ) (σ σ)                          (σ σ) σ (σ σ) σ
     ALL-FT-L: ** ****                           ALL-FT-L: ***
```

(15a) has a binary rhythm while (15b) a ternary one. Both satisfy *LAPSE. But the ternary scansion achieves this in a more economical way by having only two feet than the binary parsing, which has three feet. The maximally dense parsing of (15a) has more violations of ALL-FT-L (six) compared to the less dense parsing of (15b) (three). But the economy of (15b) is at the cost of exhaustive parsing, motivating the partial ranking ALL-FT-L ≫ PARSE-σ. This brings us to the core constraint ranking responsible for generating ternarity understood as an underparsing effect.

16. (E&K (20))
Ranking for ternarity
*LAPSE ≫ ALL-FT-X ≫ PARSE-σ

It is time to see how this ranking accounts for the ternary rhythm in Cayuvava. The following tableau for a word of length $3n$ syllables (i.e. six syllables) captures all the basic predictions made by the ranking in (16).

17. (E&K (21))

/arihihibee/	*LAPSE	ALL-FT-L	PARSE-σ
a. (á.ri).hi.hi.be.e	*!**		****
b. a.ri.(hí.hi).be.e	*!	**	****
c. (à.ri).(hí.hi).be.e	*!	**	**
☞ d. (à.ri).hi.(hí.be).e		***	**
e. (à.ri).hi.hi.(bé.e)	*!	****	**
f. a.(rì.hi).hi.(bé.e)		* ***!*	**
g. (à.ri).(hì.hi).(bé.e)		** **!**	

The underparsing constraint ALL-FT-L seeks to maximally minimize the number of feet but cannot override the bare minimum (two) guaranteed by *LAPSE (cf. 17a, b). This justifies the ranking *LAPSE ≫ ALL-FT-X, the core mechanism for ternary pattern. But even a two-foot parse cannot guarantee a satisfaction of *LAPSE if they instantiate dis-rhythmic patterning of beats (17c, e). Of the three candidates satisfying *LAPSE, the maximally dense three-foot parse (17g) incurs maximal violation of ALL-FT-L and hence is excluded. Comparison between the two remaining two-foot parsings (17d) and (17f) brings out the second major role of ALL-FT-L i.e. regulating the directionality of footing. ALL-FT-L pulls feet maximally to the left edge of the word, selecting the ternary parse (17d).

The two ranking arguments *LAPSE ≫ ALL-FT-L and ALL-FT-L ≫ PARSE-σ based on six-syllable forms also predict the metrical pattern of words with $3n+1$ syllables (i.e. four, seven and ten syllables etc.). The minimal number of feet to satisfy *LAPSE for a word of seven-syllable length is two. Once again foot number is kept at a bare minimum by ALL-FT-L, penalizing overparsing (cf. the candidate having three feet (18g)).

18. (E&K (23))

/marahahaeiki/	*LAPSE	ALL-FT-L	PARSE-σ
a. (má.ra).ha.ha.e.i.ki	*!***		*****
b. ma.ra.(há.ha).e.i.ki	*!*	**	*****
☞ c. ma.(rà.ha).ha.(é.i).ki		* ****	***
d. ma.ra.(hà.ha).(é.i).ki		** ****!	***
e. ma.ra.(hà.ha).e.(í.ki)		** ****!*	***
f. (mà.ra).ha.(há.e).i.ki	*!	***	***
g. (mà.ra).(hà.ha).(é.i).ki		** ****!	*

From the two examples above it appears that ALL-FT-L is powerful enough to pull beats as far to the left edge as is allowed by the anti-lapse constraint, resulting in a pattern where beats fall on every third syllable counting from the end. Given this, it would be interesting to know what prevents the formation of an initial foot in a word of length $3n+2$ such as *i.ki.(tà.pa).re.(ré.pe).ha* 'the water is clean'. This initial foot in fact is cost-free as it does not cause any extra violations of ALL-FT-L in addition to perfectly satisfying *LAPSE. Since there is a tie on both the higher ranked constraints for candidate *i.ki.(tà.pa).re.(ré.pe).ha* as opposed to candidate *(ì.ki).(tà.pa).re.(ré.pe).ha*, the charge of evaluation passes on to the next lower constraint PARSE-σ, which obviously selects the latter on the virtue of minimal violation. In other words, the constraint ranking (16) which perfectly predicts the most harmonic forms in respect of words with $3n$ and $3n+1$ syllables, yields a wrong result in case of words having $3n+2$ syllables. The suggestion that E&K make to resolve this crisis is stated in the following excerpt (p. 285-286):

> In fact a minor modification of the hierarchy produces the double underparsing in words of length $3n+2$ syllables. CON contains an (independently motivated) foot-alignment constraint militating against the initial foot. This constraint, ALL-FT-R, evaluates the position of all feet with respect to the right edge: the more feet, the more violations. Clearly an initial foot causes extra violations of ALL-FT-R. This constraint seals the fate of [*(ì.ki).(tà.pa).re.(ré.pe).ha*] at the expense of violation of PARSE-σ. All it takes to achieve the initial underparsing effect is to insert ALL-FT-R between ALL-FT-L and PARSE-σ in the ranking hierarchy.

The final ranking for Cayuvava ternary rhythm is as the following.

19. (E&K (25))
Final ranking for Cayuvava
     *LAPSE ≫ ALL-FT-L ≫ ALL-FT-R ≫ PARSE-σ

The following tableau illustrates this analysis.

20. (E&K (26))

/ikitaparerepeha/	*LAPSE	ALL-FT-L	ALL-FT-R	PARSE-σ
a. i.(kì.ta).pa.(ré.re).pe.ha	*!	* ****	** *****	****
☞　b. i.ki.(tà.pa).re.(ré.pe).ha		** *****	* ****	****
c. (ì.ki).(tà.pa).re.(ré.pe).ha		** *****	* **** *!****	**
d. (ì.ki).ta.(pà.re).re.(pé.ha)		*** *****!*	*** ******	**
e. (ì.ki).(tà.pa).(rè.re).(pé.ha)		** **** **!***	** **** *****	

The critical comparison is between (20b) and (20c) whose tie on ALL-FT-L is resolved in favour of the former by the lower ranked constraint ALL-FT-R resulting in two initial upbeats. The sub-optimal status of all other candidates is self-explanatory. E&K wind up their analysis of the ternary pattern of Cayuvava based on the interaction of the anti-lapse constraint *LAPSE and the foot-alignment constraints ALL-FT-X, with the following additional ranking arguments (where '≻' should be read as 'is more harmonic than'):

21. (E&K (27))
Ranking arguments
a. ALL-FT-L ≫ ALL-FT-R
(à.ri).hi.(hí.be).e　　　　　≻ a.(rì.hi).hi.(bé.e)
ma.(rà.ha).ha.(é.i).ki　　　≻ ma.ra.(hà.ha).e.(í.ki)
b. ALL-FT-R ≫ PARSE-σ
i.ki.(tà.pa).re.(ré.pe).ha　　≻ (ì.ki).(tà.pa).re.(ré.pe).ha

1.4 Evidence from other languages

1.4.1 Chugach Alutiiq

A Yupik dialect, Chugach Alutiiq or Chugach has a ternary iambic rhythm and iteration proceeds from left to right. In words containing only light syllables, stress falls on every syllable in position $3n$-1 (i.e. σ_2, σ_5, etc.), as well as on the final syllable of any words of length $3n$+1 (i.e. four, seven) syllables. There is always a foot aligned with the left edge of the PrWd and the language selects the parametric option of persistent footing by which

any pairs of syllables that are still unparsed after directional foot construction must be footed. This ternary pattern has been analyzed in rule-based theory with ternary feet in Halle (1990), Rice (1992) and Hewitt (1992). Hayes (1995) and Kager (1993) employ binary feet with WLP. Within the OT framework, the earliest attempt was that of Green and Kenstowicz (1995) who used the foot-repulsion constraint *FTFT. This was followed by Ishii (1996) who pursued the idea that ternarity is due to interaction of ALL-FT-X and an anti-lapse constraint. But as was in case of Cayuvava, Ishii's analysis proved technically ineffective thanks to the latter's use of a parse-based constraint PARSE-2 in stead of *LAPSE. Discounting all their predecessors E&K therefore propose a fresh analysis of Chugach ternarity built around their primary thesis that ternarity is the result of interaction between a grid-based anti-lapse constraint *LAPSE and foot-alignment constraints ALL-FT-X all of which are independently motivated. Before we actually present the details of E&K's analysis of Chugach, let us take note of the relevant data from the language cited by the authors from Leer (1985).

22. (E&K (37))
    (mu.lú).kan   'if she takes a long time'
    (a.kú).(ta.mék)   '*akutaq* (a food; ABL SG)
    (ta.qá).ma.(lu.ní)   'apparently getting done'
    (a.kú).tar.(tu.nír).tuq   'he stopped eating *akutaq*'
    (ma.ŋár).su.(qu.tá).(qu.ní) 'if he (REFL) is going to hunt porpoise'

The core mechanism for explaining Chugach ternarity is the same as that proposed for Cayuvava and for that matter, for any language having ternary pattern i.e. *LAPSE ≫ ALL-FT-X ≫ PARSE-σ (cf. 16). The value for X in Cayuvava is L as parsing proceeds from right to left. In Chugach, the directionality of footing is reversed. The logical

conclusion is that the value for X in the latter is R. It is therefore expected that Chugach's ternarity is due to interaction of the following core constraints:

23. *Lapse ≫ All-Ft-R ≫ Parse-σ

The next major difference between Cayuvava and Chugach is the existence of foot-persistence (to use Hayesian terminology) in the latter. The question therefore arises how to capture this parametric choice in an OT format. E&K's answer in this connection is:

> We will show that a simple reranking of the set {*Lapse, Parse-σ, All-Ft-L/R} captures the differences in metrification. Recall that in our earlier analysis of the initial underparsing effect in Cayuvava, an opposite-edge foot-alignment constraint (All-Ft-Y) blocked the assignment of the initial foot, taking precedence over Parse-σ [cf. 20b, c]. All it takes to derive the logically opposite effect of overparsing (or 'persistent footing') is the reversal of the ranking of these constraints: ……(p 292).

The proposed reranking mechanism for foot-persistence is spelt out in the following.

24. (E&K (42))
Parsing at 'opposite' edge in Cayuvava and Chugach
   a. *Cayuvava* (*non-persistent*)
      *Lapse ≫ All-Ft-L≫ All-Ft-R ≫ Parse-σ
      i.ki.(tà.pa).re.(ré.pe).ha   ≻ (í.ki).(tà.pa).re.(ré.pe).ha

   b. *Chugach* (*persistent*)
      *Lapse ≫ All-Ft-R ≫ Parse-σ≫ All-Ft-L
      (ma.ŋár).su.(qu.tá).(qu.ní) ≻ (ma.ŋár).su.(qu.tá).qu.ni

The final ranking for Chugach however needs one more undominated constraint in addition to *Lapse. Scrutiny of the data in (22) proves the undominated status of *Lapse. But (22) also shows that Chugach requires every word to start with a foot. This demand is satisfied by invoking the independently motivated alignment constraint, namely Align-L.

25. ALIGN-L (E&K (43))
    Align (PrWd-L, Ft-L)

Without this undominated constraint and with the high-ranking ALL-FT-R the grammar would make incorrect predictions about the patterns of words of length 3*n*+1: *ma.(ŋar.sú).qu.(ta.qú).ni* will wrongly be selected in stead of the grammatical one *(ma.ŋár).su.(qu.tá).(qu.ní)* because of the one fewer violation incurred by the former on the count of ALL-FT-R. The optimal status of *(ma.ŋár).su.(qu.tá).(qu.ní)* therefore not only justifies the invocation of the alignment constraint ALIGN-L, but also the following ranking argument for Chugach.

26. (E&K (44))
ALIGN-L ≫ ALL-FT-R
(ma.ŋár).su.(qu.tá).(qu.ní) ≻ ma.(ŋar.sú).qu.(ta.qú).ni

The entire discussion therefore boils down to E&K's (: 293) statement: "once we have undominated *LAPSE and ALIGN-L, *all* ternarity effects can be attributed to ALL-FT-R." This will be illustrated through the operations of the following final ranking for Chugach.

27. (E&K (45))
ALIGN-L, *LAPSE ≫ ALL-FT-R ≫ PARSE-σ ≫ ALL-FT-L

28. (E&K (46))

/maŋarsuqutaquni/	ALIGN-L	*LAPSE	ALL-FT-R	PARSE-σ	ALL-FT-L
a. (ma.ŋár).su.qu.ta.qu.ni		*!**	*****	*****	
b. ma.(ŋar.sú).qu.(ta.qú).ni	*!		* ****	***	* ****
c. (ma.ŋár).su.(qu.tá).qu.ni			** *****	**!*	***
☞ d. (ma.ŋár).su.(qu.tá).(qu.ní)			** *****	*	*** *****
e. (ma.ŋár).(su.qú).ta.(qu.ní)			*** *****!	*	** *****
f. (ma.ŋár).(su.qú).(ta.qú).ni			* *** ****!*	*	** ****

Of the six candidate metrifications in the above tableau, (28a, b) are excluded by the two undominated constraints. (28e, f) survive the undominated constraints, but fail on account

of incurring greater number of violation marks than the optimal three-foot parse (28d). (28c) and (28d) are logged in a tie by scoring identically with respect to ALL-FT-R. At this stage the dominant status of the 'foot-persistence' constraint PARSE-σ over ALL-FT-L becomes evident. PARSE-σ gives the verdict in favour of the three-foot parse on consideration of its maximal parsing compared to the two-foot parsing in (28c).

Behind all these surface activities involving especially the interactions of PARSE-σ and ALL-FT-L what remains steady and active is the role of ALL-FT-R pulling the iambs as close to the right edge of the word as permitted by the two undominated constraints especially *LAPSE. As already stated, ternarity therefore is the consequence of this interaction between the anti-lapse constraint and the ones taking care of foot-alignments. The crucial role of high-ranking ALL-FT-R in achieving ternarity is also proved by the following algorithm for a word of length $3n$ syllables.

29. (E&K (48))

/akutartunirtuq/	ALIGN-L	*LAPSE	ALL-FT-R	PARSE-σ	ALL-FT-L
a. (a.kú).tar.tu.nir.tuq		*!*	****	****	
b. (a.kú).(tar.tú).nir.tuq			** ****!	**	**
☞ c. (a.kú).tar.(tu.nír).tuq			* ****	**	***
d. (a.kú).tar.tu.(nir.túq)		*!	****	**	****
e. a.(ku.tár).tu.(nir.túq)	*!		***	**	* ****
f. (a.kú).(tar.tú).(nir.túq)			** ****!		** ****

Six-syllable forms are bound to a have a minimum of two feet if they are to survive the undominated constraint *LAPSE. But merely having two feet also does not help. Consider for instance, the candidate (29d) where ALL-FT-R overexerts itself at the expense of *LAPSE. (29b) survives the undominated constraints but fails incurring maximum violation of ALL-FT-R. Same is the fate of maximally parsed (29f). (29e) is rejected by the undominated ALIGN-L. Selection of (29c) is therefore a perfect reconciliation

between the underparsing constraint ALL-FT-R and the one enforcing rhythmic alternation by prohibiting long sequences of weak beats i.e. *LAPSE. The result is ternarity. A similar story of the interaction between the same two constraints indirectly generating ternarity is narrated by the following tableau for words of length $3n+2$. The ranking PARSE-σ ≫ ALL-FT-L is responsible for maximal parsing and ALL-FT-R ≫ PARSE-σ sees to it that feet are maximally spaced apart within, of course, the limits imposed by the undominated constraints. Once again the result is rhythmic ternarity.

30. (E&K (50))

/taqamaluni/	ALIGN-L	*LAPSE	ALL-FT-R	PARSE-σ	ALL-FT-L
a. (ta.qá).ma.lu.ni		*!	***	***	
b. ta.(qa.má).lu.ni	*!		**	***	*
c. (ta.qá).(ma.lú).ni			* ***!	*	**
☞ d. (ta.qá).ma.(lu.ní)			***	*	***

In sum[8], the above OT analysis of the ternary pattern noted in Chugach provides substantial evidence in support of the claim of E&K that ternarity does not depend on any ternarity-specific constraint (*FTFT) or device (TERNARY FOOT, or binary foot in combination with WLP etc.), but is the indirect fall-out of the interaction of some independently existing universal constraints mainly anti-lapse constraint *LAPSE and foot-alignment constraints ALL-FT-X.

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[8] I shall not go into the mora-based analysis of lapse proposed in E&K for words with heavy syllables and the reasons thereof are the following. a) E&K do not carry out this analysis in respect of any other languages in which heavy syllables do play an active role in deciding stress placement such as Finnish. b) Coming to the issue of a factorial typology E&K have professedly restricted their goal 'to develop a factorial typology of quantity-insensitive styles of alternation…' (p 307) only.

1.4.2 *LAPSE is not a ternarity-specific constraint: argument from Sentani[9]

Let us start by looking at the following set of Sentani words ranging from four to seven

syllables.

31. (E&K (58))
bóhi	'next'
walóbo	'spirit'
fomàlére	'for we will go across'
haxòmibóxe	'he obeyed them'
molòkoxawále	'I wrote to you'
molòkoxàwaléne	'because I wrote to you'

Metrical pattern of Sentani is a strange one: the same word can have both iambic and

trochaic feet. Main stress always falls on the penult and a secondary stress on the second

in words of minimally four syllables. Another secondary stress falls on the fourth syllable

in words of seven or more syllables. The key comparison is between words of four and

six syllables. Words of four syllables have stress on their second and third syllables,

resulting in a clash. In contrast, words of six syllables are stressed on their second and

fifth syllables. These lack secondary stress in clash with the main stress, resulting in a

local ternary pattern. E&K adopt Elenbaas's argument that Sentani has an iambic stress

system in which stress on the final syllables is avoided even at the cost of clash. The first

three ranking arguments are therefore:

32. a. NON-FIN ≫ *CLASH   (fo.mà).(lé.re) ≻ (fo.mà).(lɛ.ré)
    b. NON-FIN ≫ FT=IAMB   (fo.mà).(lé.re) ≻ (fo.mà).(lɛ.ré)
    c. FT=IAMB ≫ *CLASH   (fo.mà).(lé.re) ≻ (fò.ma).(lé.re)

---

[9] Sentani is a Papuan language spoken in Irian Jaya, the easternmost province of Indonesia
(Elenbaas 1996, 1999).

The optimal parse *(fo.mà).(lé.re)* has one (i.e. minimal) violation mark of FT=IAMB and

*CLASH each. The constraint ranking required for four syllables in Sentani is

33. NON-FIN ≫ FT=IAMB ≫ *CLASH

In six-syllables, the avoidance of final stress does not result in clash but in a ternary

rhythm thanks to the non-parsing of the third and fourth syllable. Consequently, another

ranking argument emerges:

34. (E&K (60))
*CLASH ≫ PARSE-σ
(mo.lò).ko.xa.(wá.le) ≻ (mo.lò).(ko.xà).(wále)

Again the fact that every such word begins and ends in a foot justifies the invocation of

the following undominated word-to-foot alignment constraints ALIGN-L and ALIGN-R.

The complete ranking for words of four and six syllables in Sentani is therefore

35. ALIGN-L, ALIGN-R, NON-FIN ≫ FT=IAMB ≫ *CLASH ≫ PARSE-σ

This ranking is illustrated in the following tableaux.

36. (E&K (63))

/fomalɛre/	ALIGN-L	ALIGN-R	NON-FIN	FT=IAMB	*CLASH	PARSE-σ
☞ a. (fo.mà).(lɛ́.re)				*	*	
b. (fo.mà).lɛ.re		*!				**
c. fo.(ma.lɛ́).re	*!	*				**
d. (fo.mà).(lɛ.ré)			*!			

37. (E&K (64))

/molokoxawale/	ALIGN-L	ALIGN-R	NON-FIN	FT=IAMB	*CLASH	PARSE-σ
☞ a. (mo.lò).ko.xa.(wá.le)				*		**
b. (mo.lò).ko.(xa.wá).le		*!				**
c. (mo.lò).(ko.xà).(wa.lé)			*!			
d. (mo.lò).(ko.xà).(wá.le)				*	*!	
e. (mo.lò).(kò.xa).(wá.le)				**!	*	
f. (mò.lo).(kò.xa).(wá.le)				**!*		

The net result of this part of the discussion is that Sentani allows the mixed iambic-trochaic pattern with two unparsed syllables resulting in local ternarity effect (cf. 37a). But we are yet to witness the role of the anti-lapse constraint *LAPSE in generating ternarity in an otherwise binary system.

For E&K the crucial evidence for an undominated grid-based anti-lapse constraint *LAPSE comes from a comparison of the metrical patterns of the forms in (38).

38. (E&K (65))
a. *Seven syllables: perfect binarity*
    molòkoxàwaléne   'because I wrote to you'
    ənàsəmòlonsánde 'they will go and bury me'

b. *Seven syllables with schwa in σ_4: stress shifts to next syllable, causing a clash*
    molònasəhàndéra 'after they will bury me'
    əkàikɛləwàimíle   'they went and taught them'

c. *Six syllables with schwa in σ_3: no stress shift or clash*
    alɛ̀nnəxondére   'so that he gives a message with his feet'
    jaxàrəmbondére   'for I will clarify'

The seven-syllable forms normally have three stresses (two secondaries and a main stress), arranged in a perfectly binary pattern (cf. 38a). But in case there is a schwa in the fourth syllable the medial secondary stress shifts from the fourth to the fifth syllable even at the cost of a clash with the main stress placed on the sixth (38b). By contrast six-syllables do not have any medial secondary stress at all leaving the third and fourth syllables unparsed at the cost of PARSE-σ. To unfold the underlying story let us remember that the rhythmic anti-lapse constraint allows a maximum of two successive weak beats and any sequence longer than this fatally violates *LAPSE. Consequently, six-syllables

can afford to have two inter-stress weak beats without inviting any *LAPSE-driven

*CLASH violation. In contrast, three successive weak beats in between two stresses force

a stress insertion under duress of the undominated *LAPSE. Incidentally, since schwa

rejects any stress, the newly inserted stress has to move to the immediate neighbourhood

of the main stress at the expense of a clash. In other words the ranking relation between

the two relevant constraints is *LAPSE ≫ *CLASH. To capture the previous half of the

story that causes stress shift (Elenbaas 1999) proposes a constraint:

39. (E&K (68))
*(C)ə́
No stressed schwa in open syllables.

Since *(C)ə́ can force a violation of *CLASH, the latter has to remain dominated by the

former. (40) gives the final ranking for Sentani which is illustrated in the subsequent

tableau for a seven-syllable word with schwa.

40. (E&K (70))
*LAPSE, ALIGN-L, ALIGN-R, NON-FIN ≫ *(C)ə́ ≫ FT=IAMB ≫ *CLASH ≫ PARSE-σ

To focus on the crucial interaction of *LAPSE, *(C)ə́, FT=IAMB, *CLASH and PARSE-σ,

we keep out the other undominated constraints from the tableau.

41. (E&K (71))

/molonasəhandera/	*LAPSE	*(C)ə́	FT=IAMB	*CLASH	PARSE-σ
☞ a. (mo.lò).na.(sə.hàn).(dé.ra)			*	*	*
b. (mo.lò).(nà.sə).han.(dé.ra)			**!	*	*
c. (mo.lò).(na.sə̀).han.(dé.ra)		*!	*		*
d. (mo.lò).na.sə.han.(dé.ra)	*!		*		***

The key findings on the basis of Sentani are summed up by E&K (: 302) in this

excerpt:

Up to now we have presented arguments for a grid-based anti-lapse constraint on the basis of systematic ternarity (Cayuvava), and local ternary patterns in binary systems (Sentani). The key finding, on the basis of Sentani, is that *LAPSE is not a ternarity-specific constraint. That is, ternarity (of the 'systematic' Cayuvava/Chugach type) simply emerges from the interaction of constraints that are independently motivated for systems displaying 'occasional' ternarity. That is, systematic ternarity falls out from constraint interaction, …..

1.4.3 *LAPSE enforcing binarity: argument from Finnish

Finnish (Carlson 1978, Kager 1992, Hanson & Kiparsky 1996, Alber 1997, Elenbaas 1999) has a binary trochaic system with word-initial main stress and secondary stress on every second syllable to the right (cf. 42a-b). Deviation from this norm takes place when secondary stress shifts rightwards onto the heavy syllable in case the second syllable to the right of a preceding stress is light and the third is heavy (i.e. closed or long vowelled) (cf. 42c-e).

42. (E&K (73))
a. érgonòmia   'ergonomics-NOM'
b. púhelìmenàni   'telephone-ESS 1SG'
c. mátematìikka   'mathematics-NOM'
d. púhelimìstani   'telephones-ELAT 1SG'
e. rákastajàttariànsa   'mistresses-PART 1SG'

To predict this binary-ternary trochaic pattern E&K propose the following set of ranked constraints where *(´LH) militates against 'anti-trochees' composed of a light and a heavy syllable.

43. (E&K 74))
ALIGN-L ≫ *(´LH) ≫ PARSE-σ ≫ ALL-FT-L

The following tableaux illustrate this ranking. In (44) purely binary left-oriented rhythm occurs in the absence of any heavy syllable. (45-46) show the light-syllable-skipping effect due to the avoidance of LH trochees.

44. (E&K (75b))

/puhelimenani/	ALIGN-L	*(´LH)	PARSE-σ	ALL-FT-L
☞ a. (pú.he).(lì.me).(nà.ni)				** ****
b. (pú.he).li.(mè.na).ni			*!*	***

45. (E&K (75c))

/matematiikka/	ALIGN-L	*(´LH)	PARSE-σ	ALL-FT-L
☞ a. (má.te).ma.(tìik.ka)			*	***
b. (má.te).(mà.tiik).ka		*!	*	**

46. (E&K (75d))

/puhelimistani/	ALIGN-L	*(´LH)	PARSE-σ	ALL-FT-L
☞ a. (pú.he).li.(mìs.ta).ni			**	***
b. (pú.he).(lì.mis).(tà.ni)		*!		** ****

Three ranking arguments emerge from the three tableaux above in support of the constraint ranking in (43): PARSE-σ ≫ ALL-FT-L (44); *(´LH) ≫ ALL-FT-L (45); and *(´LH) ≫ PARSE-σ (46).

The above OT grammar for Finnish starts getting complicated as soon as the issue of explaining optionality comes up. Secondary stress on a final heavy syllable is always optional, regardless of whether the word is odd-numbered (47a, b) or even-numbered (47c, d).

47. (E&K (76))
a. kúningàs   ~   kúningas   'king-NOM'
b. káinostèlijàt   ~   káinostèlijat   'shy people-NOM'
c. rávintolàt   ~   rávintòlat   'restaurants-NOM
d. mérkonomìn   ~   mérkonòmin   'degree in economics-GEN'

Explaining optionality in odd-numbered words is not so much challenging, however. All it requires is the proposition of a new constraint NON-FIN (cf. 8) and leaving it unranked with respect to PARSE-σ to facilitate mutual reranking between the two. This results in free variation as the following two tableaux demonstrate.

48. (E&K (77b))

/kainostelijat/	ALIGN-L	*(́LH)	PARSE-σ	NON-FIN	ALL-FT-L
☞ a. (kái.nos).(tè.li).(jàt)				*	** ****
b. (kái.nos).(tè.li).jat			*!		**

49. (E&K (77a))

/kainostelijat/	ALIGN-L	*(́LH)	NON-FIN	PARSE-σ	ALL-FT-L
☞ a. (kái.nos).(tè.li).jat				*	**
b. (kái.nos).(tè.li).(jàt)			*!		** ****

The real challenge is explaining the optional forms in even-numbered words (47c-d). Mere ranking permutation between PARSE-σ and NON-FIN proves only partially fruitful yielding one of the variants. Consider the following alternative tableaux abridged and focused only on the relevant constraints and their interactions.

50. (E&K (78))

/ravintolat/	*(́LH)	PARSE-σ	NON-FIN
☞ a. (rá.vin).to.(làt)	*	*	*
b. (rá.vin).(tò.lat)	**!		
c. (rá.vin).to.lat	*	**!	

51. (E&K (78b))

/ravintolat/	*(́LH)	NON-FIN	PARSE-σ
a. (rá.vin).to.(làt)	*	*!	*
b. (rá.vin).(tò.lat)	**!		
☞ c. (rá.vin).to.lat	*		**

In (50) the ranking PARSE-σ ≫ NON-FIN yields the correct result by predicting the first free variant of (47c). The changed hierarchy between the two constraints however does

not yield the other variant *(rá.vin).(tò.lat)* selecting the ungrammatical one-foot form

(rá.vin).to.lat (cf. 51c) instead.

Intuitively, NON-FIN must actually be able to rise high enough to dominate *(´LH) so as to generate the binary pattern i.e. *(rá.vin).(tò.lat)*. Surprisingly it is found that even such an amendment too proves futile. In (52) the reverse ranking between NON-FIN and *(´LH) makes an identical prediction as the existing one in (51).

52. (E&K (78c))

/ravintolat/	NON-FIN	*(´LH)	PARSE-σ
a. (rá.vin).to.(làt)	*!	*	*
b. (rá.vin).(tò.lat)		**!	
☞ c. (rá.vin).to.lat		*	**

To circumvent[10] this crisis let us quote E&K (: 305):
> To absolutely rule out the single-foot candidate, and to force the binary candidate prominently into the output set, an undominated anti-lapse constraint must be involved. This we assume to be *LAPSE, here involved in selecting a binary pattern.

The following tableau justifies the above claim.

53. (E&K (78d))

/ravintolat/	*LAPSE	NON-FIN	*(´LH)	PARSE-σ
a. (rá.vin).to.(làt)		*!	*	*
☞ b. (rá.vin).(tò.lat)			**	
c. (rá.vin).to.lat	*!		*	**

In sum, evaluation of the Finnish free variants (to be precise, one of the two optional forms) which optionally stress the final heavy syllables, needs the undominated

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[10] The other logical alternative would be to try out the reranking between *(´LH) and PARSE-σ which incidentally produces the desired result. But E&K argue against such an alternative:
> Meanwhile *(´LH) and PARSE-σ must remain ranked [i.e *(´LH) ≫ PARSE-σ] as they are in the
> basic hierarchy …., in order to explain the obligatory underparsing in words like *púhelimìstani* …
> (Footnote 18, p 304)

In this respect, I however prefer to disagree with E&K on grounds to be discussed in § 2.5.4.

presence of the anti-lapse constraint *LAPSE in the hierarchy. Surprisingly *LAPSE, motivated originally on the basis of ternary stress systems, now functions to force rhythmic binarity thus proving E&K's claim that *LAPSE is not a ternary-feet specific constraint.

At the heart of the rhythmic theory of ternarity of E&K lies a crucial restatement of the anti-lapse constraint *LAPSE and its interaction with others, particularly the foot-alignment constraints. Any ternarity-specific device such as TERNARY FEET, WLP, or the foot-repulsion constraint *FTFT is thus rendered irrelevant. *LAPSE does not enforce ternarity. It only licenses rhythmic BOUNDEDNESS, either binary or ternary. A commendable achievement for the theory therefore is that a unified treatment of all types of ternarity – systematic ternarity as in Cayuvava and Chugach and 'fleeting' or occasional ternarity as in Sentani and Finnish[11] -- is now possible with the same set of constraints which also license binarity (cf. 53).

This brings us to the issue of predicting typological differences among languages by variable ranking of an identical constraint set:

> In accordance with the OT program of reducing typological variation to reranking of a set of universal constraints, we are now able to accommodate the bounded stress systems within a cohesive factorial typology, simply by reranking *LAPSE and other constraints. (E&K: 305).

Constructing a factorial typology and checking them out empirically therefore is the main issue in the next section.

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[11] Occasional ternarity in Finnish is the direct consequence of the undominated constraint *(´LH) ≫ PARSE-σ (cf. (45-46) above, based on E&K (: 303/(75c-d)). Role of *LAPSE is vacuous in the authors' analyses of Finnish except in enforcing rhythmic binarity in some free variants of four syllable words where *(´LH) is violated twice (one time more than allowed in the other variant) by having a final LH trochee: *(rá.vin).(tò.lat)*(53) vs. *(rá.vin).to.(làt)* (50).

1.5 Factorial typology

Constructing factorial typology is a complicated task and the complexity increases multiply in proportion to the increase in the number of constraints. To avoid this complexity and to focus attention on the interactions of the specific constraints involved in achieving the spacing-out effect for rhythmic ternarity (only in quantity-insensitive styles), E&K choose three types of constraints totaling six:

54. a.   the anti-lapse constraint: *LAPSE
    b.   the constraint enforcing metrical parsing: PARSE-σ
    c.   alignment constraints evaluating distances of feet with respect to one another, or to domain edges: ALIGN-X, ALL-FT-X (where X is an edge, left or right).

Ideally, the only criterion for judging the adequacy of a factorial typology should be its ability to contain all and only the empirically attested stress systems: no more no less. But accidental gaps are galore among natural languages. Consequently, the authors prefer to evaluate the adequacy of the factorial typology by focusing on predictions about classes of patterns that are systematically absent in stress languages. In terms of this all-and-only criterion the rhythmic theory is argued to generate all of the attested ternary systems, while its overgeneration remains within reasonable limits.

1.5.1 A basic factorial typology of *LAPSE

Six logically possible rankings emerge out of the permutations of the three basic constraints *LAPSE, PARSE-σ and ALL-FT-X (keeping the word-to-foot alignment constraint ALIGN-X temporarily at bay).

55. (E&K (80))
    a.   ALL-FT-X ≫ PARSE-σ ≫ *LAPSE   (unbounded systems)
    b.   ALL-FT-X ≫ *LAPSE ≫ PARSE-σ   (=55a)

c.   PARSE-σ ≫ *LAPSE ≫ ALL-FT-X   (binary systems)

d.   PARSE-σ ≫ ALL-FT-X ≫ *LAPSE   (=55c)

e.   *LAPSE ≫ PARSE-σ ≫ ALL-FT-X   (=55c)

f.   *LAPSE ≫ ALL-FT-X ≫ PARSE-σ   (ternary system)

As the rightmost column in (55) indicates, only three distinct patterns emerge from these six possibilities.

56. (E&K (82))
Rhythmic theory: the basic typology
a. ALL-FT-X ≫ PARSE-σ, *LAPSE   (unbounded system)
b. *LAPSE, PARSE-σ ≫ ALL-FT-X   (binary system)
c. *LAPSE ≫ ALL-FT-X ≫ PARSE-σ (ternary system)

In (56a) the underparsing constraint ALL-FT-X dominates the constraints asking for maximal and rhythmic parsings namely PARSE-σ and *LAPSE, resulting in unbounded systems with only one foot on the left edge: (´σσ)σσσσ. This single-edged pattern can be transformed into a double-edged one by introducing undominated ALIGN-Y (where Y is the opposite edge of X). Such a ranking predicts a 'hammock' pattern ('initial+penult') attested in Gugu-Yalanji (Oates & Oates 1964) while its mirror image ('penult+initial') pattern is found in Sibutu Sama (Allison 1979, Kager 1997). The metrical (trochaic) pattern of a word from the latter meaning 'we are persuading' looks like: *(bìs.sa).la.han.(ká.mi)*. The constraint ranking for the Sibutu Sama example fleshed out in concrete terms is: ALIGN-R, ALL-FT-L ≫ PARSE-σ, *LAPSE. (56b) predicts binary rhythmic patterns which form the majority of the stress systems currently known. We shall discuss this in some detail.

1.5.2 Binary rhythmic systems

Binary rhythmic systems arise when FT-BIN is undominated and PARSE-σ outranks ALL-FT-X. Footing is exhaustive except in odd-numbered words where the one residual syllable remains necessarily unparsed thanks to the high ranked foot-binarity requirement. This unparsed syllable however does not occasion any violation of *LAPSE since logically this syllable can occupy only two positions both of which are 'rhythmically licensed' by *LAPSE: at word-edge (´σσ)(´σσ)(´σσ)σ or adjacent to a foot head[12] (´σσ)(´σσ)σ(´σσ). In fact, satisfaction of *LAPSE is automatic where parsing is exhaustive. Consequently in all the rankings for binary systems in the rest of this subsection *LAPSE along with FT-BIN are assumed to be undominated and hence suppressed.

57. (E&K (87))
Iterative binary systems
a. PARSE-σ ≫ ALL-FT-X
   unidirectional   (Pintupi/Warao)
b. ALIGN-X, PARSE-σ ≫ ALL-FT-Y
   bidirectional (simple)   (Piro/Garawa)
c. ALIGN-X, PARSE-σ ≫ ALIGN-Y ≫ ALL-FT-X
   bidirectional (complex)   (Indonesian)

Pintupi and Warao are the two oft-repeated representatives of the unidirectional binary systems (57a). They project a mirror image of each other. Pintupi has stress on the initial syllable and on following alternating syllables with left-oriented feet. The core ranking predicting such a simple pattern is PARSE-σ ≫ ALL-FT-L. Warao (Osborn 1966) mirrors

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[12] At this point the role of foot-dominance needs to be made clear. Since *LAPSE measures beats on the grid (rather than the parsing of weak syllables by feet), foot-dominance matters to the evaluation by *LAPSE, and it also interacts with edges (X/Y) specified in alignment constraints. This means that every pattern can logically come in two variants, one trochaic and another iambic, mirror images of one another.

Pintupi in having right oriented feet and stressing the penult and every alternative syllables to the left as in *yi.(wà.ra).(ná.e)*. The basic ranking for this system therefore is PARSE-σ ≫ ALL-FT-R. It should be noted that in the unidirectional binary systems the unparsed syllable is always at the word-edge which is rhythmically licensed by *LAPSE.

Bidirectional systems differ from unidirectional systems by fixing one foot at an edge, and constructing iterative feet from the opposite edge. For example, Piro (Matteson 1965) stresses the penult, plus the initial and alternative syllables following it. In words of an odd number of syllables, the unparsed syllable directly precedes the final foot. Such a pattern is rightly predicted by the ranking (57b) where the word-to-foot alignment constraint ALIGN-X is promoted above ALL-FT-Y. This will be clear from the following tableau where a seven-syllable Piro word is evaluated with the said ranking with the appropriate concrete values for the alignment edge inserted.

58. (E&K (90))

/ruslunotinitkana/	ALIGN-R	PARSE-σ	ALL-FT-L
☞ a. (rù.slu).(nò.ti).ni.(tká.na)		*	** *****
b. (rù.slu).(nò.ti).(ní.tka).na	*!	*	** ****
c. (rù.slu).no.(tì.ni).(tká.na)		*	*** *****!
d. ru.(slù.no).(tì.ni).(tká.na)		*	* *** ****!*
e. ru.slu.no.ti.ni.(tká.na)		**!***	*****

Garawa (Furby 1974, McCarthy and Prince 1993b) provides the mirror image of Piro in having the main stress on the initial syllable and secondary stress on alternating syllables preceding the penult with feet oriented towards the right: *(ŋán.ki).ɾi.(kì.rim).(pà.yi)* 'fought with boomerangs'. The ranking for generating the Garawa pattern of binarity is: ALIGN-L, PARSE-σ ≫ ALL-FT-R.

Complex bidirectionality as predicted by (57c) is attested in Indonesian (Cohn 1989). Main stress is on the penult and a secondary stress is on the initial syllable with leftward alternation of secondaries on syllables preceding the penult. Words with more than six syllables provide a clear picture of such a bidirectional   metrical pattern: *(à.me).ri.(kà.ni).(sá.si)* 'Americanization'. Both the versions of ALIGN-X i.e. ALIGN-L and ALIGN-R participate in the required ranking of constraints for Indonesian which is ALIGN-R, PARSE-σ ≫ ALIGN-L≫ ALL-FT-R. This is another contribution of the word-to-foot alignment constraints to the factorial typology. For illustrations consider the following tableau.

59. (E&K (93))

/amerikanisasi/	ALIGN-R	PARSE-σ	ALIGN-L	ALL-FT-R
☞ a. (à.me).ri.(kà.ni).(sá.si)		*		** *****
b. (à.me).(rì.ka).(ní.sa).si	*!	*		* *** *****
c. (à.me).(rì.ka).ni.(sá.si)		*		*** *****!
d. a.(mè.ri).(kà.ni).(sá.si)		*	*!	** ****
e. (à.me).ri.ka.ni.(sá.si)		**!*		*****

The conclusion that entails from the preceding discussion is therefore that the factorial typology of binary rhythm is fully adequate as judged by the all-and-only criterion: it coincides with the range of empirically attested quantity-insensitive patterns.

1.5.3 Ternary rhythmic systems

The core ranking for ternary rhythm is *LAPSE ≫ALL-FT-X ≫ PARSE-σ (cf. 56c). But this core pattern branches out into five subtypes with the insertion of ALIGN-X in

different positions with the additional option of varying the value of X independently in

ALL-FT-X.

60. (E&K (95))
Iterative ternary systems

    a.   *LAPSE ≫ ALL-FT-X ≫ PARSE-σ
        unidirectional (loosely aligned)   (Cayuvava/Winnebago)

    b.   ALIGN-X, *LAPSE ≫ ALL-FT-Y ≫ PARSE-σ
        unidirectional (strictly aligned)   (Chugach/Estonian)

    c.   ALIGN-X, *LAPSE ≫ ALL-FT-X ≫ PARSE-σ
        bidirectional   (simple, loosely aligned)

    d.   ALIGN-X, *LAPSE ≫ ALIGN-Y ≫ ALL-FT-X ≫ PARSE-σ
        bidirectional   (simple, strictly aligned)

    e.   ALIGN-X, *LAPSE ≫ ALIGN-Y ≫ ALL-FT-Y ≫ PARSE-σ
        bidirectional   (complex)

Each of these subtypes is discussed below and exemplified whenever possible.

1.5.3.1 *Unidirectional systems: loosely aligned*

The first member of the ternary family employs unidirectional feet assignment along with

loose alignment of feet at the starting edge. Loose alignment means 'footing does not

start by strictly aligning the first foot at edge X, but by skipping (one or two) syllables at

that edge'. Cayuvava is the most illustrious example of this family. Here a trochee is

loosely aligned at the right edge where footing begins. Non-finality effect is derived by

pulling the trochees maximally leftward while respecting the maximal sequence of weak

beats allowed by the anti-lapse constraint *LAPSE. Initial 'double upbeat' is the

consequence of the ranking ALL-FT-R ≫ PARSE-σ in a word of $3n+2$ syllable length. The

following tableau for an eight-syllable word is repeated from (20) for illustration.

61.

/ikitaparerepeha/	*LAPSE	ALL-FT-L	ALL-FT-R	PARSE-σ
a. i.(kì.ta).pa.(ré.re).pe.ha	*!	* ****	** *****	****
☞ b. i.ki.(tà.pa).re.(ré.pe).ha		** *****	* ****	****
c. (ì.ki).(tà.pa).re.(ré.pe).ha		** *****	* **** *!****	**
d. (ì.ki).ta.(pà.re).re.(pé.ha)		*** *****!*	*** ******	**
e. (ì.ki).(tà.pa).(rè.re).(pé.ha)		** **** **!***	** **** *****	

A minimal variation in this ranking in the form of reversing the order between the two lowest constraints predicts another subtype with persistent footing effect. PARSE-σ ≫ ALL-FT-Y (Y=R) will then select (61c) as the optimal parse.

This predicted pattern is attested in Winnebago (assuming it to be ternary),[13] of course with a reversal of both directionality and foot-dominance as compared to Cayuvava i.e. in the former iambic footing takes place from left to right with one initial extrametrical syllable. This extrametricality or the 'third mora'[14] effect derives from the domination of *LAPSE (limiting the distance between the leftmost stress and word-edge to two moras) over ALL-FT-R (pulling feet maximally to the right). Foot-persistence once again is the result of PARSE-σ ≫ ALL-FT-Y (Y=L) (cf. 62). All other Winnebago words (of 3n or 3n+1 syllables) behave analogously to words of similar lengths in Cayuvava: stress falls on every third mora counting from the edge (cf. 63-64). No primary-secondary distinction among stresses is shown in E&K (: 314).

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[13] Winnebago's ternarity is controversial. Hale & White Eagle (1980), Halle & Vergnaud (1987) and Halle (1990) argue that rhythmic alternation rightward from the third mora is binary. Hayes (1995) concludes after reviewing the preliminary literature on the language that Winnebago has both binary and ternary patterns and that the factors governing their distribution are still unclear. These discrepancies stand in the way of declaring Winnebago as a clear-cut instantiation of a persistent ternary system.

[14] E&K (: 313) refer to Miner 1979: 28) who gives the following rule of accentuation in Winnebago: 'accent every third mora as long as three are available; otherwise, accent a second mora.' Though they generally accept this mora-based analysis of Winnebago, E&K implicitly treat each mora as at par with a light syllable.

62. (E&K (98a))

/hokiwaroke/	*LAPSE	ALL-FT-R	PARSE-σ	ALL-FT-L
☞ a. ho.(ki.wá).(ro.ké)		**	*	* ***
b. (ho.kí).wa.(ro.ké)		***!	*	***
c. (ho.kí).(wa.ró).ke		* **!*	*	**
d. ho.(ki.wá).ro.ke		**	**!*	*
e. ho.ki.(wa.ró).ke	*!	*		**

63. (E&K (98b))

/hokiwaroroke/	*LAPSE	ALL-FT-R	PARSE-σ	ALL-FT-L
☞ a. ho.(ki.wá).ro.(ro.ké)		***	**	* ****
b. (ho.kí).(wa.ró).(ro.ké)		** **!**		** ****
c. (ho.kí).wa.(ro.ró).ke		* ***!*	**	***
d. ho.(ki.wá).(ro.ró).ke		* ***!	**	* ***
e. ho.ki.(wa.ró).ro.ke	*!	**	****	**

64. (E&K (98c))

/hiiʒugokirusge/	*LAPSE	ALL-FT-R	PARSE-σ	ALL-FT-L
☞ a. hi(i.ʒú).go.(ki.ruś).ge		* ****	***	* ****
b. hi(i.ʒú).(go.kí).(rus.gé)		** ****!	*	* *** *****
c. hi(i.ʒú).(go.kí).rus.ge		** ****!	***	***
d. (hií).ʒu.(go.kí).rus.ge		** ****!*	***	***
e. hii.ʒu.(go.kí).rus.ge	*!*	**	****	**

A third (unattested) pattern belonging to this family of unidirectional (loosely aligned) family of ternary systems is predicted by the core hierarchy of constraints: *LAPSE ≫ ALL-FT-X ≫ PARSE-σ. This member minimally differs from the ones discussed by having *two* unparsed syllables at the edge where footing starts. This pattern occurs when foot-dominance matches the starting edge. For example, antepenultimate stress may be achieved by a R-dominant foot separated by two unparsed syllables from the starting edge R. The result is what may be termed an iambic counterpart of Cayuvava with the minimal distinction that in three syllable words there will be one unparsed syllable enforced by iambic foot.

65. (E&K (99))

'Iambic Cayuvava': *LAPSE ≫ ALL-FT-L ≫ PARSE-σ

(σσ́)σ	ta.**tá**.ta
(σσ́)σσ	ta.**tá**.ta.ta
σ(σσ́)σσ	ta.ta.**tá**.ta.ta
(σσ́)(σσ́)σσ	ta.**tá**.ta.**tá**.ta.ta
(σσ́)σ(σσ́)σσ	ta.**tá**.ta.ta.**tá**.ta.ta
σ(σσ́)σ(σσ́)σσ	ta.ta.**tá**.ta.ta.**tá**.ta.ta

In summing up this subsection E&K (: 315) write:

> ….[W]e have seen three loosely aligned unidirectional patterns. In two of these ([66]a, b) foot-dominance is opposite to the starting edge X[15]. Here persistence matters (depending on the relative ranking of PARSE-σ and ALL-FT-Y). In the third pattern ([66]c), foot-dominance matches the edge X, and no distinction of persistence applies:

66. (E&K (100))

a. *LAPSE ≫ ALL-FT-X ≫ ALL-FT-Y≫ PARSE-σ (non-persistent Cayuvava)

b. *LAPSE ≫ ALL-FT-X ≫ PARSE-σ≫ ALL-FT-Y (persistent: Winnebago?)

c. *LAPSE ≫ ALL-FT-X ≫ PARSE-σ   (foot matching X: unattested)

In other words, according to E&K it is possible to arrive at a generalization regarding (non-)persistent footing from the interaction of the relevant constraints. If foot-dominance is opposite to the starting edge of alternation then it is the ranking relation between PARSE-σ and the alignment constraint referring to the starting edge (e.g. ALL-FT-Y in (66a-b)) that determines if footing is persistent or not: if the alignment constraint dominates PARSE-σ, the result is non-persistent footing (cf. 66a); if PARSE-σ is dominant

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[15] X here should not be confused with the X in ALL-FT-X. X is rather an independent variant that only refers to the starting edge of iteration. For example in non-persistent Cayuvava the starting edge of alternation is *right* reference to which is contained in ALL-FT-Y rather than in ALL-FT-X (cf. 61). In Winnebago the starting edge is *left* and the information is conveyed by ALL-FT-Y (cf. 62-64). Again, in the hypothetical 'Iambic Cayuvava' (66c) the value for X in ALL-FT-X is *left* (L) (cf. 65) although footing starts at the opposite i.e. *right* (R) edge.

over the alignment constraint, feet are constructed persistently (cf. 66b). No such

distinction ensues if foot-dominance and the starting edge of iteration coincide (66c).

1.5.3.2 *Unidirectional systems: strictly aligned*

This family minimally differs from the unidirectional 'loosely aligned' patterns by the

promotion of an ALIGN-X constraint, with X being the edge at which the alternation

starts. Analogous to the earlier family this also branches out into three subtypes. Once

again persistent footing is the consequence of PARSE-σ ≫ ALL-FT-Y in patterns where

foot-dominance is the reverse of the starting edge of alternation. But in systems where the

two match persistence is automatic.

67. (E&K (101))
a. ALIGN-X, *LAPSE ≫ ALL-FT-X ≫ ALL-FT-Y ≫ PARSE-σ (non-persistent: not
                                                          attested)
b. ALIGN-X, *LAPSE ≫ ALL-FT-X ≫ PARSE-σ ≫ ALL-FT-Y (persistent: Chugach)
c. ALIGN-X, *LAPSE ≫ ALL-FT-X ≫ PARSE-σ   (Estonian)

(67b) with persistent footing is attested in iambic Chugach which we have already

noticed in (30) repeated in (68).

68.

/taqamaluni/	ALIGN-L	*LAPSE	ALL-FT-R	PARSE-σ	ALL-FT-L
a. (ta.qá).ma.lu.ni		*!	***	***	
b. ta.(qa.má).lu.ni	*!		**	***	*
c. (ta.qá).(ma.lú).ni			* ***!	*	**
☞ d. (ta.qá).ma.(lu.ní)			***	*	***

(67a) predicts a hypothetical non-persistent variant of Chugach with the constraint for

maximal parsing ranked lowest.

69. (E&K (102))

'Non-persistent Chugach': ALIGN-L, *LAPSE ≫ ALL-FT-R ≫ ALL-FT-L

$$≫ \text{PARSE-}σ$$

(σσ́)σ	ta.**tá**.ta
(σσ́)σσ	ta.**tá**.ta.ta
(σσ́)σ(σσ́)	ta.**tá**.ta.ta.**tá**
(σσ́)σ(σσ́)σ	ta.**tá**.ta.ta.**tá**.ta
(σσ́)σ(σσ́)σσ	ta.**tá**.ta.ta.**tá**.ta.ta
(σσ́)σ(σσ́)σ(σσ́)	ta.**tá**.ta.ta.**tá**.ta.ta.**tá**

The prediction (67c) is proved true in Estonian (Prince 1980, Kager 1994, Hayes 1995), a trochaic language where foot-dominance matches the starting edge (i.e. left) of alternation. Main stress falls on initial syllable, with secondary stress on every non-final syllable in position $3n$ and a 'persistent' secondary stress on the penult in words of length $3n+1$ syllables.

70. (E&K (103))

(pí.mes).tav	'blinding'
(ré.te).(lì.le)	'ladder-ALL SG'
(pí.mes).ta.(và.le)	'blinding-ILL SG'
(ó.sa).va.(mà.le).ki	'also more skilful-ABL SG'

The following tableaux (71-73) illustrate the interaction of the relevant constraints with the appropriate values of X inserted.

71.

/retelile/	ALIGN-L	*LAPSE	ALL-FT-R	PARSE-σ
☞ a. (ré.te).(lì.le)			**	
b. (ré.te).li.le		*!	**	**
c. re.(té.li).le	*!		*	**
d. re.te.(lí.le)	*!			**

72.

/pimestavale/	ALIGN-L	*LAPSE	ALL-FT-R	PARSE-σ
☞ a. (pí.mes).ta.(và.le)			***	*
b. (pí.mes).(tà.va).le			* ***!	*
c. pi.(més.ta).(và.le)	*!		**	*
d. (pí.mes).ta.va.le		*!*	***	***

73.

/osavamaleki/	ALIGN-L	*LAPSE	ALL-FT-R	PARSE-σ
☞ a. (ó.sa).va.(mà.le).ki			* ****	**
b. (ó.sa).(và.ma)(lè.ki)			** ****!	
c. (ó.sa).(và.ma).le.ki		*!	** ****	**
d. (ó.sa).va.ma.(lè.ki)		*!	****	**
e. o.(sá.va).(mà.le).ki	*!		* ***	**

In sum, out of the three subtypes predicted by the reranking of the core constraints deriving ternarity *LAPSE, ALL-FT-X, PARSE-σ with the undominated ALIGN-X, two are attested in Chugach (persistent) and Estonian.

1.5.3.3 *Bidirectional system*

In bidirectional ternary systems one foot is fixed at one or both edges. Consequently, the issue of '(non-)persistence', so important in unidirectional systems, is irrelevant here. While discussing binary systems in §1.5.2 we have seen that bidirectionality can be of two types: simple (Piro/Garawa) and complex (Indonesian) (cf. 57b, c). Ternarity brings a subdivision of simple bidirectionality into 'loosely' and 'strictly' aligned starting edges. Thus three patterns of bidirectional ternary rhythm are predicted, repeated below from (60c-e). None of these three patterns is attested.

74. a. ALIGN-X, *LAPSE ≫ ALL-FT-X ≫ PARSE-σ
    bidirectional (simple, loosely aligned)

  b. ALIGN-X, *LAPSE ≫ ALIGN-Y ≫ ALL-FT-X ≫ PARSE-σ
    bidirectional (simple, strictly aligned)

  c. ALIGN-X, *LAPSE ≫ ALIGN-Y ≫ ALL-FT-Y ≫ PARSE-σ
    bidirectional (complex)

1.5.3.3.1 *Simple bidirectional, loosely aligned*

This pattern has a foot fixed at edge X and loosely aligned at the opposite edge Y, where alternation starts. Two further sub-patterns emerge depending on whether two (75a) or one (75b) syllable(s) is left unparsed at the starting edge of alternation. Both the subpatterns are depicted with trochaic feet.

75. (E&K (105))

Align-X, *Lapse ≫ All-Ft-X ≫ Parse-σ

a. X = R   b. X = L

ta.(**tá**.ta)	(**tá**.ta).ta
ta.ta.(**tá**.ta)	(**tá**.ta).(**tá**.ta)
ta.(**tá**.ta).(**tá**.ta)	(**tá**.ta).(**tá**.ta).ta
ta.ta.(**tá**.ta).(**tá**.ta)	(**tá**.ta).ta.(**tá**.ta).ta
ta.ta.(**tá**.ta).ta.(**tá**.ta)	(**tá**.ta).(**tá**.ta).(**tá**.ta).ta
ta.ta.(**tá**.ta).(**tá**.ta).(**tá**.ta)	(**tá**.ta).(**tá**.ta).ta.(**tá**.ta).ta
ta.ta.(**tá**.ta).ta.(**tá**.ta).(**tá**.ta)	(**tá**.ta).ta.(**tá**.ta).ta.(**tá**.ta).ta
ta.ta.(**tá**.ta).ta.(**tá**.ta).ta.(**tá**.ta)	(**tá**.ta).(**tá**.ta).(**tá**.ta).ta.(**tá**.ta).ta

1.5.3.3.2 *Simple bidirectional, strictly aligned*

This pattern predicted in (74b) differs from the preceding one in being strictly aligned at both edges, with one edge taking priority over the other. Alternation is directed toward the 'dominant' edge X, departing from the starting edge Y. Once again two subpatterns emerge depending on the actual edge signified by X and Y.

76. (E&K (106))

ALIGN-X, *LAPSE ≫ ALIGN-Y ≫ ALL-FT-X ≫ PARSE-σ

a. X = R, Y = L   b. X = L, Y = R

ta.(**tá**.ta)   (**tá**.ta).ta

(**tá**.ta).(**tá**.ta)   (**tá**.ta).(**tá**.ta)

(**tá**.ta).ta.(**tá**.ta)   (**tá**.ta).ta.(**tá**.ta)

(**tá**.ta).(**tá**.ta).(**tá**.ta)   (**tá**.ta).(**tá**.ta).(**tá**.ta)

(**tá**.ta).ta.(**tá**.ta).(**tá**.ta)   (**tá**.ta).ta.(**tá**.ta).(**tá**.ta)

(**tá**.ta).ta.(**tá**.ta).ta.(**tá**.ta)   (**tá**.ta).ta.(**tá**.ta).ta.(**tá**.ta)

(**tá**.ta).ta.(**tá**.ta).(**tá**.ta).(**tá**.ta)   (**tá**.ta).ta.(**tá**.ta).(**tá**.ta).(**tá**.ta)

(**tá**.ta).ta.(**tá**.ta).ta.(**tá**.ta).(**tá**.ta)   (**tá**.ta).(**tá**.ta).ta.(**tá**.ta).ta.(**tá**.ta)

1.5.3.3.3 *Complex bidirectional*

This final member of the bidirectional family has feet strictly aligned at both edges, with prioritization of one over the other in trisyllabic words. But in contradistinction to the previous pattern, rhythm is directed away from the dominant edge X, which is the starting edge as well. As usual two sub-patterns arise thanks to the two possible values of X (left/right) and Y (left/right).

77. (E&K (107))

ALIGN-X, *LAPSE ≫ ALIGN-Y ≫ ALL-FT-Y ≫ PARSE-σ

a. X = R, Y = L   b. X = L, Y = R

ta.(**tá**.ta)   (**tá**.ta).ta

(**tá**.ta).(**tá**.ta)   (**tá**.ta).(**tá**.ta)

(**tá**.ta).ta.(**tá**.ta)   (**tá**.ta).ta.(**tá**.ta)

(**tá**.ta).(**tá**.ta).(**tá**.ta)   (**tá**.ta).(**tá**.ta).(**tá**.ta)

(**tá**.ta).(**tá**.ta).ta.(**tá**.ta)   (**tá**.ta).ta.(**tá**.ta).(**tá**.ta)

(**tá**.ta).ta.(**tá**.ta).ta.(**tá**.ta)   (**tá**.ta).ta.(**tá**.ta).ta.(**tá**.ta)

(**tá**.ta).(**tá**.ta).(**tá**.ta).ta.(**tá**.ta)   (**tá**.ta).ta.(**tá**.ta).(**tá**.ta).(**tá**.ta)

(**tá**.ta).(**tá**.ta).ta.(**tá**.ta).ta.(**tá**.ta)   (**tá**.ta).ta.(**tá**.ta).ta.(**tá**.ta).(**tá**.ta)

As already stated none of the three bidirectional patterns (with two sub-patterns each) is attested in any natural languages. Speculating on the reasons for this gap, E&K cite a

number of probable reasons. The most prominent among these is the typological markedness of ternary systems compared to the binary systems apparently owing to the computational complexity involved in the former. The major contributory factor towards increased complexity in ternary rhythm is the gradient constraint ALL-FT-X. Again, for independent reasons, bidirectional patterns are typologically marked compared to unidirectional patterns. This is true even in binary rhythm. Computing the interaction of a pre-installed foot at a particular edge with the stress train arriving at this landmark from the opposite edge is an additional problem. Moreover, realization of ternarity requires long words, minimally six syllables long. Morphological factors like restrictions on the maximal number of morphemic concatenations also contribute to the rarity of ternary rhythm.

1.6 Conclusions

As a critique of E&K this chapter familiarizes us with their principal findings with respect to the explanation of ternary rhythm. OT allows an elegant and principled account of rhythmic ternarity, a phenomenon that causes severe complications in rule-based metrical theory. The new OT account also does away with the ternarity-specific foot-repulsion constraint *FTFT, proposed in early OT analysis (Kager 1994). The core constraint interaction underlying ternarity (*LAPSE ≫ ALL-FT-X ≫ PARSE-σ) accounts for languages with uniform ternarity such as Cayuvava and Chugach. This is also extendable to languages where rhythmic ternarity and binarity co-occur as in Winnebago, Estonian etc. Typological variation within the class of ternary rhythmic systems is

accounted for by reranking a small set of constraints with respect to word-to-foot alignment (ALIGN-X).

The proposed rhythmic theory of ternarity involves an anti-lapse constraint, *LAPSE. *LAPSE rules out weak beats that are not adjacent to strong beats or word-edges. This grid-based constraint receives independent support as a universal constraint from two languages with local ternary effects in otherwise binary patterns namely Sentani and Finnish. In these languages the anti-lapse constraint 'trims back the underparsing effects of quantitative constraints' licensing two successive weak beats.

Finally, a restricted factorial typology predicts all the attested ternary patterns while keeping the quantum of overgeneration within a reasonable limit.

CHAPTER II

*LAPSE(DE) AND A NEW APPROACH TO RHYTHMICTY

2.0 Introduction

In the preceding chapter we have seen how the rhythmic theory of anti-lapse succeeds in providing a principled account of both regular and occasional ternarity in languages like Cayuvava, Chugach, Winnebago, Sentani and Finninsh. The core OT grammar for this is crucially dependent on a constraint that keeps the maximal size of a sequence of weak beats within the limit of two. This grid-based constraint, *LAPSE (Selkirk 1984, Elenbaas 1999), thus rules out any weak beat (i.e. an unparsed syllable) that is not adjacent either to a strong beat (i.e. a stressed syllable) or word-edge, the two standard licensors of phonological elements in both segmental and metrical phonology (McCarthy and Prince 1993b, Steriade 1995, Beckman 1997, Zoll 1997 among others). The superiority of this constraint over its predecessor in early OT accounts of ternarity (for instance Kager 1994) namely *FTFT, lies in its being not specific to any particular foot-type: *LAPSE simply enforces rhythmic alternation in bounded systems – whether binary or ternary – by restricting the maximal sequence of weak beats within a word to below three. The

basic OT mechanism for evaluating ternarity is *LAPSE ≫ ALL-FT-X ≫ PARSE-σ and all typological variations – both attested and unattested – follow from an interaction of these with the word-to-foot alignment constraint ALIGN-X (where X is either the left or the right edge of the PrWd).

There is no denying the fact that the above unified and generalized treatment of ternarity is a major achievement for any theory that stakes its claim to both descriptive as well as explanatory adequacy. But the acid test for the viability of a theory lies in its ability to account for every fresh set of data provided by natural languages. The advent of new linguistic realities in the horizon therefore warrants a fresh assessment of the analytical abilities of the existing theory. Explaining a newly found 'predicted but unattested' set of data never poses any problem for the theory; it rather underscores the empirical richness of the latter. Real problem arises when in course of empirical quest one hits upon a set of linguistic facts, which are predicted not to exist by the existing theory. More often than not, accommodation of the new facts does not, however, force a sacrifice *en mass* of the major premises of the current theory. This is because adaptation of the latter in response to empirical exigencies is a commonplace practice in scientific research.

Take for instance the case of the rhythmic theory of ternarity proposed by E&K discussed in the previous chapter. This grid-based analysis of rhythmicity disallowing a long series of weak beats provides a simple and unified explanation to all types of bounded systems – binary and ternary (systematic as well as occasional) – with interaction of a small set of constraints among which the anti-lapse constraint *LAPSE

figures prominently. Typological variations are predicted on the basis of reranking. But all its analytical mechanisms fail when it comes to explaining the metrical pattern of TB. In fact the restricted factorial typology projected by this theory rules out the possibility of a rhythmic pattern attested in this variety of Bangla.

Based on their internal make-up and stress distribution pattern, TB words are classified into two groups: those containing only light syllables and those containing both light and heavy. In the latter the heavy ones attract stress and hence differ from the former class in which main stress is always initial and secondary stress falls on every third non-final syllable. Consequently, words of up to four syllables have only one, initial, stress. In this trochaic system footing starts at the left edge and proceeds towards the right maintaining an inter-stress interval of two syllables in longer sequences. Morphology never plays any role in determining stress distribution.

78. *TB words containing light syllables*[16]

    a. zí.ra.bi   'a kind of sweets'
       gó.ra.li   'ankle'
    b. bí.βɛ.sɔ.na   'consideration'
       kɛ́.ra.mo.ti   'ingenuity'
    c. ɸó.ri.sa.lɔ̀.na   'direction'
       ɔ́.mɔ.nɔ.zùgi   'inattentive'
    d. ɔ́.mɔ.nɔ.zù.gi.ta   'inattentiveness'
       ɔ́.nu.kɔ.rɔ̀.ni.yɔ   'imitable'
    e. ɔ́.no.nu.kɔ̀.ro.ni.yɔ   'inimitable'
    f. ɔ́.no.nu.kɔ̀.ro.ni.yɔ̀.ta   'inimitability'

Words of length 3*n* (i.e. of three (78a), six (78d) syllables) pose no problem as far as the anti-lapse constraint, *LAPSE, is concerned. Everywhere a weak beat is adjacent to a

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[16] The small set of words presented here is representative. For further examples see Appendix: Part I

licensor, either a strong beat or word-edge. The same picture prevails in words having

3n+2 (i.e. of five (78c) and eight (78f)) syllables with a minor twist that in these cases a

word-final trochee emerges because of iterative ternary footing. The critical cases are

those of words with 3n+1 syllables such as four syllables (78b) and seven syllables (78e).

In these words, a trail of three successive weak beats separate the rightmost stress from

the right edge of the word. Given the definition of the anti-lapse constraint *LAPSE as in

E&K, repeated below from (13) in §1.3.2, these instances with triple upbeats will never

see the light of day as the medial weak beat will always lack a licensor as it is not

preceded by a strong beat.

79. *LAPSE
    Every weak beat must be adjacent to a strong beat or the word-edge.

The closest case for illustrating how *LAPSE militates against a sequence of three word-

final upbeats is the selection of the Finnish optional form *(rá.vin)(tò.lat)* against the

nontrivial rival candidate *(rá.vin).to.lat* in a constraint hierarchy. We re-present the

evaluation process in the following tableau.

80.

/ravintolat/	*LAPSE	NON-FIN	*(´LH)	PARSE-σ
a. (rá.vin).to.(làt)		*!	*	*
☞ b. (rá.vin).(tò.lat)			**	
c. (rá.vin).to.lat	*!		*	**

The anti-lapse constraint here not only 'absolutely' rules out the candidate having only

one foot (80c), but also enforces a binary pattern. Selection of *(ré.te).(lì.le)* (71a) over

(ré.te).li.le (71b) in Estonian (§1.5.3.2) retells the same story of *LAPSE crucially ruling

in favour of the candidate with two feet against the one containing one foot.[17] Even the factorial typology of *LAPSE and other constraints rule out the possibility of such a system with trochees although with iambs this is perfectly all right. Consider for example the prediction for hypothetical non-persistent Chugach in (69).

How does a constraint-based grammar then account for the presence of a triple upbeat at the final edge of a word? Does this involve any crucial reranking of the set of constraints, which generate ternarity? Or does the theory need to redefine the anti-lapse constraint itself? All these questions will guide the course of our discussion in the present chapter. The core part of the chapter contains a suggestion for restatement of the anti-lapse constraint to accommodate the *deviant* facts of TB. The redefined anti-lapse constraint regards foot-edge (depending on the directionality of alternation) and word-edge as the two licensors of weak beats. Appropriate ranking of the alignment constraints (ALIGN-L/R, ALL-FT-L/R) determines the direction of footing and hence the particular edge of the foot that can license a weak beat. The redefined anti-lapse constraint not only explains the TB facts but also is capable of accommodating all the attested metrical patterns mentioned in E&K. This modified rhythmic theory of ternarity however differs from the one proposed in E&K in making distinct predictions about some unattested systems.

Organization of the chapter is as the following. §2.1 gives an OT account of TB metrical pattern using *FTFT as a means to achieve ternarity. In §2.2 a detailed argumentation is presented against proposing *FTFT as a universal constraint since its only function is to distance every foot from the adjacent one by an intervening unparsed

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[17] In both Finnish and Estonian, ALIGN-L remains undominated along with *LAPSE.

syllable so that an effect of ternary rhythm prevails on the surface. Looking for a suitable alternative, an attempt has been made in §2.3 to apply the anti-lapse constraint *LAPSE proposed by E&K to explain the metrical realities of TB. But *LAPSE fails to accommodate the entirety of TB facts especially in respect of licensing a sequence of three weak beats at the right edge in words of length $3n+1$ (i.e. four and seven) syllables. This provides the rationale for redefining the anti-lapse constraint to make it maximally accommodative – not at the cost of the restrictiveness of a universal constraint however – of cross-linguistic diversities of metrical patterns. This is undertaken in §2.4. All the six subsections of §2.5 exemplify the success of the new anti-lapse constraint *LAPSE(DE) in explaining the various metrical patterns instantiating both occasional and regular ternarity. §2.6 deals with the typological consequences of our rhythmic theory based on *LAPSE(DE). Special thrust is placed on projecting a factorial typology of various ternary rhythmic systems. §2.7 shows that the same core constraint hierarchy can account for the metrical pattern in words containing heavy syllables provided a few new constraints are invoked and a minor reorganization is made among the existing ones. §2.8 gives the conclusions.

2.1 OT account of TB metrical pattern

Ternary rhythm in TB light sequences is the consequence of skipping one syllable every time after constructing a binary trochee. That means, TB grammar contains the following two undominated constraints.

81. FOOT BINARITY (FT-BIN)
   'Feet are binary at some level of analysis (μ, σ).' (Prince and Smolensky 1993: 47)

82. TROCHEE (TROCHEE)
    'Within foot, every '*' is followed by a '.'.'   (Vijver 1998: 6)

Again, in every such word the head foot is aligned with the left edge. In OT terms, this

requirement translates into a word-to-foot alignment constraint referring to the left edge

of the word.

83. ALIGN-LEFT (ALIGN-L)
    Align (PrWd-L, Ft-L)   (E&K: 292)

Successive feet construction is prohibited under the parametric option of WLP (Weak

Local Parsing) to use the Hayesian (1995) terminology. The OT counterpart of this is

available in, for example, Kager (1994) in the constraint *FTFT.

84. *FTFT
    Feet must not be adjacent.

In a trisyllable all these constraints (81-84) are satisfied at the expense of the constraint

that ensures regular iteration through exhaustive parsing namely PARSE-σ.

85. PARSE-σ
    Syllables are parsed by feet.
The ranking of these constraints accounts for optimal parse with a word-initial foot in a

trisyllabic word as is illustrated below.

86. *Basic constraint ranking for TB light sequences*
    FT-BIN, TROCHEE, ALIGN-L, *FTFT ≫ PARSE-σ

87.

/zírabi/	FT-BIN	TROCHEE	ALIGN-L	*FTFT	PARSE-σ
☞ a. (zí.ra).bi					*
b. zi.(rá.bi)			*!		*
c. (zí.ra).(bì)	*!			*	
d. (zi.rá).bi		*!			*

No candidate in (87) can survive incurring a violation of any of the four undominated

constraints which, having no interactions among themselves, remain unranked with each

other. The optimal candidate (87a) satisfies all the undominated constraints at the cost of one violation of the lowest ranked constraint PARSE-σ. This final underparsing is in contradistinction to initial underparsing (87b). The latter is ruled out by the undominated alignment constraint ALIGN-L. The binary foot constraint comes into action in barring the candidate (87c) parsing a monosyllabic degenerate foot. This violation overshadows a more serious violation, that of the foot-repulsion constraint *FTFT. We shall see the crucial role of the latter in longer sequences where trochees are prevented from abutting each other. (87d) will never get selected in TB since feet are trochaic under all circumstance. Let us now turn to longer sequences. From now on we suppress the presence of two of the undominated constraints FT-BIN and TROCHEE in rankings.

Words of four and five syllables length do not need any new constraints. In the former (88) formation of a word-final foot through exhaustive parsing is less urgent than avoiding construction of successive feet. In a five-syllable word (89) however the need for exhaustive parsing can be satisfied to a greater degree without outraging the demands of the foot-repulsion constraint. This results in the emergence of a secondary foot aligned at the right edge. We get the first instance of iterative ternary rhythm thanks to the undominated status of *FTFT.

88.

/biβɛsɔna/	ALIGN-L	*FTFT	PARSE-σ
☞ a. (bí.βɛ).sɔ.na			**
b. (bí.βɛ).(ˋsɔ.na)		*!	
c. bi.(βɛ́.sɔ).na	*!		**

89.

/ɸorisalɔna/	ALIGN-L	*FTFT	PARSE-σ
☞ a. (ɸɔ́.ri).sa.(lɔ̀.na)			*
b. (ɸɔ́.ri).(sà.lɔ).na		*!	*
c. ɸo.(rí.sa).(lɔ̀.na)	*!	*	*
d. (ɸɔ́.ri).sa.lɔ.na			**!*

It must have been noticed that a conflicting picture emerges in the three preceding tableaux regarding the status of extrametricality in TB. In three and four syllable words (87-88) (final) extrametricality of one and two syllables respectively is a must. But this is contradicted in a five-syllable word (89). Interestingly both these conflicting outcomes are the consequences of an identical set of constraints ranked uniformly. This is one of the beauties of OT: even a low ranked constraint can play a decisive role to evaluate the optimal candidate when the higher ranked ones fail to force a decision. This is because in OT every constraint is violable but violation must be minimal and only to satisfy the higher ranked constraints. In a trisyllable (87) evaluation of the optimal parse necessitates a minimal violation (*once*) of the lowest ranked constraint PARSE-σ to satisfy the higher ranked constraints. In a four-syllable word the minimal violation of PARSE-σ can be increased by one mark (to *two*, cf. 88a) under duress of the undominated constraints. But this is the maximal ceiling for *minimal violation* in respect of the constraint looking after maximal parsing. One extra violation mark excludes the concerned candidate from the fray. This is illustrated in the failure of the candidate (89d).

But there are occasions when even the lowest ranked constraint fails to force a decision. Such a situation arises in a six-syllable word when *two* syllables are skipped instead of *one* – the minimal number required to satisfy *FTFT – after the first foot is built. Do we then need to propose a constraint to the effect that word-medially skipping

more than one syllable is prohibited? There is no such need however. For there are independently motivated edge-oriented alignment constraints like ALL-FT-X (where X refers to either the left or the right edge of the word) which keep the inter-foot distance within the *permissible* limit requiring all feet to be as close as possible to the designated edge of the PrWd.

90. ALL-FOOT-X (ALL-FT-L/R)
    'The edge X of every foot coincides with the edge X of some PrWd.'

In this generalized constraint X being a variable can refer to either the left (L) or the right (R) edge of the PrWd. The relevant value of X for TB is obviously L. The demand of ALL-FT-L however is surprisingly very strong requiring the left edge of every foot to coincide with the left edge of the PrWd. Such a demand can never be satisfied in a language, which allows rhythmic alternation i.e. multiple feet within the same word: any foot other than the initial one will compulsorily violate this constraint. Obviously in TB ALL-FT-L cannot stand undominated precisely because the language displays rhythmic alternation. In fact this constraint must be dominated by PARSE-σ to enforce multiple feet per word. But though dominated by PARSE-σ, ALL-FT-L exerts its influence in a more subtle way by restricting the optimal candidate from violating it more than minimally. That is, this candidate has all its feet *as close as possible* to the left edge of the PrWd, measured by numbers of syllables distancing every foot from the left edge of the word. So the constraint ranking needed to predict the ternary alternation in a six-syllable word in TB is

91. ALIGN-L, *FTFT ≫ PARSE-σ ≫ ALL-FT-L.

Interaction of these constraints is illustrated in the following tableau.

92.

/ɔmɔnɔzugita/	ALIGN-L	*FTFT	PARSE-σ	ALL-FT-L
☞ a. (ɔ́.mɔ).nɔ.(zù.gi).ta			**	***
b. (ɔ́.mɔ).(nɔ̂.zu).(gì.ta)		*!*		** ****
c. ɔ.(mɔ́.nɔ).zu.(gì.ta)	*!		**	* ****
d. (ɔ́.mɔ).nɔ.zu.(gì.ta)			**	****!

Exclusions of candidates (92b) and (92c) from the race are self-explanatory. The critical competition is that between candidates (92a) and (92d) both of which survive the undominated constraints and score a tie on the count of PARSE-σ by carrying two violation marks each. The onus of evaluating the optimal parse then passes on to the next lower constraint in the hierarchy. Quite predictably, ALL-FT-L passes the verdict in favour of (92a) as opposed to (92d) on the strength of minimal violation.

Further evidence in support of the ranking argument PARSE-σ ≫ ALL-FT-L is available from the evaluation of the optimal candidate in seven-syllables. In the following tableau three candidates (93a, d, g) survive the undominated constraints and all of them fare identically with respect to the first dominated constraint namely PARSE-σ. Each has two feet and three unparsed syllables. But dis-rhythmic distribution of stresses occurs whenever inter-foot distance is more than the minimal number of syllables (i.e. *one*) needed to satisfy the higher ranked constraint *FTFT. ALL-FT-L exerting its pressure to pull the trochees maximally towards the left edge of the PrWd, then selects the candidate that minimally violates it. This candidate is (93a).

93.

/ɔnonukɔroniyɔ/	ALIGN-L	*FTFT	PARSE-σ	ALL-FT-L
☞ a. (ɔ́.no).nu.(kɔ̀.ro).ni.yɔ			***	***
b. (ɔ́.no).(nù.kɔ).(rɔ̀.ni).yɔ		*!*	*	** ****
c. (ɔ́.no).nu.(kɔ̀.ro).(nì.yɔ)		*!	*	*** *****
d. (ɔ́.no).nu.kɔ.ro.(nì.yɔ)			***	****!*
e. ɔ.(nó.nu).kɔ.(rɔ̀.ni).yɔ	*!		***	* ****
g. (ɔ́.no).nu.kɔ.(rɔ̀.ni).yɔ			***	****!

Rhythmic ternarity in eight syllable words is captured straightway by the same constraint ranking. What is noticeable however is the indifferent role of ALL-FT-L in the evaluation of the optimal parse. Candidates (94b, c) are ruled out by the undominated constraints. Of the three surviving candidates (94d, e) are discounted by PARSE-σ on simple parity count. The optimal candidate has three trochees each distanced from the other by one unparsed syllable. Any more underparsing than this can be achieved only at the cost of PARSE-σ, top-ranked among the dominated constraints.

94.

/ɔnonukɔroniyɔta/	ALIGN-L	*FTFT	PARSE-σ	ALL-FT-L
☞ a. (ɔ́.no).nu.(kɔ̀.ro).ni.(yɔ̂.ta)			**	*** ******
b. (ɔ́.no).(nù.kɔ).(rɔ̀.ni).(yɔ̂.ta)		*!**		** **** ******
c. ɔ.(nó.nu).kɔ.(rɔ̀.ni).yɔ.ta	*!		***	* ****
d. (ɔ́.no).nu.kɔ.ro.(nì.yɔ).ta			***!*	*****
e. (ɔ́.no).nu.kɔ.(rɔ̀.ni).yɔ.ta			***!*	****

In this subsection we have seen that a simple constraint ranking FT-BIN, TROCHEE, ALIGN-L, *FTFT ≫ PARSE-σ ≫ ALL-FT-L accounts for all types of light sequences in TB. Rhythmic ternarity is primarily the consequence of the undominated foot-repulsion constraint *FTFT spacing out the trochees towards the right, the direction of alternation. The opposite edge alignment constraint ALL-FT-L however sees to it that the trochees do not travel far away from the left edge, more than the distance needed to

satisfy *FTFT in terms of number of syllables. The word-final double underparsing in words of length $3n+1$ (i.e. four and seven) syllables is due to the joint effects of undominated FT-BIN and *FTFT.

But despite this neat picture of the metrical analysis of ternarity in TB, we express a strong reservation against it following the arguments against the existence of the foot-repulsion constraint *FTFT put forward in E&K. We also understand that this constraint has to be replaced with a more natural and independently motivated one. Since ternarity is not a primitive in the metrical systems of the world languages its analysis should not necessitate a ternarity-specific constraint; but rather should follow from the interaction of more general constraints responsible for rhythmic effects universally. In the next section we introduce a detailed argumentation building these points up to their logical conclusions.

2.2 Arguing against the foot-repulsion constraint *FTFT

Unlike binarity, ternarity is not a primitive of the metrical systems of the world languages currently known. This is proved by the fact that ternary rhythm is well-established for only a small group of languages such as Chugach (Alutiiq), Cayuvava, Estonian and possibly Winnebago. Proposing a constraint such as *FTFT, as a part of UG, whose all and only function is to ensure surface ternarity is therefore counterintuitive.

Ever since the discovery of ternary patterns in some languages, metrical phonologists have tried to capture it in terms of some typical ternarity-specific tools. These include TERNARY FEET of Halle & Vergnaud (1987), Levin (1988), Dresher & Lahiri (1991), Hewitt (1992), Rice (1992); binary feet in combination with a special

parsing mode called Weak Local Parsing (or WLP) proposed in Hayes (1995); or Relativised Extrametricality of Hammond (1990) who argues that both WLP and extrametricality

> 'produce parses in which binary feet are followed by a single syllable, either at the right edge of a word, or at the right edge of a foot. This is 'relativised extrametricality', that is relativised to a domain (foot or PrWd)'. (E&K: 279)

*FTFT (Kager 1994) represents the early OT response to translate these pre-OT analytical tools of rule-based theories into an OT constraint. Naturally, *FTFT suffers from the same limitation of being ternarity-specific like its predecessors. In OT, every constraint is universal and hence maximally generalized. The foot-repulsion constraint owing its motivation to a specific purpose is a clear misfit in OT.

Efforts have been made in recent OT analyses to eliminate this ternarity-specific canstraint and to suggest alternative methods of capturing ternarity. Most prominent among these are Ishii (1996) and E&K. It was Ishii who first suggested the idea that ternarity arises from the interaction of foot alignment constraints (ALL-FT-X) with an anti-lapse constraint. Assuming Kager (1994) Ishii proposes an anti-lapse constraint PARSE-2[18] that stipulates that 'of every two stress units one must be parsed into a foot'. But such a formulation engenders serious complications and more often than not fails to deliver the goods. (For details see E&K).

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[18] Ishii (1996) refers to the foot-based anti-lapse constraint as *LAPSE, whose formulation is identical to the PARSE-2 constraint proposed in Kager (1994). To avoid any confusion with regard to the grid-based constraint defined also as *LAPSE, E&K in their paper refer to Ishii's parse-based constraint as PARSE-2. In the present thesis there will not be much discussion of Ishii's anti-lapse constraint. But wherever necessary, we shall follow the instance of E&K to refer to Ishii's anti-lapse constraint as PARSE-2.

Consequently, E&K propose a new anti-lapse constraint *LAPSE, which we have already discussed in detail in §1.3.2. To remind ourselves of the core ideas of *LAPSE of E&K let us repeat the constraint itself.

95. *LAPSE
     Every weak beat must be adjacent to a strong beat or the word-edge.

Based on the *Anti-lapse Provision* of Selkirk (1984), *LAPSE does not involve any counting of weak beats. This absolutely rhythmic constraint is based on the notion of licensing. Explaining this aspect of *LAPSE, E&K (: 282) write:

> All that *LAPSE does is to check the linear adjacency of a weak beat with respect
> to rhythmic landmarks: either a strong beat or an edge. In this view, strong beats
> and edges become the LICENSORS of weak beats.

In brief, a weak beat which is neither adjacent to a strong beat or word-edge violates *LAPSE. Superiority of *LAPSE as opposed to its OT predecessor *FTFT lies in that it is not aimed at generating any particular rhythmic effect. It only ensures rhythmic alternation by prohibiting long sequences of weak beats. What should be the nature of the rhythm -- binary or ternary -- is the consequence of interaction of constraints including *LAPSE.

Although they reject Ishii's anti-lapse constraint, E&K adopt the basic insight of the former that explaining ternarity does not require any ternarity-inducing mechanisms. Instead ternarity emerges by 'LICENSING' involving interactions of the anti-lapse constraint *LAPSE (banning sequences of unstressed syllables) with standard foot-alignment constraints such as ALL-FT-X, ALIGN-Y etc. We have already seen in Chapter I how E&K succeed in analyzing the cross-linguistic data belonging to both regular and occasional ternary rhythm with their newly formulated constraint *LAPSE interacting

with various foot-alignment constraints. Let us now apply the same to explain the stress distribution pattern of TB, which by definition has a regular ternary rhythm in sequences of light syllables.

2.3 Applying *LAPSE to TB metrics

TB light sequences of three to eight syllables (maximum size of a non-compound word) can be classified into three subtypes: words of length $3n$ (i.e. three and six syllables), $3n+1$ (i.e. four and seven syllables), and $3n+2$ (i.e. five and eight syllables). Our effort in this section is to construct an OT grammar that accounts for each of these subtypes. To start with let us see what constraints are needed for the purpose in addition to *LAPSE.

As we have seen in §1.3.2 the core constraint ranking for generating ternarity effect in any language is *LAPSE ≫ ALL-FT-X ≫ PARSE-σ (16). This constraint ranking can be interpreted in the following way. If in a particular language the underparsing constraint ALL-FT-X overrides the demand for exhaustive parsing of syllables signified by the constraint PARSE-σ, unbounded system will result with only one foot standing at the designated edge (left or right) of the PrWd. But the force of the underparsing constraint is cut to size if the anti-lapse constraint *LAPSE dominates it. Since *LAPSE does not allow more than two weak beats in between two strong beats or a strong beat and the adjacent word-edge, every strong beat can be followed or preceded by maximally two weak beats or unparsed syllables (assuming no syllable weight distinction). The result is ternary rhythm.

In this new OT analysis of ternarity, directionality of footing is the consequence of which of the two underparsing constraints -- ALL-FT-L or ALL-FT-R -- figures

predominantly in the constraint hierarchy. In a language like TB where foot construction begins at the left edge of the PrWd and proceeds towards the right, ALL-FT-R dominates over ALL-FT-L. The latter, though dominated, exerts a subtle counter pressure to pull the trochees towards the left and in consequence of this tension of the two opposing forces the maximal inter-foot distance remains within the limit of one (unparsed) syllable. Dominance of ALL-FT-L over PARSE-σ is justified by the absence of persistent footing in TB. Beside these in TB every word begins with a foot (a trochee). This motivates the invocation of the undominated word-to-foot alignment constraint ALIGN-L. Assuming the undominated presence of the two constraints FT-BIN (81) and TROCHEE (82) (suppressed in the ranking as before) we therefore have evidence to construct the following constraint ranking for explaining ternarity in TB.

96. *LAPSE, ALIGN-L ≫ ALL-FT-R ≫ ALL-FT-L ≫ PARSE-σ[19]

We first illustrate the efficacy of this ranking in respect of TB words of $3n$ syllables.

97.

/zirabi/	*LAPSE	ALIGN-L	ALL-FT-R	ALL-FT-L	PARSE-σ
☞ a. (zí.ra).bi			*		*
b. zi.(rá.bi)		*!		*	*

Trisyllables present the simplest instances of ternarity without of course making the effects of rhythmic alternation obvious. Any way, the prediction of the revised constraint hierarchy built on the basis of the findings of E&K and using the undominated anti-lapse constraint *LAPSE, is proved perfectly accurate in evaluating the optimal parse. Rhythmic

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[19] There should not be any confusion regarding the reversed relation between ALL-FT-L and PARSE-σ in the earlier constraint ranking for TB in (91) in §2.1 compared to the one presented here. This reversal is chiefly the fall-out of the use of two different constraints to account for ternarity in the respective rankings: *FTFT in (91) and *LAPSE in (96).

ternarity however is clearly attested in the other member of the 3n subtype i.e. six-syllables. In the following tableau we illustrate the OT algorithm producing ternarity in such a word.

98.

/ɔmɔnɔzugita/	*LAPSE	ALIGN-L	ALL-FT-R	ALL-FT-L	PARSE-σ
☞ a. (ɔ́.mɔ).nɔ.(zù.gi).ta			* ****	***	**
b. (ɔ́.mɔ).(nɔ̀.zu).(gì.ta)			** ****!	** ****	
c. ɔ.(mɔ́.nɔ).zu.(gì.ta)		*!	***	* ****	**
d. (ɔ́.mɔ).nɔ.zu.(gì.ta)	*!		****	****	**
e. (ɔ́.mɔ).(nɔ̀.zu).gi.ta	*!		** ****	**	**
f. (ɔ́.mɔ).nɔ.zu.gi.ta	*!**		****		****

Only two candidates (98a, b) survive the undominated constraints. Of these (98b) is ruled out by the high ranking underparsing constraint ALL-FT-R as the former violates the latter *maximally* (i.e. as opposed to *minimally*) by constructing one extra foot in excess of what is minimally required to satisfy the anti-lapse constraint *LAPSE. In other words, the spacing-out effect that causes ternarity in (98a) is obstructed in (98b) due to the dense parsing of syllables in the latter, resulting in perfect binarity. Initial underparsing is always at the cost of fatal violation of undominated alignment requirement of ALIGN-L. This explains the suboptimality of (98c). All the three remaining candidates (98d-f) incur one or more fatal violations of *LAPSE and hence are excluded. Whenever there is a sequence of more than two weak beats the medial one will lack a licensor whether in the form of a strong beat (98d) or word-edge (98e). We have shown the erring beat (syllable) marked as underlined. By the same calculation there are three unlicensed weak beats in a sequence of five in (98f).

We now apply the constraint hierarchy (96) to evaluate the grammatical forms in words of length 3n+2 syllables. Generally the minimum number of feet required for a

word of 3*n*+2 syllables equals *n*. In other words, in a word of five syllables the minimum number of feet expected is *one* and in a word of eight syllables the number is *two*. But what we notice in reality in TB is the excess presence of one syllable in both the cases. What could be the factor enforcing such an additional foot in such type of words. To find the desired answer let us look at the following tableaux.

99.

/ɸorisalɔna/	*LAPSE	ALIGN-L	ALL-FT-R	ALL-FT-L	PARSE-σ
☞ a. (ɸó.ri).sa.(lɔ̀.na)			***	***	*
b. (ɸó.ri).(sà.lɔ).na			* ***!	**	*
c. ɸo.(rí.sa).(lɔ̀.na)		*!	**	***	*
d. (ɸó.ri).sa.lɔ.na	*!*		***		***

In (99) three candidates (a, b, c) contain two feet each i.e. one in excess of what is required for a word of 3*n*+2 (i.e. five) syllables. In contrast, (99d) conforms to the minimum figure of one foot. But surprisingly it is the *deviant* forms with two feet which satisfy the undominated anti-lapse constraint *LAPSE whereas the *ideal* form (99d) incurs two fatal violation of the said constraint. The question that has been troubling us so far is now well answered: undominated *LAPSE does not tolerate a sequence of more than two weak beats. Consequently it enforces one extra stress, and hence an extra foot, for its own satisfaction. Any candidate having less than two feet in a five-syllable word is thus ruled out by *LAPSE. Out of three candidates that survive *LAPSE, (99c) is thrown out by the undominated ALIGN-L. Only two candidates (99a-b) now remain in the fray and the judgment passes on to the constraint standing immediately below the undominated ones as both these remaining candidates fare identically in respect of the latter. Perfect binarity occurs in (99b) due to the fact that both the feet are pushed maximally leftwards incurring one extra violation of right edge oriented constraint ALL-FT-R compared to the ternary

rhythm candidate (99a). ALL-FT-R then gives the verdict in favour of (99a) vindicating the minimality condition of violation – one of the key principles in OT. The same explanation is repeated in the success story of the most harmonic candidate (100a) in an eight-syllable word excepting that here the number of feet increases by one more.

100.

/ɔnonukɔroniyɔta/	*LAPSE	ALIGN-L	ALL-FT-R	ALL-FT-L	PARSE-σ
☞ a. (ɔ́.no).nu.(kɔ̀.ro).ni.(yɔ̂.ta)			*** ******	*** ******	**
b. (ɔ́.no).(nù.kɔ).(rɔ̀.ni).(yɔ̂.ta)			** **** ****!**	** **** ******	
c. ɔ.(nó.nu).kɔ.(rɔ̀.ni).yɔ.ta	*!	*	** *****	* ****	****
d. (ɔ́.no).nu.kɔ.ro.(nì.yɔ)	*!*		* ******	*****	****
e. (ɔ́.no).nu.kɔ.(rɔ̀.ni).yɔ.ta	*!*		** ******	****	****
f. (ɔ́.no).(nù.kɔ).(rɔ̀.ni).yɔ.ta	*!		** **** ******	** ****	**

It is time now to look at the third and last subtype of TB words which equal a length of $3n+1$ (i.e. four and seven) syllables. An interesting thing happens here posing a serious challenge to the efficacy of constraint ranking (96) which has so far yielded the desired results in predicting ternarity in TB. Let us first consider two representative words of the specified length.

101. a. (bí.βɛ).sɔ.na   'consideration'
  b. (ɔ́.no).nu.(kɔ̀.ro).ni.yɔ 'inimitable'

In both these words three weak beats follow the rightmost strong beat. Going by the current definition of the anti-lapse constraint, *LAPSE, as proposed in E&K, both of them incur one fatal violation each by having an unlicensed weak beat (marked with underline). The optimal forms predicted by the OT grammar (96) in respect of words of this subtype thus severely contradict the attested facts of the language. The following tableaux are presented for illustration.

102.

/biβɛsɔna/	*LAPSE	ALIGN-L	ALL-FT-R	ALL-FT-L	PARSE-σ
a. (bí.βɛ).sɔ.na	*!		**		**
☞? b. (bí.βɛ).(ˋsɔ.na)			**	**	
c. bi.(bɛ́.sɔ).na		*!	*	*	**

103.

/ɔnonukɔroniyɔ/	*LAPSE	ALIGN-L	ALL-FT-R	ALL-FT-L	PARSE-σ
a. (ɔ́.no).nu.(kɔ̂.ro).ni.yɔ	*!		** *****	***	***
b. (ɔ́.no).(nù.kɔ).(rɔ̂.ni).yɔ			* *** ****!*	** ****	*
c. (ɔ́.no).nu.(kɔ̂.ro).(nì.yɔ) ☞?			** *****	*** *****	*
d. (ɔ́.no).nu.kɔ.ro.(nì.yɔ)	*!*		*****	*****	***
e. ɔ.(nó.nu).kɔ.(rɔ̂.ni).yɔ		*!	* ****	* ****	***
g. (ɔ́.no).nu.kɔ.(rɔ̂.ni).yɔ	*!		* *****	****	***

In both the tableaux above, the optimal parses (102b) and (103c) display binary rhythm with only local ternarity in the latter. By contrast the desired optimal candidates, which attest regular ternarity (102a) and (103a) are excluded by incurring one fatal violation each on the count of the anti-lapse constraint.

The real problem confronting us is what sort of constraint ranking is capable of providing a uniform account for all the three subtypes of words in TB. Or more precisely, is it really the problem of reorganizing the constraint ranking or redefining some of the constraints? We shall argue that it is not any reorganization of the constraint ranking but an appropriate statement of the undominated anti-lapse constraint *LAPSE that holds the key to the solution of the problem. This however we will do in the following subsection. To start with we consider the former possibility first.

2.4 TB metrics and an argument for redefining *LAPSE

In terms of the core grammar proposed in E&K for generating ternarity, *LAPSE must remain undominated in the hierarchy. This is because the purpose of this constraint is to

ban long sequences of weak beats. Domination of *LAPSE and PARSE-σ by the underparsing constraints ALL-FT-X will produce unbounded systems. In the reverse case i.e. when *LAPSE and PARSE-σ dominate ALL-FT-X, binary rhythm results.[20] As far as ternarity is concerned it is ensured only by the ranking *LAPSE ≫ ALL-FT-X ≫ PARSE-σ. These typological predictions are based on the findings of E&K, already stated in §1.5.1 repeated for convenience in (104).

104. a. ALL-FT-X ≫ PARSE-σ, *LAPSE   (unbounded system)
    b. *LAPSE, PARSE-σ ≫ ALL-FT-X   (binary system)
    c. *LAPSE ≫ ALL-FT-X ≫ PARSE-σ (ternary system)

It is obvious therefore that for ternarity *LAPSE must dominate ALL-FT-X ≫ PARSE-σ and this has been sufficiently evidenced in the evaluation of ternarity in TB words of lengths $3n$ and $3n+2$ (cf. 97-100). In other words constraint reranking does not hold the answer for the elimination of binary rhythm in words of length $3n+1$.

    Let us now consider the other possibility: constraint redefining. The constraint that plays the all-important role of ruling out final triple upbeat in words of length $3n+1$ syllables is the anti-lapse constraint *LAPSE. In the absence of it, the evaluation would have passed on to one of the edge-oriented alignment constraints ALL-FT-L because both the non-trivial candidates i.e. (a) & (b) in (102) and (a) & (c) in (103) score a tie in respect of ALL-FT-R and incur no violation on the count of the word-to-foot alignment constraint ALIGN-L. The verdict of ALL-FT-L goes in favour of the desired candidates i.e. the ones with final triple upbeat for the simple reason of minimal violations on parity

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[20] The mutual ranking between *LAPSE and PARSE-σ is immaterial in respect of production of non-ternary rhythms.

count. So, if any constraint needs to be restated for accommodating the facts of TB in terms of the present ranking, it must be the anti-lapse constraint, *LAPSE.

As per its current definition, 'Every weak beat must be adjacent to a strong beat or the word-edge' (E&K: 282), only stresses and word-edges can license a weak beat. In other words the distance between two licensors should not be more than two weak beats so that each licensor has one (the maximal number allowed) weak beat within its licensing scope. Facts of TB however demand that the licensing scope of at least one of these prosodic categories[21] should be extended to include *two* weak beats so that a sequence of triple upbeat can be easily accommodated. Now the question arises, which one of these licensors should enjoy this benefit of extended scope? If every strong beat were permitted to license two weak beats each, then there would arise a pattern in which inter-stress distance would be maximized to four weak beats! No metrical system is currently known in which rhythmic alternation involves such a quaternary distribution of stress. The focus then shifts to the other licensor i.e. word-edge. But which word-edge? If both the edges of a word were allowed to license two weak beats each, there is a possibility of having as many as six weak beats[22] within a single word with just one stress. To achieve a semblance of rhythmic effect at all, with such a large number of weak beats, every word must have an overlong size, a phenomenon very rare in natural languages. Implication for the theory therefore is that the extra licensing facility should be restricted to only one of the edges of word, either initial or final. Doing this involves the danger of reintroducing the provision of parametric options in OT. This would be a

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[21] A strong beat, as a (prominent) syllable, is also a prosodic unit.

[22] Assuming that each strong beat can license two weak beats -- one on each side because of adjacency -- and each word-edge can license two weak beats, theoretically, the total number of weak beats in a word (with one strong beat) would be six.

bizarre situation given the avowed renunciation of any parametric options by OT. The latter instead constructs grammar on the basis of interactions of universal violable constraints.

To get round this array of complications it would be worthwhile to consider the possibility of projecting foot-edge as a valid licensor of weak beats.[23] Once again such a proposition is fraught with the danger of increasing the number of weak beats in a word if both the edges of a foot are accepted as valid licensors in the same language. Empirically, every language selects a particular foot-edge as licensor of a weak beat. Selection of this particular foot-edge however is not subject to any parametric selection. This is ensured if directionality of iteration is taken into consideration. The licensing edge of the foot must coincide with the direction of footing. That is, *if rhythmic footing proceeds from left to right, only the right edge of a foot can license a weak beat. Conversely, if the alternation were directed towards the left, the left edge of the foot would be the licensor. This is independent of any distinction of foot-dominance. Let us call this licensing foot-edge* ***directional foot-edge***. It is a separate issue how directionality is captured in terms a constraint hierarchy. We shall get back to that before long.

But once again this is too strong a proposition. For if in a word with multiple feet every foot allows one weak beat through *directional foot-edge* licensing, the optimal candidate in a six-syllable word with trochaic feet, will have a regular sequence of three upbeats word-medially since the following strong beat will also license a weak beat on

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[23] Considering foot-edge as a licensor of weak beats is not absolutely new. Hammond (1990) has already anticipated the idea in his concept of 'relativised extrametricality' according to which a single unparsed syllable can occur only at the right edge of a (binary) foot or at the right edge of a word. Ours however is a more generalized proposal in the sense that any edge of a foot can be the licensor of a weak beat depending on the directionality of footing decided by the relevant constraint ranking. In addition, we adopt from E&K the view that every word-edge can license a weak beat.

either of its side. That is, in a language with left-to-right trochaic pattern a word of six syllables will have a metrical pattern like (´σσ)σσ(`σσ) instead of (´σσ)σ(`σσ)σ. The former scansion with a medial triple upbeat produces a quaternary pattern while the latter with a medial double upbeat yields a perfectly ternary rhythm. That the ternary pattern is a cross-linguistically favoured one is established by the following examples from languages representing both iambic and trochaic systems.

105.
a. (à.ri).hi.(hí.be).e   vs.   *(à.ri).hi.hi.(bé.e)   (Cayuvava)   R→L[24]

b. (a.kú).tar.(tu.nír).tuq   vs.   *(a.kú).tar.tu.(nir.tuq́)   (Chugach)   L→R

c. (pú.he).li.(mìs.ta).ni   vs.   *(pú.he).li.mis.(tà.ni)   (Finnish)   L→R

d. (ó.sa).va.(mà.le).ki   vs.   *(ó.sa).va.ma.(lè.ki)   (Estonian)   L→R

c. (ɔ́.mɔ).nɔ.(zù.gi).ta   vs.   *(ɔ́.mɔ).nɔ.zu.(gì.ta)   (TB)   L→R

The net result of the above discussion supported by cross-linguistic evidence is that the directional edge of all feet is not entitled to become the licensor of a weak beat. The question then arises what types of feet are allowed to employ their directional edge as licensor of weak beats. Answering this question our discussion comes full circle. Remember we started off with the specific purpose of finding an answer for what licenses a triple upbeat word-finally in a TB word of length $3n+1$ syllables (cf. 101). We now can claim to have found an answer for the said question. Insights from the preceding discussion tell us that it is (only) the iteration-final directional foot-edge that can license a weak beat. In a trochaic language like TB with alternation proceeding from left to right, this weak beat licensed by the iteration-final directional foot-edge is flanked by one more on each side: it is preceded by the one licensed by the immediately preceding strong beat

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[24] These signal the directionality of footing with R standing for *right* edge and L for *left* edge.

and is followed by the one licensed by the following word-edge. This gives the *problematic* sequence of three weak beats word-finally in TB words containing four and seven syllables.

In the wake of this discovery of a third type of licensor for weak beats in a word, an appropriate restatement of the anti-lapse constraint is well warranted.

106. *New anti-lapse constraint* (pre-final version)
　　*LAPSE
　　Every weak beat must be adjacent to a strong beat or the iteration-final foot-edge
　　or a word-edge.

The licensing effects of all these three prosodic units mentioned in the definition of *LAPSE unite together to give a cumulative result of a triple upbeat word-finally (cf. TB).

But if examined critically, this newly defined *LAPSE turns out to be highly non-restrictive compared to its predecessor, which we from now on refer to as *LAPSE (E&K): the former has three clauses, each contributing a licensor while the latter has only two. The greater descriptive adequacy noticed in the new *LAPSE (106), is only at the cost of economy of generalizations. It is worthwhile therefore to explore the possibility of reducing the number of clauses incorporated in the new anti-lapse constraint.

The careful reader must have noticed that while defining the *directional foot-edge* as a licensor of weak beats we have made no reference to foot-dominance. This is because in deciding the licensing edge of a foot, its head or the strong beat plays no role at all. In fact, given that in a ternary rhythm only one syllable remains unparsed in between two feet and that this unparsed syllable (or weak beat) now has a licensor in either of the foot-edges adjacent to it, the licensing scope of a strong beat logically gets reduced to the foot internal domain. If a strong beat is allowed to license a weak beat

outside the domain of foot, every weak beat standing outside the domain of a foot and also away from the licensing scope of a word-edge, will be subject to double licensing by any of the adjacent foot-edge as well as the adjacent strong beat in a system where foot-dominance is the opposite of the directionality of footing i.e. where trochees are constructed rightwards (cf. TB) and iambs, leftwards (cf. hypothetical 'Iambic Cayuvava'). Such a provision for double licensing stands contrary to the principle of economy.

From the above discussion it then follows that in terms of the redefined *LAPSE (106) the role of a strong beat as a licensor for weak beats is a very restricted one, confined only to licensing the foot-internal weak beat. But is it not sheer redundancy to make provision for licensing a foot-internal weak beat through a separate constraint? Any constraint hierarchy having undominated FT-BIN (stipulating that feet are binary, cf. §1.2.2 (3a)) and TROCHEE or FT=IAMB (specifying the relevant foot-type), accounts for the fact that within a foot every weak beat stands adjacent to a strong beat. It is unnecessary therefore to project a separate constraint for a purpose, which is already taken care of by other constraints.

In sum, there is no justification for incorporating the clause mentioning the strong beat as one of the licensors of weak beats in a maximally restrictive statement of the anti-lapse constraint. Let us therefore revise the definition of the concerned constraint and distinguish it from now onwards as *LAPSE (DE) where the bracketed abbreviation DE stands for *Domain Edge*: foot and word are established prosodic domains.

107. *LAPSE (DE)
Every weak beat must be adjacent either to a *directional foot-edge* or word-edge.

Before we go on to show how this new constraint functions in a constraint hierarchy and accounts for the facts of TB and also of other languages, a word about the factors determining the licensing edge of a foot is worth the while. In Chapter I we have seen that directionality of footing is generally taken care of by the two edge-oriented alignment constraints ALL-FT-R and ALL-FT-L. In course of performing their normal duty of pulling the binary feet towards the respective edge of the PrWd represented by the values for R/L (i.e. right/left), these constraints indicate the direction of alternation. In our new approach to ternarity also these edge-oriented alignment constraints perform the same function. But in addition they also play a crucial role in determining the licensing edge of a foot, which is dependent on the directionality of iteration. In a constraint ranking where ALL-FT-R is ranked high and undominated by any other alignment constraint, the foot-edge capable of licensing a weak beat will be the right edge. In the converse situation where its left edge counterpart holds the sway, iteration will run towards the left and the left edge of every foot would license a weak beat.

But very often these edge-oriented alignment constraints are dominated by either of the word-to-foot alignment constraints ALIGN-L or ALIGN-R or both. The question to ask then is how does the constraint ranking determine the direction of footing and in consequence the licensing edge of a foot. In terms of the new OT mechanism that we propose here to account for rhythmic ternarity, direction of iteration falls out automatically from the highest ranked of the four alignment constraints: ALIGN-L & ALIGN-R and ALL-FT-L & ALL-FT-R. We have already mentioned that the edge-oriented alignment constraints ALL-FT-L & ALL-FT-R indicate that the direction of footing coincides with the value represented by L or R in the respective constraints. But the

word-to-foot alignment constraints ALIGN-L & ALIGN-R suggest that footing proceeds

opposite to the direction implied by the value of L or R. That is, if ALIGN-L ranks highest

among the alignment constraints, iteration proceeds towards the opposite edge i.e.

towards the *right*. On the contrary, if ALIGN-R tops the list, foot construction proceeds

towards the *left*. Automatically, in the former case the *right* edge of a foot functions as

the licensor of an adjacent weak beat; and conversely, in the latter case, the *directional*

foot-edge capable of licensing a weak beat is the *left* edge. Now, more often than not,

these word-to-foot alignment constraints remain undominated in the overall constraint

hierarchy of a language and in this respect they differ from the edge-oriented alignment

constraints. The reason for this however is not difficult to find. ALIGN-X demands that

the left or right edge of *one* foot must be aligned with the corresponding edge of some

PrWd. Very often this foot stands out from the rest as the head-foot in the PrWd. Such

constraints therefore impose strict alignment and (may) remain undomainated (either one

or both) in the hierarchy. When both ALIGN-L & ALIGN-R are undominated iteration

becomes bidirectional and both the edges, *left* and *right,* of the foot become licensors: i.e.

left edge of the right aligned foot and *right* edge of the left aligned foot (cf. Sentani).[25]

Contrary to ALIGN constraints, ALL-FT-X can never remain undominated because it is

practically impossible to have *all* the feet of a word aligned with a particular edge of the

PrWd. Consequently, in any language which allows rhythmic alternation, and hence

multiple feet per word, ALL-FT-X functions as a gradient constraint whose violation is

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[25] One can foresee a problem in a bidirectional system like Sentani with a word having a medial third foot distanced from the left- and right-aligned feet by two intervening unparsed syllables on both sides: (ό̀σσσ(ό̀σ)σσ(όσ). While *LAPSE (E&K) rules out such an overlong word, for *LAPSE (DE) this is perfectly 'grammatical'. However, in the overall constraint hierarchy there are other low ranked constraints, which see to it that such a form does not turn out optimal. For more details see § 2.5.3.

counted in terms of the number of syllables separating the feet from the designated edge of the PrWd. In the absence of ALIGN-X, the *highest* ranked ALL-FT-X determines the direction of alternation and hence the licensing edge of a foot. The following algorithm sums up the entire story behind deciding the directional foot-edge and hence the licensing edge of a foot.

108.   (i) Locate the highest ranking member of the set of four foot-alignment constraints (ALIGN-L, ALIGN-R, ALL-FT-L, ALL-FT-R).
(ii) If it is ALIGN-L, then the directional foot-edge (i.e. the licensing edge) is the opposite i.e., right. If it is ALIGN-R, then the directional foot-edge (hence the licensing edge) is left.
(iii) But if it is ALL-FT-L, then the directional foot-edge is left. If it is ALL-FT-R, then the directional foot-edge is right.
(iv) If both ALIGN-L and ALIGN-R are tied at the top of the ranking, then both the edges of every foot can license a weak beat (resulting in bi-directional footing).

Finally, it should be clearly understood that in this new approach, no alignment constraint is entrusted with the responsibility of licensing weak beats (whether one or more). Licensing is the sole responsibility of the anti-lapse constraint *LAPSE(DE) which specifically mentions the two eligible licensors: *directional foot-edge* and word-edge. In respect of licensing, the role of the alignment constraints is at the most indirect. They only determine – depending on which among them top(s) the list – the direction of foot construction and, by implication, the particular edge of a foot capable of licensing a weak beat. Determination of the other licensor i.e. word-edge is automatic and follows from its linear adjacency to the licensee.

We shall now demonstrate how the new anti-lapse constraint (107) accounts for the *deviant* forms in TB (cf. 101). We continue to suppress the presence of the undominated constraints FT-BIN and TROCHEE in the ranking.

109.

/biβεsɔna/	*LAPSE(DE)	ALIGN-L	ALL-FT-R	ALL-FT-L	PARSE-σ
☞ a. (bí.βɛ).sɔ.na			**		**
b. (bí.βɛ).(ˋsɔ.na)			**	*!*	
c. bi.(βɛ́.sɔ).na		*!	*	*	**

As stated earlier, ALIGN-L, being the highest of the alignment constraints in the hierarchy, points out that footing proceeds from left to right and that the *right* edge of the foot licenses a weak beat. That is, in the optimal parse in (109a) of the three word-final weak beats the foot internal weak beat *βɛ* is taken care of by undominated constraints FT-BIN and TROCHEE. The second weak beat *sɔ* is licensed by the *directional foot-edge* i.e. the *right* edge of the foot. And the last weak beat represented by the syllable *na* finds its licensor in the adjacent (*right)* edge of the word. Consequently, no violation is attested in respect of the anti-lapse constraint *LAPSE (DE) for the candidate (109a) which would have been excluded by *LAPSE (E&K). The critical competition is between candidates (109a) and (109b). Both survive the undominated constraints and are logged in a tie in respect of ALL-FT-R. Quite expectedly the charge of evaluation shifts to the next constraint down the hierarchy ALL-FT-L and the latter rules in favour of (109a) on consideration of minimal violation. This justifies our claim that in the presence of highest-ranking ALIGN-X, which determines the licensing edge as well as direction of iteration, the role of edge-oriented alignment constraint ALL-FT-X is only to mark the distance of the feet of the candidates from the respective edge of the PrWd and judge the optimal candidate on parity count.

The selection of the optimal candidate (110a) for a seven syllable word in the following tableau repeats the same story with the difference that owing to the increased number of potential candidates we can see here the crucial role of *LAPSE (DE) in action.

110.

/ɔnonukɔroniyɔ/	*LAPSE(DE)	ALIGN-L	ALL-FT-R	ALL-FT-L	PARSE-σ
☞ a. (ɔ́.no).nu.(kɔ̂.ro).ni.yɔ			** *****	***	***
b. (ɔ́.no).(nù.kɔ).(rò.ni).yɔ			* *** ****!*	** ****	*
c. (ɔ́.no).nu.(kɔ̂.ro).(nì.yɔ)			** *****	*** *!****	*
d. (ɔ́.no).nu.kɔ.ro.(nì.yɔ)	*!*		*****	*****	***
e. ɔ.(nó.nu).kɔ.(rò.ni).yɔ		*!	* ****	* ****	***
g. (ɔ́.no).nu.kɔ.(rò.ni).yɔ	*!		* *****	****	***

Perfect ternary rhythm occurs in (110a) owing to the presence of three weak beats following the secondary stress. All the three weak beats have their respective licensors and are therefore approved of by the new anti-lapse constraint *LAPSE (DE). Its closest rival (110c), which would have been chosen optimal by *LAPSE (E&K), is also passed by *LAPSE (DE). But (110c) is excluded because of its having an additional foot (formed 'persistently' on the last two syllables) incurring non-minimal violations of the left-edge-oriented alignment constraint ALL-FT-L. (110b) instantiates perfect binarity thanks to its maximally dense parsing. It thus incurs more violations than necessary on the count of the high ranking underparsing constraint ALL-FT-R requiring the trochees to be maximally close to the right edge of the PrWd. The 'hammock' pattern in (110d) is ruled against because out of its four inter-stress weak beats the rightmost two (in underline) lack licensors. (110g) repeats the same story with the variation that here only one weak beat goes unlicensed at the fatal expense of the anti-lapse constraint. Undominated word-to-foot alignment constraint ALIGN-L rules out candidate (110e) owing to the

misalignment displayed by the latter between the left edge of its initial foot and the left edge of the PrWd.

In sum, in this section we have seen that the rhythmic theory of anti-lapse based on licensing as proposed in E&K can be improved substantially to accommodate the *unpredicted* metrical realities of TB by redefining the crucial anti-lapse constraint banning long sequences of weak beats. The revised version of the relevant constraint named *LAPSE (DE), as opposed to its predecessor conveniently renamed *LAPSE (E&K), discards strong beat as a licensor of weak beats and introduces *directional foot-edge* as a new licensor. Advantage of this revised constraint is that it explains all the so-called *deviant* forms in TB and, as per our implicit claim, promises to do so for all the cross-linguistic metrical facts, which provided the empirical basis for E&K. In the next section we extend our OT account of ternarity to these cross-linguistic data.

2.5 Extending the application of *LAPSE (DE) to other ternary systems

In this section we show that the new anti-lapse constraint *LAPSE (DE) couched in the same core constraint hierarchy proposed for ternarity by E&K explains the entire range of cross-linguistic facts examined by the latter. Variations in respect of directionality, persistent footing (to use Hayesian terminology once again) etc. are taken care of by the interactions of alignment constraints and PARSE-σ. To start with, we shall consider data from languages which instantiate regular ternarity.

2.5.1 Cayuvava

As already noted in §1.3.1 and §1.3.2, Cayuvava is an iterative trochaic system with ternary rhythm. Main stress falls on the antepenult and alternation moves from right to

left. Persistent footing is not allowed. To illustrate how the new anti-lapse constraint *LAPSE (DE) produces the desired results like its predecessor *LAPSE (E&K), we present both of them side by side in the following tableaux. The erring beats (or syllables) are underlined.

111.

/arihihibee/	*LAPSE(E&K)	LAPSE(DE)	ALL-FT-L	ALL-FT-R	PARSE-σ
a. (á.ri).<u>hi</u>.<u>hi</u>.<u>be</u>.e	*!**	*!**		****	****
b. a.ri.(hì.hi).<u>be</u>.e	*!	*!	**	**	****
c. (á.ri).(hì.hi).<u>be</u>.e	*!	*!	**	** ****	**
☞ d. (á.ri).hi.(hì.be).e			***	* ****	**
e. (á.ri).<u>hi</u>.hi.(bè.e)	*!	*!	****	****	**
f. a.(rí.hi).hi.(bè.e)			* ***!*	***	**
g. (á.ri).(hì.hi).(bè.e)			** **!**	** ****	

In the evaluation of the six-syllable word in the preceding tableau, no difference is registered in respect of the two versions of the anti-lapse constraint. This is because in this system with right-to-left trochees foot-dominance and the licensing edge of the foot coincide: both are *left*. The former i.e. foot-head is a licensor for *LAPSE (E&K) and the latter i.e. *directional foot-edge* for *LAPSE (DE). A foot-head or the strong beat licenses any adjacent weak beat as per the definition of *LAPSE (E&K). In terms of our proposition, the highest ranked of the alignment constraints ALL-FT-L determines that footing proceeds from right to left and by implication, that the licensing edge of a foot is the *left* edge. Thus a weak beat abutting the left edge of a foot is duly licensed. By contrast a weak beat standing on the right edge of a foot stands unlicensed, so to speak, unless it is adjacent to a word-edge. All the underlined weak beats stand on the right side of a foot and all, excepting the word-final one, lack a licensor (cf. 111a-c). In (111e) of the two medial unparsed syllables the first one <u>hi</u> cannot be licensed by the preceding

foot since the licensing edge of a foot is *left* edge. Contrary to this the following unparsed syllable (weak beat) *hi* is licensed by the *left* edge of the following foot. All these four candidates are ruled against by *LAPSE (DE). Of the remaining candidates (111f-g) are excluded as they incur non-minimal violations in respect of ALL-FT-L. (111d) satisfies the anti-lapse constraint *LAPSE (DE) and has the least number of violations permitted by the higher ranked constraints and wins the fray. The same principles of stress assignment are at work in evaluating the most harmonic candidate in the following two tableaux in (112-113) for seven and eight syllables respectively. We do not go into the details of the evaluation processes of individual candidates, which should be self-explanatory. What is to be noted however is that in spite of their conceptual differences the two versions of the anti-lapse constraint yield identical results as one of the licensors in each coincide – the foot-head for *LAPSE (E&K) and the *directional foot-edge* for *LAPSE (DE): both are *left*.

112.

/marahahaeiki/	*LAPSE (E&K)	*LAPSE (DE)	ALL-FT -L	ALL-FT -R	PARSE -σ
a. (má.ra).ha.ha.e.i.ki	*!***	*!***		*****	*****
b. ma.ra.(há.ha).e.i.ki	*!*	*!*	**	***	*****
☞ c. ma.(rà.ha).ha.(é.i).ki			* ****	* ****	***
d. ma.ra.(hà.ha).(é.i).ki			** ****!	* ***	***
e. ma.ra.(hà.ha).e.(í.ki)			** ****!*	***	***
f. (mà.ra).ha.(há.e).i.ki	*!	*!	***	** *****	***
g. (mà.ra).(hà.ha).(é.i).ki			** ****!	* *** *****	*

113.

/ikitaparerepeha/	*LAPSE (E&K)	*LAPSE (DE)	ALL-FT -L	ALL-FT -R	PARSE- σ
a. i.(kì.ta).pa.(ré.re).<u>pe</u>.ha	*!	*!	* ****	** *****	****
☞ b. i.ki.(tà.pa).re.(ré.pe).ha			** *****	* ****	****
c. (ì.ki).(tà.pa).re.(ré.pe).ha			** *****	* **** *!*****	**
d. (ì.ki).ta.(pà.re).re.(pé.ha)			*** *****!*	*** ******	**
e. (ì.ki).(tà.pa).(rè.re).(pé.ha)			** **** **!****	** **** ******	

At this juncture our new OT analysis of ternarity arrives at a problem. Remember in this new approach, foot-head has no role as a licensor. This role has been taken over by the *directional foot-edge*. This means the optimal parse in a system, which agrees with trochaic Cayuvava in all respects of metrification except in forming iambic feet, will have the same output form for an eight-syllable word as that in (112b). But since foot-dominance is right in iambs there will emerge a sequence of three upbeats word-initially, which is highly marked and (perhaps) unattested in any natural language. The proposed hypothetical system that (E&K) refer to as 'Iambic Cayuvava' (cf. 65) is correctly ruled out by *LAPSE(E&K), but incorrectly ruled in by *LAPSE(DE). For illustrations let us look at the following tableau where we use the same constraint hierarchy built for 'Iambic Cayuvava' by (E&K): *LAPSE ≫ ALL-FT-L ≫ PARSE-σ (cf. 65).

114.

/tatatatatatatata/	*LAPSE(E&K)	*LAPSE(DE)	ALL-FT-L	PARSE-σ
a. ta.(ta.tá).ta.(ta.tá).<u>ta</u> ta		*!	* ****	****
b. ta.<u>ta</u>.(ta.tá).ta.(ta.tá).ta	(*!)		** *****	***!*
☞ c. (ta.tá).(ta.tá).ta.(ta.tá).ta			** *****	**
d. (ta.tá).ta.(ta.tá).ta.(ta.tá)			*** *****!*	**
e. (ta.tá).(ta.tá).(ta.tá).(ta.tá)			** **** **!****	

The critical case is that of (114b). This candidate is ruled out by *LAPSE(E&K) as the second syllable from the left (given in underline) fails to get a licensor, standing adjacent

neither to a strong beat nor to a word-edge. But for *LAPSE(DE) the calculations are different: highest ranked of the alignment constraints ALL-FT-L determines that direction of footing is towards *left* and hence, by implication, it is only the left edge of a foot that can license a weak beat. In consequence, the underlined syllable in (114b) is perfectly licensed by the left edge of the succeeding foot.

However, this incorrect prediction by *LAPSE(DE) does not pose any serious threat to the new rhythmic theory. This is because as the tableau (114) also shows, the OT grammar of 'Iambic Cayuvava' is not constructed only of the anti-lapse constraint. The latter contains other constraints as well, which despite being ranked lower than the anti-lapse constraint can have a significant role in evaluating the optimal parse. In fact it is perfectly within the letter and spirit of OT that in case of higher ranked constraints turning out ineffective in forcing a decision, the lower ranked constraints swing into action and decide the optimal output. In the present case since both *LAPSE(DE) and ALL-FT-L fail to select the grammatical output, evaluation passes onto the lowest ranked constraint PARSE-σ that rejects (114b) for having more violations than the most harmonic (114c). The elimination of (114d-e) is self-explanatory.

But a point of more profound theoretical interest is the evaluation of (114a) on, which the two anti-lapse constraints directly conflict. For *LAPSE(E&K) this is the optimal candidate since it does not incur any lapse violation and has the least number of violation marks in respect of ALL-FT-L. But *LAPSE(DE) straightway rejects (114a) for having violation of lapse as defined by itself: the underlined weak beat in (114a) is licensed neither by the *directional foot-edge* (which is the left edge of a foot) nor a word-edge. The optimal candidate for *LAPSE(DE) is (114c) evaluated by the entire constraint

hierarchy. This rejection of, let us say, the E&K-optimal output by the new rhythmic theory in favour of, let us say, the DE-optimal form, strongly establishes the empirical superiority of the new rhythmic approach over that of E&K. This is because iambic systems with antepenultimate main stress are unattested in any natural language. Ruling out such an overgenerated pattern our theory of rhythmicity scores better in respect of typological predictions. More discussion on this awaits us in §2.6.

2.5.2 Chugach

In Chugach iambic feet are constructed persistently from left to right with one unparsed syllable in between. Stress falls on every syllable in position $3n$-1 (i.e. σ_2, σ_5 etc.), as well as on the final syllable of any words of length $3n$+1 (i.e. four, seven) syllables. Because of foot-persistence any pairs of syllables that are still left unparsed after directional foot assignment must be footed. This is unlike what we saw in Cayuvava. Consequently there is a local reranking in the constraint hierarchy with PARSE-σ coming to dominate over ALL-FT-L. Additionally undominated ALIGN-L tops the list of alignment constraints. We are familiar with all these because in Chapter I we have seen how E&K account for these facts in terms of constraint interaction. What is new however is the introduction of the revised anti-lapse constraint *LAPSE(DE) in the constraint ranking in place of *LAPSE(E&K). We shall however continue to compare the two in tabular forms by presenting them side-by-side. Any difference between the two in terms of candidate evaluation will be taken due note of. As before the weak beats remaining unlicensed will be underlined.

115.

/maŋarsuqutaquni/	ALIGN-L	*LAPSE (E&K)	*LAPSE (DE)	ALL-FT-R	PARSE-σ	ALL-FT-L
a. (ma.ŋár).su.<u>qu</u>.<u>ta</u>.<u>qu</u>.ni		*!**	*!**	*****	*****	
b. ma.(ŋar.sú).qu.(ta.qú).ni	*!			* ****	***	* ****
c. (ma.ŋár).su.(qu.tá).qu.ni				** *****	**!*	***
d. (ma.ŋár).su.(qu.tá).(qu.ní) ☞				** *****	*	*** *****
e. (ma.ŋár).(su.qú).ta.(qu.ní)				*** *****!	*	** *****
f. (ma.ŋár).(su.qú).(ta.qú).ni				* *** ****!*	*	** ****

In (115) the highest ranked of the alignment constraints is (undominated) ALIGN-L, which automatically determines that footing proceeds in the opposite direction of L i.e. towards *right*. Obviously, the *directional edge* of a foot capable of licensing a weak beat is also *right*. Any weak beat (or unparsed syllable) not standing close to the right edge of a foot lacks a licensor unless of course it is adjacent to a word-edge. For instance the three underlined syllables in (115a) do not abut either the right edge of a foot or any edge of the PrWd. This renders them defaulters in respect of *LAPSE(DE). The equations are different for *LAPSE(E&K) as strong beats and word-edges are valid licensors of weak beats. The three underlined weak beats lack both the licensors and incur fatal violations in respect of *LAPSE(E&K). Once again we notice that the two versions of the anti-lapse constraint behave identically in ruling out any candidates having an unlicensed weak beat for a similar reason we have noticed in case of Cayuvava: the foot-dominance and the licensing edge of the foot agree (both are *right*) as iambic feet are constructed iteratively from left to right. Rest of the details of the evaluation process involving other candidates is already explained in §1.4.1. and hence not repeated here. Additional evidence in

support of the principles of metrification under discussion is supplied by the following

two tableaux for six and five syllables in (116) and (117) respectively.

116.

/akutartunirtuq/	ALIGN -L	*LAPSE (E&K)	*LAPSE (DE)	ALL-FT -R	PARSE -σ	ALL-FT -L
a. (a.kú).tar.<u>tu</u>.<u>nir</u>.tuq		*!*	*!*	****	****	
b. (a.kú).(tar.tú).nir.tuq				** ****!	**	**
c. (a.kú).tar.(tu.nír).tuq ☞				* ****	**	***
d. (a.kú).tar.<u>tu</u>.(nir.túq)		*!	*!	****	**	****
e. a.(ku.tár).tu.(nir.túq)	*!			***	**	* ****
f. (a.kú).(tar.tú).(nir.túq)				** ****!		** ****

117.

/taqamaluni/	ALIGN -L	*LAPSE (E&K)	*LAPSE (DE)	ALL-FT -R	PARSE -σ	ALL-FT- L
a. (ta.qá).ma.<u>lu</u>.ni		*!	*!	***	***	
b. ta.(qa.má).lu.ni	*!			**	***	*
c. (ta.qá).(ma.lú).ni				* ****!	*	**
☞ d. (ta.qá).ma.(lu.ní)				***	*	***

     In the above tableaux for various Chugach words one licensor each of the two

anti-lapse constraints coincide. That is, the foot-head (a licensor for *LAPSE(E&K)) of an

iamb is *right*; so also is the licensing edge of a foot (a licensor of weak beats according to

*LAPSE(DE)). And it is observed that the two anti-lapse constraints yield identical

grammatical outputs. At this point a question of theoretical importance strikes the

inquisitive mind: what would be the predictions of the two theories if the two above

mentioned licensors -- each belonging to the two respective anti-lapse constraints -- differ

i.e. if trochees (always left-headed) are constructed iteratively rightwards. Let us illustrate

the phenomenon with the evaluation process of the optimal candidate in a word of seven

syllables from the hypothetical 'Trochaic Chugach'.

118.

/tatatatatatata/	ALIGN -L	*LAPSE (E&K)	*LAPSE (DE)	ALL-FT -R	PARSE -σ	ALL-FT -L
a. (tá.ta).ta.(tá.ta).(tá.ta) ☞				** *****	*	*** *****
b. (tá.ta).ta.(tá.ta).ta.ta		(*!)		** *****	**!*	***
c. (tá.ta).(tá.ta).(tá.ta).ta				* *** ****!*	*	** ****
d. (tá.ta).(tá.ta).ta.(tá.ta)				*** *****!	*	** *****

No candidate in this system can survive incurring any violation for the undominated alignment constraint ALIGN-L. Hence we have kept such candidate forms outside the tableau. The elimination of (118c-d) does not need any explanation. The critical case is that of (118b) which is desirably *ruled out* by *LAPSE(E&K) but incorrectly *ruled in* by *LAPSE(DE). Such an incorrect prediction apparently seems to weaken the analytical strength of the new rhythmic theory based on *LAPSE(DE).

But a careful observation shows that the candidate (118b) with three word-final lapses is ruled out by the low ranking constraint PARSE-σ for having non-minimal violations in comparison to the optimal output (118a). Such a selection of the optimal form by lower ranked constraints does not reveal any theoretical inferiority of an OT grammar. On the contrary, it highlights one of the basic tenets of OT that even the lower ranked constraints can play a decisive role when the higher ranked ones fail to force a decision. Consequently, the new rhythmic theory being proposed in the present thesis continues to stand vindicated.

2.5.3 Sentani

So far we have considered only unidirectional systems and seen how the two versions of the anti-lapse constraint produce identical results when one of their respective licensors i.e. strong beat in*LAPSE(E&K) and directional foot edge in *LAPSE(DE) – coincide. For example, in trochaic Cayuvava the foot-head (or strong beat) is left and so also is the directional foot-edge or the licensing edge of the foot. (But the two constraints yield different results when these two licensors vary i.e. when foot-dominance (or strong beat) is on the right and the licensing edge of a foot is left (cf. 'Iambic Cayuvava') or vice versa (cf. 'Trochaic Chugach'). In Sentani we observe an identical performance of the two constraints in respect of producing the optimal outputs. But this time the story is significantly different. In this language foot construction is bidirectional. Main stress is on the penult and iterative iambs are formed at the opposite (i.e. initial) edge. Within the same word feet of opposite dominance are allowed: one iamb stands strictly aligned with each edge of the PrWd; but avoidance of final stress converts the final iamb into a trochee. This results in stress clash in words of four syllables, and ternarity in six syllables. Local ternarity also emerges in seven syllables when there is a schwa in the fourth syllable, which rejects stress. Stress thus shifts to the fifth syllable increasing the inter-stress distance between the initial and second stress to two syllables as opposed to the usual one syllable. The question then arises what licenses the additional weak beat. According to *LAPSE (E&K) it is the adjacent strong beat whereas according to *LAPSE (DE) it is the *directional foot-edge* that license the weak beat. Both the anti-lapse constraints thus produce identical results although for different reasons. We keep aside undominated NON-FIN and lowest ranked PARSE-σ from the ranking for lack of space.

119.

/molonasəhandera/	ALIGN -L	ALIGN -R	*LAPSE (E&K)	*LAPSE (DE)	*(C)ə́	FT= IAMB	*CLASH
a.(mo.lò).na.(sə.hàn).(dé.ra) ☞						*	*
b. (mo.lò).(nà.sə).han.(dé.ra)						**!	*
c. (mo.lò).(na.sə̀).han.(dé.ra)					*!	*	
d. (mo.lò).na.sə.han.(dé.ra)			*!	*!		*	

The crucial comparison is between candidates (119a) and (119d). In (119d) both the versions of the anti-lapse constraints agree to rule against a sequence of three weak beats separating the two stresses. For both, the medial underlined syllable is the erring one lacking a licensor. For *LAPSE(E&K) the explanation is a simple one: each weak beat standing on either side of the underlined syllable stands adjacent to a strong beat and hence both are properly licensed. The erring beat in contrast stands outside the licensing zone of either of the strong beats and thus incurs a fatal violation in respect of the anti-lapse constraint. The explanation offered by *LAPSE(DE) for the failure of the candidate (119d) is a subtler one. Undominated ALIGN-L qualifies the *right* edge of the initial (or left aligned) foot to be a licensor just as ALIGN-R makes the *left* edge of the final (or right aligned) foot to be a licensor of the adjacent weak beat. Remember as per our proposition when both these word-to-foot alignment constraints are ranked highest among the alignment constraints and are themselves mutually unranked, bidirectional footing results and opposing edge of feet become licensors of adjacent weak beats. In consequence, both the weak beats on either side of the underlined syllable in (119d) get their appropriate licensors in their adjacent foot-edges and hence escape any violation in respect of *LAPSE(DE). Being non-adjacent to either of the above valid licensors i.e. opposite *directional foot-edges*, the weak beat represented by the syllable *sə* incurs fatal violation

for the respective candidate form. To avoid this violation of the anti-lapse constraint a stress is forced which in the usual case would have been placed on the fourth syllable. But the high ranking negative constraint *(C)ɔ́ militating against a schwa receiving stress in an open syllable causes shift of the newly inserted stress to the immediately succeeding syllable even at the cost of *CLASH. The optimal candidate (119a) thus emerges with a violation mark for *CLASH since it helps non-violation of the undominated anti-lapse constraint.

Explanation of ternary rhythm in six syllables, with or without a schwa, falls out perfectly from what has been stated above in respect of ternary rhythm in seven syllables. Each of the two medial weak beats in (120-121) finds their respective licensors in the adjacent foot-edge: *right* edge of the initial foot and *left* edge of the final foot. Incidentally the heads of the two feet also coincide with these edges. Consequently identical results are produced by both the anti-lapse constraints *LAPSE(E&K) & *LAPSE(DE). To focus attention on the relevant issues we consider only the non-trivial candidates in the following tableaux.

120.

/molokoxawale/	ALIGN -L	ALIGN -R	*LAPSE (E&K)	*LAPSE (DE)	*(C)ɔ́	FT= IAMB	*CLASH
☞ a. (mo.lò).ko.xa.(wá.le)						*	
b. (mo.lò).(ko.xà).(wá.le)						*	*!

121.

/alɛnnəxondɛra/	ALIGN -L	ALIGN -R	*LAPSE (E&K)	*LAPSE (DE)	*(C)ɔ́	FT= IAMB	*CLASH
☞ a. (a.lɛ̀n).nə.xon.(dɛ́.ra)						*	
b. (a.lɛ̀n).(nə.xòn).(dɛ́.ra)						*	*!

In both these tableaux the optimal forms, (120a) and (121a), contain two medial weak beats without violating any of the versions of anti-lapse constraints. In terms of

*Lapse(E&K) each of the medial weak beats has a valid licensor in the form of the adjacent strong beats. According to *Lapse(DE) the licensors for the medial weak beats are their respective foot-edges, which they abut: left edge of the right-aligned trochee and right edge of the left-aligned iamb. Insertion of a stress is only at the cost of uncalled-for violation of the negative constraint *Clash: in OT any violation of a lower ranked constraint is tolerated iff only it is to satisfy the higher ranked ones. The rival candidates (120b) and (121b) are therefore predictably excluded.

Now as hinted at in Footnote (22), a serious problem confronts us given that two weak beats (or unparsed syllables) are licensed in between two feet. Theoretically, it is possible to have, in a bidirectional system like Sentani, a word with three feet where the medial foot is flanked by two unparsed syllables (or weak beats) on either side: (σσ́)σσ̱(σσ́)σσ(σ́σ). Both the edges of a foot being licensors in terms of *Lapse(DE) such a scansion is perfectly all right. For *Lapse(E&K) such a form will however never see the light of day having incurred one lapse violation in the fourth syllable from the left (given in underline). This means, the new rhythmic theory proves inferior to that of E&K by generating 'ungrammatical' forms. It is coincidental (let us assume) that the Sentani data given in E&K and cited in the present thesis in (31) and (38) do not contain any word larger than seven syllables. It is important therefore that the new rhythmic theory proves itself capable of ruling out a candidate form like (σσ́)σσ̱(σσ́)σσ(σ́σ) to establish its parity with the theory of E&K.

To ensure this for the new rhythmic theory let us reiterate (what has been stated in respect of 'Iambic Cayuvava' (cf. §2.5.1) and 'Trochaic Chugach' (cf. §2.5.2)) that the

OT grammar for no language is constructed exclusively of high-ranking lapse and alignment constraints. There are other lower ranked constraints, which play crucial roles in eliminating ungrammatical forms although the latter are permitted by the higher constraints. For illustration let us look at the following tableau for a hypothetical ten-syllable word in Sentani. For lack of space we suppress in ranking the two undominated word-to-foot alignment constraints ALIGN-L and ALIGN-R and also the constraint militating against a schwa receiving stress *(C)ə́ since we are dealing only with a hypothetical word. But we incorporate the lowest ranked PARSE-σ, which has a particular relevance in the present context.

122.

/tatatatatatatatatata/	*LAPSE (E&K)	*LAPSE (DE)	FT= IAMB	*CLASH	PARSE- σ
a. (ta.tà).ta.<u>ta</u>.(ta.tà).ta.ta.(tá.ta)	(*!)		*		***!*
b. (ta.tà).(ta.tà).(ta.tà).(ta.tà).(tá.ta)			*	*!	
c. (ta.tà).ta.(ta.tà).ta.(ta.tà).(tá.ta)			*	*!	**
☞ d. (ta.tà).(ta.tà).(ta.tà).ta.ta (tá.ta)			*		**

All the four constraints have one violation each of FT=IAMB and hence no conflict arises among the candidate forms on the count of this constraint. (122b) and (122c) survive both the versions of the anti-lapse constraint but are excluded by having one violation each in respect of *CLASH. The crucial case for the present discussion is that of (122a). This candidate form is ruled out by *LAPSE(E&K) for having its fourth weak beat (underlined) unlicensed – the latter is linearly adjacent neither to a strong beat nor a word-edge. For *LAPSE(DE), which allows both the edges of foot to license a weak beat because of undominated ALIGN-L and ALIGN-R (highest among the alignment constraints), candidate (122a) instantiates no violation.

This however does not mean that the concerned candidate is evaluated optimal by the constraint hierarchy of Sentani just because it has been passed by a high ranked constraint. Because in OT, evaluation is both parallel as well as recursive: every potential candidate form is evaluated by each member of a set of ranked constraints. A lower-ranked constraint can be violated to avoid the violation of a higher-ranked one, but violation is always kept to a minimum, given the requirement of maximal harmony. On this ground any non-minimal violation of a lower-ranked constraint can prove fatal for a particular candidate. This is exactly what happens in the calculation of the suboptimal status for (122a). Compared to the most harmonic candidate (122d), (122a) has two extra violations of the lowest ranked PARSE-σ and this renders (122a) ungrammatical. This once again proves that the new theory of rhythmicity being proposed here is also capable of producing the optimal results even though it uses a different version of the anti-lapse constraint.

2.5.4 Finnish

As was noted in §1.4.3, in Finnish, local ternarity arises in an otherwise binary trochaic system with initial main stress and subsequent secondaries on alternate syllables when secondary stress shifts rightwards on to the subsequent heavy syllable in case the second syllable to the right of a preceding stress is light and the third syllable is heavy (i.e. closed or long vowelled) (cf. 42c-e). In terms of OT this is explained as the consequence of high-ranked negative constraint *(LH) militating against an anti-trochaic combination of a light and heavy syllable sequence. But what prevents the secondary stress from traveling beyond the heavy syllable? Certainly this is the anti-lapse constraint militating

against any long sequence of weak beats.[26] The following tableau for a six-syllable word displays the crucial role of the anti-lapse constraint in this respect. Once again we include both *LAPSE(E&K) and *LAPSE(DE) in the evaluation process to show that despite being conceptually different the latter is perfectly capable of yielding the desired results. The constraint ranking is the same as given in (E&K) and mentioned in §1.4.3 with the difference that undominated anti-lapse constraint is also present now.

123.

/puhelimistani/	ALIGN -L	LAPSE (E&K)	LAPSE (DE)	*(´LH)	PARSE -σ	ALL-FT-L
☞ a. (pú.he).li.(mìs.ta).ni					**	***
b. (pú.he).<u>li</u>.*mis*.(tà.ni)		*!	*!		**	****
c. (pú.he).(lì.mis).(tà.ni)				*!		** ****

Candidate (123c) is excluded by high-ranked *(´LH). But more significantly, we get a demonstration of how the evaluation process of a relevant candidate varies owing to the conceptual difference between the two versions of the anti-lapse constraint. Both the versions agree that whenever there is an inter-stress gap of three weak beats one of the weak beats will remain unlicensed at the fatal cost of the anti-lapse constraint. But their dispensations vary in singling out the exact *deviant* weak beat. For *LAPSE(E&K) the erring weak beat is represented by the underlined syllable (i.e. third from the left edge of the word) in candidate (123b) since it does not abut any of the strong beats which are on the first and the fifth syllable. For *LAPSE(DE) the fourth syllable from the left (given in italics) is the defaulter. This is because the highest ranked of the alignment constraints ALIGN-L decides that only the right edge of a foot can be the valid licensor for a weak beat (other than the word-edges). Consequently, the third syllable *li* will be properly

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[26] E&K do not introduce the anti-lapse constraint into the ranking; but from their discussion it is obvious that they assume its undominated presence in the hierarchy.

licensed while the fourth syllable *mis* will remain unlicensed incurring a fatal violation on

the count of anti-lapse *LAPSE(DE). Candidate (123b) therefore is excluded by both the

versions of the anti-lapse constraints although for different reasons. In candidate (123a)

the weak beat contained in the third syllable *li* is licensed from the left by the *directional*

foot-edge i.e. the *right* edge of the left-aligned foot. So it does not violate *LAPSE(DE).

Interestingly, it also satisfies *LAPSE(E&K) by standing adjacent to the second strong

beat on the fourth syllable. The final weak beat is licensed by the right edge of the word.

In consequence (123a) emerges optimal.

A serious problem develops with respect to the optional forms like

(kái.nos).(tè.li).(jàt) ~ (kái.nos).(tè.li).jat. 'shy people-NOM', *(rá.vin).to.(làt) ~*

(rá.vin).(tò.lat) 'restaurants-NOM' etc. According to E&K obtaining the optional forms in

words ending in LH and having an odd number of syllables is not a problem. The dual

patterns are achieved by locally reversing the ranking relation between PARSE-σ and

NON-FIN as is shown in the following two tableaux repeated from (48-49) in Chapter I.

124.

	/kainostelijat/	ALIGN-L	*(ˊLH)	PARSE-σ	NON-FIN	ALL-FT-L
☞	a. (kái.nos).(tè.li).(jàt)				*	** ****
	b. (kái.nos).(tè.li).jat			*!		**

125.

	/kainostelijat/	ALIGN-L	*(ˊLH)	NON-FIN	PARSE-σ	ALL-FT-L
☞	a. (kái.nos).(tè.li).jat				*	**
	b. (kái.nos).(tè.li).(jàt)			*!		** ****

Obtaining the desired result in respect of one of the variants of similar words with even-

numbered syllables (e.g. *(rá.vin).to.(làt)*) is once again not a big challenge. NON-FIN

ranked below PARSE-σ ensures the emergence of the optimal form. The following tableau

illustrates the process.

126.

/ravintolat/	ALIGN-L	*(´LH)	PARSE-σ	NON-FIN	ALL-FT-L
☞ a. (rá.vin).to.(làt)		*	*	*	***
b. (rá.vin).(tò.lat)		**!			**
c. (rá.vin).to.lat		*	**!		

Going by the principle of reranking NON-FIN ≫ PARSE-σ should have yielded the other

optional form with binary parse *(rá.vin).(tò.lat).* But this does not happen and as the

following tableau shows the ungrammatical single-foot candidate *(rá.vin).to.lat* turns out

victorious.

127.

/ravintolat/	ALIGN-L	*(´LH)	NON-FIN	PARSE-σ	ALL-FT-L
a. (rá.vin).to.(làt)		*	*!	*	***
b. (rá.vin).(tò.lat)		**!			**
☞ c. (rá.vin).to.lat		*		**	

Intuitively, the answer seems to lie in raising NON-FIN even above *(´LH). But even such

a move proves futile as the same ungrammaticality persists in the 'optimal' form.

128.

/ravintolat/	ALIGN-L	NON-FIN	*(´LH)	PARSE-σ	ALL-FT-L
a. (rá.vin).to.(làt)		*!	*	*	***
b. (rá.vin).(tò.lat)			**!		**
☞ c. (rá.vin).to.lat			*	**	

E&K find the solution finally in the introduction of the anti-lapse constraint

*LAPSE(E&K) as an undominated constraint in the hierarchy. Perfect binarity obtains as

*LAPSE(E&K) rules out a candidate with triple upbeat word-finally (cf. 129).

129.

/ravintolat/	ALIGN -L	*LAPSE (E&K)	NON-FIN	*(´LH)	PARSE-σ	ALL-FT -L
a. (rá.vin).to.(làt)			*!	*	*	***
☞ b. (rá.vin).(tò.lat)				**		**
c. (rá.vin).to.lat		*!		*	**	

But given that in the revised rhythmic theory we replace *LAPSE (E&K) with *LAPSE

(DE) and that the latter allows a sequence of three weak beats word-finally *(rá.vin).to.lat*

will turn out victorious as we see in (130).

130.

/ravintolat/	ALIGN -L	*LAPSE (DE)	NON-FIN	*(´LH)	PARSE-σ	ALL-FT -L
a. (rá.vin).to.(làt)			*!	*	*	***
b. (rá.vin).(tò.lat)				**!		**
☞ c. (rá.vin).to.lat				*	**	

To circumvent this crisis we shall argue here that it is advantageous to use

reranking for deriving optional variants and that the role of the anti-lapse constraint in

this respect is only indirectly relevant since in binary rhythm no violation of this

constraint is possible.

The core hierarchy of constraints for Finnish is ALIGN-L ≫ *(´LH) ≫ PARSE-σ

≫ ALL-FT-L and the crucial part of it for the current issue of interest is *(´LH) ≫

PARSE-σ. In the analysis of E&K this mini ranking is responsible for ruling out perfect

binary parsings for words like *mátematìikka* and *púhelimìstani* (cf. (45) & (46) in §1.4.3

repeated in (131) & (132) for convenience).

131.

/matematiikka/	ALIGN-L	*(´LH)	PARSE-σ	ALL-FT-L
☞ a. (má.te).ma.(tìik.ka)			*	***
b. (má.te).(mà.tiik).ka		*!	*	**

132.

/puhelimistani/	ALIGN-L	*(´LH)	PARSE-σ	ALL-FT-L
☞ a. (pú.he).li.(mìs.ta).ni			**	***
b. (pú.he).(lì.mis).(tà.ni)		*!		** ****

Candidates (131b) & (132b) having maximal parsings resulting in perfect binarity are ruled out by *(´LH) ≫ PARSE-σ. In contrast, underparsing is achieved in (131a) and (132a) by the same ranking yielding ternary rhythm. Now it stands to reason to argue that for obtaining the reverse results i.e. to *rule in* maximal parsings (in the form of binary rhythm) and *rule out* underparsing (present in ternary rhythm) the constraint requiring exhaustive parsing namely, PARSE-σ should dominate *(´LH). The reason why E&K did not resort to this reversed hierarchy of PARSE-σ ≫ *(´LH) is stated by the authors in a footnote:

> Meanwhile *(´LH) and PARSE-σ must remain ranked [i.e. *(´LH) ≫ PARSE-σ] as they are in the basic hierarchy …., in order to explain the obligatory underparsing in words like *púhelimìstani* …(Footnote18, p 304).

But such a justification is difficult to accept. For in an OT enterprise, reranking for deriving optional variants is a standard practice. The authors themselves resort to it for obtaining reverse results in respect of free variants like *káinostèlijàt ~ káinostèlijat*. Surprisingly, coming to a four syllable word *rávintòlat* the authors argue that the same ranking relation *(´LH) ≫ PARSE-σ should be retained even as they want to achieve the reverse effects i.e. to *rule out* ternarity and *rule in* binarity. E&K do so because it suits their version of the anti-lapse constraint. In the changed scenario where *LAPSE(DE)

replaces *LAPSE(E&K) reranking is (perhaps) the only possible way out to account for free variation.

133.

/ravintolat/	ALIGN -L	*LAPSE (DE)	NON-FIN	PARSE-σ	*(́LH)	ALL-FT -L
a. (rá.vin).to.(làt)			*!	*	*	***
☞ b. (rá.vin).(tò.lat)					**	**
c. (rá.vin).to.lat				*!*	*	

In (133) the anti-lapse constraint is not directly involved in the interaction in obtaining binary rhythm. It is vacuously satisfied. Invocation of this constraint is therefore uncalled for as interaction among other constraints can ensure the emergence of the optimal parses. This is true even of E&K who did not feel any necessity to introduce this constraint physically into the hierarchy until they were confronted with the problem of explaining *(rá.vin).(tò.lat)*.

In sum, in this section we have first seen how the newly formulated anti-lapse constraint *LAPSE(DE) produces the identical grammatical outputs as its predecessor *LAPSE(E&K) although for different reasons (cf. 123). In the second section we have argued that it is advantageous to use constraint reranking as a means of deriving optional forms; the anti-lapse constraint has no role to play in this respect and hence can remain suppressed in the hierarchy.

2.5.5 Winnebago

In this language iambs are constructed persistently from left to right with the main stress fixed on the third syllable (or mora)[27] from the left edge of the word and with two weak beats separating one stress from the other. Here also *LAPSE(DE) yields the desired results in spite of being conceptually different from *LAPSE(E&K). We compare the two in the following tableaux for five, six and seven syllables. In the absence of any word-to-foot alignment constraint (i.e. ALIGN-X), the highest ranked of the edge-oriented alignment constraints ALL-FT-R indicates that footing takes place from left to right and by implication, that the *directional foot-edge* capable of licensing a weak beat is the *right* edge. Recall that when ALL-FT-X tops the list of the alignment constraints, the direction of alternation as well as the licensing edge of the foot agree with the value of X. Additionally, there is no requirement for strict alignment. Foot-persistence is effected through the partial ranking PARSE-σ ≫ ALL-FT-L.

134.

/hokiwaroke/	*LAPSE(E&K)	*LAPSE(DE)	ALL-FT-R	PARSE-σ	ALL-FT-L
☞ a. ho.(ki.wá).(ro.ké)			**	*	* ***
b. (ho.kí).wa.(ro.ké)			***!	*	***
c. (ho.kí).(wa.ró).ke			* **!*	*	**
d. ho.(ki.wá).ro.ke			**	**!*	*
e. ho.<u>ki</u>.(wa.ró).ke	*!	*!	*		**

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[27] It may be recalled (as also mentioned in Footnote 11 in §1.5.3.1) that though E&K generally accept the mora-based analysis of Winnebago given in Miner (1979), they implicitly treat each mora as at par with a light syllable.

135.

/hokiwaroroke/	*LAPSE (E&K)	*LAPSE (DE)	ALL-FT-R	PARSE -σ	ALL-FT-L
☞ a. ho.(ki.wá).ro.(ro.ké)			***	**	* ****
b. (ho.kí).(wa.ró).(ro.ké)			** **!**		** ****
c. (ho.kí).(wa.ró).ro.ke			** ***!*	**	**
d. ho.(ki.wá).(ro.ró).ke			* ***!	**	* ***
e. ho.<u>ki</u>.(wa.ró).ro.ke	*!	*!	**	****	**

136.

/hiiʒugokirusge/	*LAPSE (E&K)	*LAPSE (DE)	ALL-FT-R	PARSE -σ	ALL-FT-L
☞ a. hi(i.ʒú).go.(ki.ruś).ge			* ****	***	* ****
b. hi(i.ʒú).(go.kí).(rus.gé)			** ****!	*	* *** *****
c. hi(i.ʒú).(go.kí).rus.ge			** ****!	***	* ***
d. (hií).ʒu.(go.kí).rus.ge			** ****!*	***	***
e. hi<u>i</u>.<u>ʒu</u>.(go.kí).rus.ge	*!*	*!*	**	*****	***

The licensing edge of the foot is the *right* one since ALL-FT-R is ranked the highest among alignment constraints. Incidentally foot-dominance also being *right*, an unparsed syllable (or a weak beat) at the right edge of a foot will always be licensed both by *LAPSE(DE) and *LAPSE(E&K). Conversely any syllable on the left edge of a foot will remain unlicensed (from the right side) unless it stands adjacent to a word-edge. In all the tableaux above, presence of more than one syllable (or weak beat) at the left edge of the word violates both the versions of the anti-lapse constraint (cf. 134e, 135e, 136e). On the right edge maximally two syllables are allowed by the anti-lapse constraints of which the right one is licensed by the right edge of the word and the left one by the adjacent (*right*) foot-edge of the final foot (as per *LAPSE(DE)) and, alternately, by the adjacent strong beat i.e. the head of the iamb (for *LAPSE(E&K). That such candidates fail to emerge optimal is due to their non-minimal violation of either PARSE-σ (134d) or ALL-FT-R (135c, 136c-d).

2.5.6 Estonian

This is the last of the attested ternary languages whose metrical pattern is cited by E&K as providing further corroboration in favour of their revised statement of the anti-lapse constraint. In what follows, we shall show that the same results can also be predicted with our version of the anti-lapse constraint in which *directional foot-edge* is one of the two licensors of weak beats, the other being the word-edge. Estonian is a trochaic system with main stress falling on the initial syllable. In addition, a secondary stress is assigned to every non-final syllable in position $3n$ and a 'persistent' secondary stress on the penult in words of length $3n+1$ syllables (cf. 70). The constraint ranking is ALIGN-L, *LAPSE ≫ ALL-FT-R ≫ PARSE-σ in which we replace the two versions of the anti-lapse constraints *LAPSE(DE) and *LAPSE(E&K) for assessing their comparative performance in yielding optimal results.

137.

/retelile/	ALIGN-L	*LAPSE(E&K)	*LAPSE(DE)	ALL-FT-R	PARSE-σ
☞ a. (ré.te).(lì.le)				**	
b. (ré.te).<u>li</u>.le		(*!)		**	*!*
c. re.(té.li).le	*!			*	**

In deriving the metrical pattern of Estonian we notice significant differences in the evaluation processes of candidate forms owing to the conceptual differences between the two versions of the anti-lapse constraint. This however does not hamper the emergence of the optimal candidates. In a four (i.e. $3n+1$) syllable word both *LAPSE(E&K) and *LAPSE(DE) agree in ruling in the optimal parse (137a) with perfect binary rhythm. But differences crop up between the two theories in ruling out the candidate (137b) with three

upbeats word-finally. According to *LAPSE(E&K) such a candidate is excluded because the second weak beat *li* (i.e. third syllable from the left) standing adjacent to neither a strong beat (i.e. stressed syllable) nor any word-edge remains unlicensed. For *LAPSE(DE) however the candidate is suboptimal for different reasons since calculations are different. ALIGN-L being the highest ranked of the alignment constraints present in the hierarchy (the other being ALL-FT-R) footing must move to the direction opposite to the value of L i.e. towards *right* and consequently, the right edge of every foot is the crucial *directional foot-edge* that can license a weak beat to its right. The remaining edge-adjacent weak beat is taken care of by the right edge of the word. Candidate (137b) is thus perfectly all right for *LAPSE(DE). That the candidate still fails is due to the last ranked constraint PARSE-σ, which swings into action once the high ranked constraints fail to force a decision: both candidates (137a) and (137b) score a tie in respect of the constraint ALL-FT-R. Quite predictably, PARSE-σ gives the verdict in favour of (137a) as the latter maximally satisfies the constraint by containing no unparsed syllable. Exclusion of (137c) is self-explanatory and has nothing to do with the point of our current interest.

Evaluation of the optimal candidate in five-syllables reveals another significant aspect of difference in the predictions of the two theories. Consider the following tableau.

138.

/pimestavale/	ALIGN-L	*LAPSE(E&K)	*LAPSE(DE)	ALL-FT-R	PARSE-σ
☞ a. (pí.mes).ta.(và.le)				***	*
b. (pí.mes).(tà.va).le				* ***!	*
c. (pí.mes).ta.*va*.le		*!*	*!	***	***

Both the rhythmic binary pattern in (138b) and the ternary pattern in (138a) are approved by the undominated constraints including both the versions of the anti-lapse constraint.

But (138b) is failed by ALL-FT-R as both the feet are maximally oriented towards the left edge. (138a) scores better in this respect by having its trochees maximally inclined towards the right subject, of course, to satisfaction of the undominated ALIGN-L. What interests us most however is the exclusion of the candidate with a single initial trochee (138c). It has four successive weak beats preceded by the word-initial main stress. Obviously it violates both *LAPSE(E&K) and *LAPSE(DE); but the exact calculation in terms of total number of violation marks incurred for each variety of the anti-lapse constraint varies. The second and the third weak beats (marked with underline) turn out defaulters for *LAPSE(E&K) as they fail to stand adjacent to any of the two licensors mentioned in the constraint. By contrast, in the assessment of *LAPSE(DE) only the third weak beat (given in italics) violates the constraint having been licensed neither by a word-edge nor the *directional foot-edge* which in this system is *right*. Consequently, while both *LAPSE(E&K) and *LAPSE(DE) rule out (138c) their evaluation tallies are different.

Predictions of the two theories also vary in ruling out sequences of three upbeats word-finally as well as word-medially. This is illustrated in a six-syllable word whose evaluation details are given in the next tableau.

139.

/osavamaleki/	ALIGN-L	*LAPSE(E&K)	*LAPSE(DE)	ALL-FT-R	PARSE-σ
☞ a. (ó.sa).va.(mà.le).ki				* ****	**
b. (ó.sa).(và.ma)(lè.ki)				** ****!	
c. (ó.sa).(và.ma).le.ki		(*!)		** ****!	**
d. (ó.sa).va.*ma*.(lè.ki)		*!	*!	****	**

Both the anti-lapse constraints agree in ruling in (139a) and (139b) which instantiate ternary and binary rhythm respectively. Exclusion of the latter is due to the non-minimal

violation of the underparsing constraint ALL-FT-R. What is of direct interest to us is the way the two theories predict the ungrammaticality of the forms having dis-rhythmic distribution of stresses. Candidate (139c) violates *LAPSE(E&K) by containing an unlicensed weak beat in the form of the fifth syllable (in underline): it is separated from the nearest strong beat (on the third syllable) and the nearest word-edge (*right*) by one syllable on each side. For *LAPSE(DE) the underlined weak beat *le* is perfectly licensed by the adjacent *directional foot-edge* i.e. the *right* edge of the adjacent foot, and hence (139c) incurs no violation of the constraint. It is the next constraint down the hierarchy ALL-FT-R that rules it out on parity count with the optimal form (139a). (139d) is the critical case with word-medial three weak beats. Of these the middle one (in underline) is the erring member according to the dispensation of *LAPSE(E&K) as it lacks a licensor: on either side it is distanced from the nearest strong beat by one weak beat. For *LAPSE(DE) the third weak beat *ma* (in italics) is the defaulter since the only possible licensor for it, the *directional foot-edge* of the preceding foot, is away by one beat. Thus for both *LAPSE(E&K) and *LAPSE(DE) candidate (139d) is a suboptimal one though for altogether different reasons.

To sum up, in §2.5 we have shown that our newly proposed anti-lapse constraint *LAPSE(DE) is perfectly capable of delivering the goods in ruling out forms having long sequence of weak beats. Despite being conceptually different from its predecessor *LAPSE(E&K), its predictions are entirely attested in the metrical systems of various natural languages which include both regular and occasional ternarity. In the previous section i.e. §2.4 we have seen how it accounts for the *deviant* forms of TB which are predicted not to exist by the theory of E&K. Our new theory based on the novel

formulation of the anti-lapse constraint thus has the advantage of greater predictability with equal, if not more, degree of restrictiveness as its predecessor *LAPSE(E&K). It must, however, be mentioned that the anti-lapse constraint cannot alone constitute the OT grammar of a language. Like any other constraint, it functions only in a hierarchy, which contain many other constraints. And in OT even the lower ranked constraints do play crucial roles in forcing a decision when higher ranked ones, including the anti-lapse constraint, prove ineffective. This has been witnessed time and again in the preceding discussion in respect of ruling out the ungrammatical and unattested forms (cf. §§2.5.1-3 and §2.5.6) especially by the new theory of rhythmicity under construction. This, however, does not reflect any shortcomings of the latter based on *LAPSE(DE). On the contrary, it vindicates one of the basic premises of OT namely, minimality condition of violation to ensure maximal harmony. We now turn to the typological consequences of this new theory of rhythmicity.

2.6 Typological consequences of *LAPSE(DE)

In the last section and the one preceding that, we have seen that the new approach to rhythmicity based on *LAPSE(DE) successfully predicts the grammatical outputs for the metrical patterns in as many as seven languages: TB, Cayuvava, Chugach, Sentani, Finnish, Winnebago and Estonian. Of these Sentani and Finnish instantiate what E&K call 'fleeting' ternarity while the rest exemplify regular ternarity. In the process of demonstrating how *LAPSE(DE) accounts for all these cross-linguistic variations in metrical facts, we have seen that it differs substantially from *LAPSE(E&K) in analytical details of evaluations for individual candidate forms in a number of languages even as it

agrees with the latter in many other instances. Major differences are noticed in respect 'Iambic Cayuvava' (§2.5.1), 'Trochaic Chugach' (§2.5.2), in hypothetical longer sequences in Sentani (§2.5.3) and in respect of Estonian facts (§2.5.6). But the most crucial variation in the predictions of the two theories is registered in case of the rhythmic system of TB. According to the typological predictions of the rhythmic theory based on *LAPSE(E&K), TB metrical pattern with word-final triple upbeat in words of length $3n+1$ syllables is an impossibility. In contrast, according to the rhythmic theory that we propose with the revised statement of the anti-lapse constraint *LAPSE(DE), TB system is a well expected metrical pattern in any natural language. Differences between the two theories are not confined only to the attested cases like these. In a number of unattested cases, which are predicted by E&K, our theory produces distinct outcomes owing to its basic conceptual difference with the former in formulating the anti-lapse constraint. Such variations in the typological predictions of the two approaches are the main issue of our interest in the present section.

The basic typology of the rhythmic theory constructed by E&K use three types of constraints: a) the anti-lapse constraint, *LAPSE; b) the constraint enforcing metrical parsing, PARSE-σ; and c) alignment constraints evaluating distances of feet with respect to one another, or to domain edges: ALIGN-X, ALL-FT-X (where X is an edge). Permutations of these three constraint types yield six basic theoretical possibilities, which boil down to three rhythmical patterns, repeated below from (56). (ALIGN-X is temporarily kept out of this core typology.)

140. *Rhythmic theory: the basic typology*

    a. ALL-FT-X ≫ PARSE-σ, *LAPSE   (unbounded system)

    b. *LAPSE, PARSE-σ ≫ ALL-FT-X   (binary system)

    c. *LAPSE ≫ALL-FT-X ≫ PARSE-σ   (ternary system)

As (140a) predicts, unbounded systems result when undominated underparsing constraint

ALL-FT-X dominates over PARSE-σ and *LAPSE. Possibility of rhythmic alternation is

precluded since there is only one foot allowed in a word aligned with either of the edges

depending on the value of X. A semblance of rhythmicity emerges in the hammock

patterns, which have 'both edges marked by stresses while medial stresses are absent'. As

noted earlier, such a pattern is noted in Sibutu Sama with stresses on the initial and penult

(cf. §1.5.1). The basic constraint ranking for this system according to E&K is ALIGN-R

≫ ALL-FT-L ≫ PARSE-σ, *LAPSE. Lowest ranking *LAPSE has no role whatsoever in

the evaluation process. Yet it contributes some violation marks to the price sheet of each

individual candidate. Though of no empirical consequence, these violation marks

produced by *LAPSE(E&K) provide us a good ground for testing out how *LAPSE(DE)

fares in these respects. This we illustrate with the following tableau for a six-syllable

word in Sibutu Sama cited from E&K (: 309).

141.

/bissalahankami/	ALIGN-R	ALL-FT-L	PARSE-σ	*LAPSE (E&K)	*LAPSE (DE)
a. (bìs.sa).(là.han).(ká.mi)		** ***!*			
b. (bís.sa).la.han.ka.mi	*!		****	***	***
☞ c. (bìs.sa).la.han.(ká.mi)		****	**	*	*
d. bis.sa.la.han.(ká.mi)		****	***!*	**	**

It is interesting to note that both the anti-lapse constraints produce identical outputs even

though they differ essentially in their formulations. For *LAPSE(E&K) candidate (141b)

has three erring weak beats (all underlined) since they are licensed neither by a strong beat nor any word-edge. For *LAPSE(DE) also the same three are the defaulters but this time the explanation is different. Undominated ALIGN-R, the highest ranked of the alignment constraints in this language determines that the *directional foot-edge* capable of licensing weak beats is the opposite of R(ight) i.e. *left* edge. All the underlined weak beats stand only on the right edge of the foot. Nor do these weak beats stand adjacent to any word-edge, the other valid licensor. As a result all these three successive weak beats incur violation marks for both the anti-lapse constraints. In (141c) the two non-common licensors of the two alignment constraints, strong beat and *directional foot-edge,* coincide in the word-final foot. Hence the adjacent weak beat contained in the syllable *han* is duly licensed as opposed to its underlined neighbour *la*, which lacks a licensor under either of the two interpretations of the anti-lapse constraint. Explanation of why both the anti-lapse constraints yield identical results in (141d) should be self-evident now.

The second basic type of metrical systems predicted by the rhythmic theory of E&K is binary pattern and the core constraint ranking for this is *LAPSE, PARSE-σ ≫ ALL-FT-X (cf. 140b). But that the role of the anti-lapse constraint in obtaining rhythmic binarity is at the most indirect, is mentioned even by the exponents of the rhythmic theory as is evident from the following excerpt cited from E&K (: 309-310):

> High-ranked PARSE-σ automatically precludes lapses (allowing us to assume undominated *LAPSE in rankings below). No lapses arise, as the unparsed syllable can, logically speaking, only occupy two positions, both of which are 'rhythmically licensed' by *LAPSE: at an edge or adjacent to a foot head.

The above observation of E&K holds even for our theory in which the anti-lapse constraint has been reformulated by replacing one of the licensors -- foot-head-- with the

directional foot-edge while the other licensor – namely, word-edge -- remains the same. No violation of the anti-lapse constraint is therefore attested in binary rhythm. In this respect we fully subscribe to the factorial typology of binary rhythm constructed in E&K and summarized in §1.5.2 of the present thesis. Consequently, we keep aside binary rhythm from our consideration of the possible repercussions of the new anti-lapse constraint *LAPSE(DE) in typological predictions.

2.6.1 Ternary rhythmic systems

The core ranking for ternary rhythm is *LAPSE ≫ ALL-FT-X ≫ PARSE-σ (cf. 140c).

This branches out into five major types with the inclusion of ALIGN-X and the varying values of ALL-FT-X. We repeat these five subtypes from (60).

142. *Iterative ternary systems*
   a. *LAPSE ≫ALL-FT-X ≫ PARSE-σ
      unidirectional (loosely aligned)   (Cayuvava/Winnebago)
   b. ALIGN-X, *LAPSE ≫ALL-FT-Y ≫ PARSE-σ
      unidirectional (strictly aligned)   (Chugach/Estonian)
   c. ALIGN-X, *LAPSE ≫ALL-FT-X ≫ PARSE-σ
      bidirectional (simple, loosely aligned)
   d. ALIGN-X, *LAPSE ≫ ALIGN-Y ≫ ALL-FT-X ≫ PARSE-σ
      bidirectional (simple, strictly aligned)
   e. ALIGN-X, *LAPSE ≫ ALIGN-Y ≫ ALL-FT-Y ≫ PARSE-σ
      bidirectional (complex)

2.6.1.1 Revised factorial typology of *unidirectional loosely aligned systems*

As noted in E&K and also mentioned earlier in §1.5.3.1, the unidirectional (loosely aligned) ternary system is predicted to have three members in the family. They are:

143. i. *LAPSE ≫ ALL-FT-L ≫ ALL-FT-R ≫ PARSE-σ

    ii. *LAPSE ≫ ALL-FT-R ≫ PARSE-σ ≫ ALL-FT-L

    iii. *LAPSE ≫ ALL-FT-L ≫ PARSE-σ

(143i) is attested in non-persistent Cayuvava (cf. 113) where we have seen that the two anti-lapse constraints *LAPSE(E&K) and *LAPSE(DE) produce identical results despite their conceptual differences. For convenience we re-present an abridged form of the tableau (113) focusing only on the performances of the two anti-lapse constraints.

144.

/ikitaparerepeha/	*LAPSE (E&K)	*LAPSE(DE)	ALL-FT-L	ALL-FT-R	PARSE-σ
a. i.(kì.ta).pa.(ré.re).pe.ha	*!	*!	* ****	** *****	****
☞ b. i.ki.(tà.pa).re.(ré.pe).ha			** *****	* ****	****

Due to the highest ranked of the alignment constraints ALL-FT-L in this language, the left edge of a foot is the *directional foot-edge* which licenses a weak beat to its left. Consequently, the underlined weak beat (syllable) in (144a) violates *LAPSE(DE) by lacking a licensor. *LAPSE(E&K) also judges it a defaulter as it stands adjacent to neither a strong beat nor to a word-edge. Contrarily, both the anti-lapse constraints are satisfied by the rhythmic distribution of stress in (144b).

    (143ii) is attested in the ternary system of Winnebago where persistent footing is the consequence of PARSE-σ ≫ ALL-FT-L. The following truncated tableau is repeated from (135) to illustrate how *LAPSE(DE) predicts the same result as its predecessor *LAPSE(E&K). This time the *directional foot-edge* shifts to the *right* side of a foot thanks to the highest ranked of the alignment constraints ALL-FT-R. Understandably the weak beat represented by the underlined syllable in (145b) goes unlicensed and the candidate concerned (145b) is excluded by *LAPSE(DE). The same candidate fails on the count of

*LAPSE(E&K) too by having the same weak beat licensed neither by a word-edge nor by an adjacent strong beat. Candidate (145a) satisfies both.

145.

/hokiwaroroke/	*LAPSE (E&K)	*LAPSE (DE)	ALL-FT-R	PARSE-σ	ALL-FT-L
☞ a. ho.(ki.wá).ro.(ro.ké)			***	**	* ****
b. ho.<u>ki</u>.(wa.ró).ro.ke	*!	*!	**	****	**

E&K predict yet another possible member in this group of unidirectional loosely aligned ternary system having the ranking *LAPSE ≫ ALL-FT-L ≫ PARSE-σ (143iii). This unattested hypothetical system they call 'Iambic Cayuvava'. As mentioned in (52) and repeated in (146), this pattern occurs when foot-dominance matches the starting edge: i.e. iambs are constructed from right to left with antepenultimate main stress. Such a prediction falls out from E&K's formulation of the anti-lapse constraint *LAPSE(E&K) with the strong beat as one of the two licensors. Every strong beat by virtue of sheer adjacency (without direction) is capable of licensing any weak beat on either of its sides. Result is overgeneration of a metrical pattern named 'Iambic Cayuvava' not attested in any natural systems currently known.

146. *'Iambic Cayuvava':* *LAPSE ≫ ALL-FT-L ≫ PARSE-σ (Not attested)

(σσ́)σ	ta.**tá**.ta
(σσ́)σσ	ta.**tá**.ta.ta
σ(σσ́)σσ	ta.ta.**tá**.ta.ta
(σσ́)(σσ́)σσ	ta.**tá**.ta.**tá**.ta.ta
(σσ́)σ(σσ́)σσ	ta.**tá**.ta.ta.**tá**.ta.ta
σ(σσ́)σ(σσ́)σσ	ta.ta.**tá**.ta.ta.**tá**.ta.ta

But such an overgenerated system is happily excluded from the typology if directionality of footing is roped in to play a role in licensing. This is precisely what our theory based on the revised anti-lapse constraint accomplishes by replacing foot-dominance (i.e. strong

beat) with *directional foot-edge*, determination of which follows automatically from the highest ranked of the alignment constraints in the hierarchy, whether undominated or not. Let us illustrate the exclusion of such an unattested metrical pattern with double underparsing at the beginning of iteration. For convenience, we present the evaluation mechanisms of the two approaches to rhythmicity in two separate tableaux: (147) for *LAPSE(DE) and (148) for *LAPSE(E&K).

147.

/tatatatatatata/	*LAPSE(DE)	ALL-FT-L	PARSE-σ
☞ a. ta.(ta.tá).ta.(ta.tá).ta		* ****	***
b. (ta.tá).ta.(ta.tá).ta.ta	*!	***	***
c. (ta.tá).(ta.tá).ta.(ta.tá)		** ****!*	*
d. ta.ta.(ta.tá).ta.(ta.tá)		** ****!*	***

148.

/tatatatatatata/	*LAPSE(E&K)	ALL-FT-L	PARSE-σ
a. ta.(ta.tá).ta.(ta.tá).ta		* ***!*	***
☞ b. (ta.tá).ta.(ta.tá).ta.ta		***	***
c. (ta.tá).(ta.tá).ta.(ta.tá)		** ****!*	*
d. ta.ta.(ta.tá).ta.(ta.tá)	*!	** *****	***

In the seven-syllable word of hypothetical 'Iambic Cayuvava', the maximally parsed candidate (c) in both the tableaux (147) & (148) is excluded by earning *non-minimal* violation marks for the alignment constraint ALL-FT-L. Again, as we have noticed in §2.5.1 both the theories of rhythmicity (one using *LAPSE(E&K) and the other *LAPSE(DE)) reject a candidate form with initial double underparsing in 'Iambic Cayuvava' although for different reasons. Such a candidate is suboptimal for E&K for having a lapse violation (cf. 148d). The same candidate is ruled out by our theory since it incurs more violations in respect of lower ranked ALL-FT-L than needed to satisfy the higher ranked anti-lapse constraint (cf. 147d). The fact that it does not violate

*LAPSE(DE) is not enough to redeem the candidate judged in a constraint hierarchy. The candidate with two weak beats at the starting edge of alternation is optimal (cf. 148b) in terms of *LAPSE(E&K). But in terms of *LAPSE(DE) this candidate is suboptimal (cf. 147b) since the second weak beat (the underlined syllable) from the right edge of the word lacks a licensor: it stands adjacent neither to the licensing edge (i.e. *left* edge in this system) of a foot or a word-edge. By contrast, a candidate with one upbeat word-finally is an ideal choice for *LAPSE(DE) (cf. 147a). But such a candidate is always suboptimal for the theory of E&K for having non-minimal violation on the count of ALL-FT-L. Now given the fact that the rhythmical pattern of 'Iambic Cayuvava' with double upbeat at the beginning of iteration is not attested in any natural language, the rhythmic approach based on *LAPSE(E&K) which overgenerates such a pattern should always remain a secondary option, the primary being the one that rules it out. In other words there is every reason to say that our new rhythmic theory based on *LAPSE(DE) registers a definite victory over the theory of E&K in respect of restrictiveness of typological predictions.

Empirically speaking, iambs are rare compared to trochees. Right-to-left iambs are even rarer. All the metrical systems currently attested with antepenultimate main stress belong to the trochaic pattern. Given this empirical fact, the typological prediction made by our theory based on *LAPSE(DE) is perfectly adequate and hence more restrictive than that of E&K.

Before we go ahead, a word about the generalization of E&K about foot-persistence and foot-matching. According to the authors persistent footing is dependent on the relative ranking of ALL-FT-L and PARSE-σ in cases where foot-dominance is opposite to the starting edge. For example in Cayuvava (trochaic) foot-head is left and the

starting edge of iteration is right. In this language to ensure non-persistent footing ALL-FT-L must dominate PARSE-σ. In Winnebago also foot-dominance is opposite to the starting edge: right and left respectively. Foot-persistence is achieved in this system through the reverse ranking of the two relevant constraints: PARSE-σ≫ALL-FT-L. In contrast, foot-persistence is automatic in a system where foot-dominance matches with the starting edge of iteration. For instance in the examples of hypothetical iambic Cayuvava in (146) a six-syllable word must have a parsing of (σσ́)(σσ́)σσ as opposed to σσ̲(σσ́)σσ since in the latter candidate the underlined syllable will remain unlicensed standing away from both word-edge as well a strong beat. Such a generalization is no longer valid in the changed scenario since foot-dominance no longer has any role to play as licensor. In terms of the theory we propose the underlined syllable in σσ̲(σσ́)σ̣σ is perfectly licensed by the *directional foot-edge*, which is the *left* edge of the foot. It is the syllable at the opposite foot-edge, i.e. second from the right edge of the word (marked with a dot underneath) that lacks a licensor and hence renders the candidate ungrammatical. In the dispensation of our theory the optimal parse will be (σσ́)σ(σσ́)σ for the same reasons discussed in relation to justifying the optimal parse in (147).

In sum, in respect of *unidirectional loosely aligned* ternary systems we have seen that both the attested patterns (143i-ii) are predicted by our theory as perfectly as is done by E&K. But the real superiority of our approach based on *LAPSE(DE) is proved in ruling out a system like (143iii) with a double upbeat at the beginning of iteration

overgenerated by E&K. The revised, as well as more restrictive, factorial typology for the unidirectional loosely aligned ternary systems is therefore as the following.

149. *Revised factorial typology of unidirectional loosely aligned systems*
    a. *LAPSE(DE) ≫ ALL-FT-L ≫ ALL-FT-R ≫ PARSE-σ
    b. *LAPSE(DE) ≫ ALL-FT-R ≫ PARSE-σ ≫ ALL-FT-L

2.6.1.2 Revised factorial typology of *unidirectional strictly aligned systems*

To start with, let us look at the typological possibilities predicted by E&K repeated from (67).

150.
a. ALIGN-X, *LAPSE ≫ ALL-FT-X ≫ ALL-FT-Y ≫ PARSE-σ
                                      (non-persistent: not attested)
b. ALIGN-X, *LAPSE ≫ ALL-FT-X ≫ PARSE-σ ≫ ALL-FT-Y (persistent: Chugach)
c. ALIGN-X, *LAPSE ≫ ALL-FT-X ≫ PARSE-σ   (Estonian)

Evidently, these types arise as a consequence of ALIGN-X being introduced as an undominated constraint in the hierarchies, which gave various loosely aligned unidirectional systems discussed in the previous section.

     (150b) is attested in Chugach (cf. 115-117) where persistent footing is achieved by PARSE-σ≫ ALL-FT-L. Foot-head or the strong beat and the *directional foot-edge* as licensors of weak beats coincide: both are *right* as iambic feet are constructed from left to right. It should be remembered that the highest ranked of the alignment constraints ALIGN-L dictates that footing proceeds towards the direction opposite to L i.e. towards *right*. That means the licensing edge of the foot is also *right*. The judgments of both the anti-lapse constraints thus agree in ruling out the erring form as is shown in the following abridged tableau for a word of $3n+2$ (i.e. five) syllables.

151.

/taqamaluni/	ALIGN-L	*LAPSE (E&K)	*LAPSE (DE)	ALL-FT-R	PARSE-σ	ALL-FT-L
a. (ta.qá).ma.<u>lu</u>.ni		*!	*!	***	***	
☞ b. (ta.qá).ma.(lu.ní)				***	*	***

(150a) predicts a non-persistent counterpart of iambic Chugach because of the reverse ranking ALL-FT-L ≫ PARSE-σ. Such an unattested pattern is predicted by our theory also as the following illustration shows.

152.

/tatatatatatata/	ALIGN-L	*LAPSE (E&K)	*LAPSE (DE)	ALL-FT-R	ALL-FT-L	PARSE-σ
☞ a. (ta.tá).ta.(ta.tá).ta.ta				** *****	***	***
b. (ta.tá).ta.<u>ta</u>.(ta.tá).ta		*!	*!	* *****	****	***
c. (ta.tá).ta.(ta.tá).(ta.tá)				** *****	*** *!****	*

Since ALIGN-L is undominated no initial upbeat is allowed in (151) and (152); and every foot licenses one weak beat at its right edge according to *LAPSE(DE). The farthest weak beat given in underline stands unlicensed by both the versions of the anti-lapse constraints for their characteristic reasons.

(150c) predicts a persistent pattern with foot-dominance matching the starting edge – both are *left*. This pattern is attested in Estonian. But as we have seen already in (137) the two anti-lapse constraints give varied judgments in ruling out the second strongest contender for the optimal status in a word of four syllables. For illustration let us look again at the relevant tableau abridged for convenience.

153.

/retelile/	ALIGN-L	*LAPSE(E&K)	*LAPSE(DE)	ALL-FT-R	PARSE-σ
☞ a. (ré.te).(lì.le)				**	
b. (ré.te).<u>li</u>.le		(*!)		**	*!*

Candidate (153a) is approved by both *LAPSE(E&K) and *LAPSE(DE) as binary rhythm never allows lapse. Difference between the two approaches arises in respect of evaluating the single initial-foot candidate with three word-final upbeats. According to *LAPSE(E&K) the weak beat signaled by the underlined syllable in (153b) is unlicensed and hence violates the anti-lapse constraint. This renders the candidate suboptimal. For *LAPSE(DE) there is no violation earned on its count by any of the weak beats including the underlined one in (153b). This is because ALIGN-L dictates that the *right* edge of the foot is a licensor for an immediately succeeding weak beat. This clearance by *LAPSE(DE) thus qualifies the candidate concerned for optimal status. But it is failed fatally by PARSE-σ for having been less maximally parsed than its rival. Notice, both the candidates score identically in respect of ALL-FT-R.

This difference between the evaluations of the two anti-lapse constraints once again underlines the fact that the generalization of E&K that foot-persistence is the automatic consequence of the matching between foot-dominance and the starting edge of alternation is no longer valid. In the changed scenario where *LAPSE(E&K) is substituted by *LAPSE(DE) and where foot-dominance has no role to play, the role of PARSE-σ cannot be underestimated. Its dominant status (over ALL-FT-L though not given in the preceding tableau) is still the main factor behind ensuring persistent footing. ALL-FT-L ≫ PARSE-σ would have selected the non-persistent *(ré.te).li.le* as the optimal form.

The above observations find additional support in TB, which is the non-persistent counterpart of Estonian. Foot-dominance matches the starting edge – both are *left*; yet E&K's prediction that foot-persistence is automatic in such cases is not attested. On the

contrary, the language instantiates non-persistent footing forcing a reformulation of the anti-lapse constraint itself to accommodate an extra upbeat word-finally. To avoid persistent footing PARSE-σ must be dominated by ALL-FT-L in TB.

154.

/biβesɔna/	ALIGN-L	*LAPSE (E&K)	*LAPSE (DE)	ALL-FT-R	ALL-FT-L	PARSE-σ
☞ a. (bí.βɛ).sɔ.na		(*!)		**		**
b. (bí.βɛ).(ˋsɔ.na)				**	*!*	

It is a familiar story now that according to *LAPSE(E&K) in a candidate form like (154a) with word-initial stress the second weak beat (i.e. third syllable from the left) lacks a licensor and hence is excluded. In consequence the binary parse in (154b) would have been the optimal choice. Obviously TB has no place in the typology of E&K. In contrast the rhythmic theory that we propose here based on the re-stated anti-lapse constraint *LAPSE(DE) rules in the single-foot candidate (154a). In fact, for *LAPSE(DE) neither of the two candidates (154a) and (154b) exemplifying ternary and binary rhythm respectively incurs any violations. Highest ranked alignment constraint ALIGN-L determines that the licensing edge of a foot is the right edge. Consequently, the underlined syllable in (154a) is perfectly licensed for *LAPSE(DE). It is rather the low ranked ALL-FT-L that excludes the binary candidate for having an extra foot away from the strictly left edge.

In sum, the factorial typology of *LAPSE(DE) differs substantially from that of *LAPSE(E&K) in respect of unidirectional strictly aligned ternary systems because of their essential conceptual difference. The former adds an entirely new type of metrical pattern, the non-persistent counterpart of Estonian attested in TB. In addition, disallowing foot-dominance any role in licensing weak beats it maximally simplifies the explanation

of foot-persistence (or the absence of it) by attributing the latter only to the relative ranking of ALL-FT-Y and PARSE-σ. The new typology however agrees with the existing one in overgenerating the non-persistent counterpart of iambic Chugach. To conclude, we give the new typology projected by our theory in consequence of *LAPSE(DE).

155. *New factorial typology of unidirectional strictly aligned systems*
a. ALIGN-X, *LAPSE(DE) ≫ ALL-FT-X ≫ ALL-FT-Y ≫ PARSE-σ
    (Non-persistent: Trochee(TB); Iamb (n/a))

b. ALIGN-X, *LAPSE(DE) ≫ ALL-FT-X ≫ PARSE-σ ≫ ALL-FT-Y
    (Persistent: Trochee (Estonian); Iamb (Chugach))

Each of these types branches out into two subtypes depending on the location of the foot-head. For (155a), non-persistent trochaic variety is attested in TB although the iambic counterpart of it is unattested. Both the possibilities subsumed under (155b) are attested: persistent trochee in Estonian and persistent iamb in Chugach.

2.6.1.3 Bidirectional systems

As has been noted in §1.5.3.3, in bidirectional ternary systems one foot is fixed at one edge or both the edges thereby precluding the possibility of non-persistence. E&K predict three types of bidirectional ternary rhythm which, repeated from (74), are the following. No bidirectional ternary pattern is attested in any language.

156.   a. ALIGN-X, *LAPSE ≫ ALL-FT-X ≫ PARSE-σ
        bidirectional (simple, loosely aligned)
    b. ALIGN-X, *LAPSE ≫ ALIGN-Y ≫ ALL-FT-X ≫ PARSE-σ
        bidirectional (simple, strictly aligned)
    c. ALIGN-X, *LAPSE ≫ ALIGN-Y ≫ ALL-FT-Y ≫ PARSE-σ
        bidirectional (complex)

Each of these types branches out into two subtypes depending on the interpretation of X in ALIGN-X: *left* or *right*. Consequently, according to E&K there emerge six possible varieties of bidirectional ternary rhythm with trochees. The number of logical possibilities increases if iambic variation is also taken into consideration. In our approach foot-dominance being irrelevant the same illustrations can be interpreted either iambically or trochaically. We shall however construct only trochaic feet so that any possible point of contrast between the predictions made by the two theories does not get overshadowed by irrelevant details of comparison.

In respect of simple bidirectional loosely aligned system, we have seen two predicted patterns as depicted by E&K in (75) above. For convenience of discussion we repeat the same below.

157. ALIGN-X, *LAPSE ≫ ALL-FT-X ≫ PARSE-σ

a. X = R   b. X = L
ta.(**tá**.ta)   (**tá**.ta).ta
ta.ta.(**tá**.ta)   (**tá**.ta).(**tá**.ta)
ta.(**tá**.ta).(**tá**.ta)   (**tá**.ta).(**tá**.ta).ta
ta.ta.(**tá**.ta).(**tá**.ta)   (**tá**.ta).ta.(**tá**.ta).ta
ta.ta.(**tá**.ta).ta.(**tá**.ta)   (**tá**.ta).(**tá**.ta).(**tá**.ta).ta
ta.ta.(**tá**.ta).(**tá**.ta).(**tá**.ta)   (**tá**.ta).(**tá**.ta).ta.(**tá**.ta).ta
ta.ta.(**tá**.ta).ta.(**tá**.ta).(**tá**.ta)   (**tá**.ta).ta.(**tá**.ta).ta.(**tá**.ta).ta
ta.ta.(**tá**.ta).ta.(**tá**.ta).ta.(**tá**.ta) (**tá**.ta).(**tá**.ta).(**tá**.ta).ta.(**tá**.ta).ta

Our theory based on *LAPSE(DE) makes an identical prediction in respect of (157a) but differs in case of (157b). This will be clear from the following set of illustrations yielded by *LAPSE(DE) corresponding to those in (157b).

158. ALIGN-X, *LAPSE(DE) ≫ ALL-FT-X ≫ PARSE-σ
     X = L

$$(\textbf{tá}.ta).ta\bullet$$
$$(\textbf{tá}.ta).ta.ta$$
$$(\textbf{tá}.ta).(\textbf{tá}.ta).ta\bullet$$
$$(\textbf{tá}.ta).(\textbf{tá}.ta).ta.ta$$
$$(\textbf{tá}.ta).ta.(\textbf{tá}.ta).ta.ta$$
$$(\textbf{tá}.ta).(\textbf{tá}.ta).(\textbf{tá}.ta).ta.ta$$
$$(\textbf{tá}.ta).(\textbf{tá}.ta).ta.(\textbf{tá}.ta).ta.ta$$
$$(\textbf{tá}.ta).ta.(\textbf{tá}.ta).ta.(\textbf{tá}.ta).ta.ta$$

For all but two of the optimal forms in (157b) (marked with bullets in (158)), our theory makes different predictions due to *LAPSE(DE). Since in the revised anti-lapse constraint the charge of licensing shifts from the strong beat to the *directional foot-edge* (in the present case *right* because of the highest ranked ALIGN-L), there will be double underparsing (or triple upbeat) at the opposite edge of ALIGN-L unless PARSE-σ overrides ALL-FT-L. Exceptions to this norm are the two parsings in three and five syllables where only one syllable remains unparsed. In trisyllables no extra foot can be formed and hence the final single underparsing. In five syllables, without the second foot a sequence of four weak beats will result in violation of *LAPSE(DE). The fact that both the theories make identical predictions in these two respects is sheer coincidence. Interestingly, it should be noted that (158) is a perfect mirror image of (157a). In the latter initial double underparsing is a predicted consequence thanks to the undominated status of ALIGN-R changing the value of *directional foot-edge* to *left*. There is thus a perfect symmetry between the two possible realizations of the ranking (156a), which generates bidirectional loosely aligned ternary systems. Undoubtedly, this is a welcome development for the

theory in the direction of minimizing computational complications inherent in bidirectional ternary patterns even though such patterns are unattested.

Simple bidirectional, strictly aligned ternary system differs from the preceding one in being strictly aligned at both edges. Descriptively one edge takes priority over the other in the sense that alternation is directed toward the 'dominant' edge X departing from the starting edge Y. In an OT grammar these pre-theoretical logistics are also taken care of by constraint ranking. Once again two subpatterns emerge depending on the actual edge signified by X and Y as we see in the following columns re-presented from (76).

159. ALIGN-X, *LAPSE ≫ ALIGN-Y ≫ ALL-FT-X ≫ PARSE-σ

a. X = R, Y = L

ta.(**tá**.ta)

(**tá**.ta).(**tá**.ta)

(**tá**.ta).ta.(**tá**.ta)

(**tá**.ta).(**tá**.ta).(**tá**.ta)

(**tá**.ta).ta.(**tá**.ta).(**tá**.ta)

(**tá**.ta).ta.(**tá**.ta).ta.(**tá**.ta)

(**tá**.ta).ta(**tá**.ta).(**tá**.ta).(**tá**.ta)

(**tá**.ta).ta.(**tá**.ta).ta.(**tá**.ta).(**tá**.ta)

b. X = L, Y = R

(**tá**.ta).ta

(**tá**.ta).(**tá**.ta)

(**tá**.ta).ta.(**tá**.ta)

(**tá**.ta).(**tá**.ta).(**tá**.ta)

(**tá**.ta).(**tá**.ta).ta.(**tá**.ta)[28]

(**tá**.ta).ta.(**tá**.ta).ta.(**tá**.ta)

(**tá**.ta).(**tá**.ta).(**tá**.ta).ta.(**tá**.ta)

(**tá**.ta).(**tá**.ta).ta.(**tá**.ta).ta.(**tá**.ta)

Both the theories make identical predictions although for altogether different reasons. *LAPSE(E&K) uses adjacent strong beat or stress as the licensor for the weak beat represented by an unparsed syllable. (Foot internal weak beat is always adjacent to strong beat and hence taken care of by FT-BIN and foot type iamb or trochee.) *LAPSE(DE)

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[28] In E&K the seven and nine syllable forms in (158b) (E&K: 317, right hand column in (93)) are wrongly parsed as (tá.ta).ta.(tá.ta).(tá.ta) and (tá.ta).ta(tá.ta).(tá.ta).(tá.ta) respectively which are in fact the optimal parses for words of identical lengths in (158a) above replicating the left hand column in (E&K: 317, (93)). We treat these as typographical errors.

makes use of *directional foot-edge* for the purpose. In (159a) undominated ALIGN-R, highest ranked of the alignment constraints, designates the left edge of a foot as the licensing edge for a weak beat. Conversely, in (159b) the licensing edge is the right edge of a foot due to the role of ALIGN-L. In the former the respective licensors of the two anti-lapse constraints i.e. strong beat (*LAPSE(E&K)) and licensing edge of a foot (*LAPSE(DE)) coincide – both are left – and this accounts for the identical outputs of the two theoretical dispensations. In (159b) the weak beat contained in the unparsed syllable is licensed from the left by the *directional foot-edge* i.e. the right edge of a foot for *LAPSE(DE) and from the right by the strong beat as per *LAPSE(E&K). Hence we notice uniform predictions made by the two approaches though for different reasons.

The last member of this family of bidirectional systems includes what E&K call 'complex bidirectional' patterns. In these one foot is fixed at both the edges except in trisyllables where the dominant edge signaled by the undominated word-to-foot alignment constraint gets priority. This family however is distinct from others in constructing the secondary feet away from the dominant one. Two logical possibilities are predicted depending on the edge referred by X. For illustrations one can refer back to (77). Both the rhythmic theories – based respectively on *LAPSE(E&K) and *LAPSE(DE) – overgenerate these unattested possibilities.

To sum up, in this subsection we have considered three subtypes of ternary bidirectional systems and found that out of the total number of six possibilities (two for each subtype) five are predicted by our rhythmic theory as well. Undominated *LAPSE(DE) projects a metrical pattern different from the one put forward by *LAPSE(E&K) in respect of the second possibility of bidirectional loosely aligned

subtype. The new pattern is an exact mirror image of the other possibility of this subtype. In this respect our theory unifies the picture of the entire bidirectional family: each subtype has two members – one replicating the other with minimal but crucial variation in the value of ALIGN-X determining the directionality of iteration. *LAPSE(E&K) fails to ensure this symmetry. Certainly this is a remarkable achievement in terms of predictability and minimizing diversity especially given the fact that all the members of the bidirectional family are only logical possibilities unattested in any natural languages.

So far in this chapter we have constructed an account of the metrical pattern of TB words consisting only of light syllables. But this does not present a comprehensive picture of the stress distribution scenario in this variety of Bangla. This is because the major part of the TB vocabulary exemplifies a predominant role of heavy syllables along with light ones in the construction of words of various lengths. For a comprehensive view of the TB metrics it is necessary therefore to have a look at the stress distribution pattern of words containing at least one heavy syllable. But since this part of our discussion does not raise any major theoretical issue, our focus will be on the role of a set of new constraints such as WSP, NON-FIN, *CLASH etc. and their interaction with the existing ones in deriving the effect of rhythmicity. In the forthcoming section this will be our central point of discussion.

2.7 Rhythm in words containing heavy syllables

As noted in the first chapter, stress distribution becomes apparently 'irregular' due to the presence of heavy syllables[29] in what we have classified as the second type of TB words. Heavy syllables attract stress and this is so powerful a requirement that it can override the otherwise inviolable principles of word-initial primary stress and of non-final prominence. Primary prominence shifts to the second syllable if the first syllable is light and the second is heavy. Initial main stress however does not skip two successive light syllables even if the third is a heavy one. Instead the third initiates a foot with secondary stress while the primary foot is constructed over the two initial light syllables. This results in sequences of successive (binary) feet in contradistinction to the ternarity effect caused by underparsing in words containing only light syllables. Significantly, two successive heavy syllables do not initiate two feet. As in the light syllabled words, stress placement is insensitive to morphology. To illustrate these facts, consider the following set of examples from among trisyllables.

160. a. a.nɔ́n.dɔ   'pleasure'   L(ˈHL)
     b. ɔ́.βi.ʃàɸ   'curse'   (ˈLL)(H̀)
     c. ʃ ˈn.tuʃ.tɔ   'satisfied'   (ˈHH)L
     d. ʃɔ́ŋ.rɔk.kɔ̀n   'reservation'   (ˈHH)(H̀)

Constructing an OT grammar for such a set of metrical facts requires invocation of some new constraints and a consequent reorganization of the constraint hierarchy that accounts for ternarity in TB light sequences. The first among these is the constraint that requires that heavy syllables be stressed. In the OT literature this close relation between

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[29] Vowel length being non-distinctive in TB, it is only the closed syllables which, by virtue of having an extra mora, count as heavy.

syllable weight and prominence is referred to as 'Weight-to-Stress-Principle' (henceforth WSP) and is formulated as the following.

161. WSP
      Heavy syllables are stressed.   (Kager 1999: 155)

This constraint is automatically violated by any heavy syllable that is not prominent, whether within a foot or outside it. In TB stress shifts from the word-initial light syllable to the heavy second syllable disrespecting the demand of initial prominence enforced through so far undominated ALIGN-L and foot-type TROCHEE. This leads to the following ranking relation between the two relevant constraints.

162. WSP ≫ ALIGN-L
    a.(nɔ́n.dɔ) ≻ *(á.nɔn).dɔ

In this connection it has been noted that despite all its power to attract prominence a heavy third syllable fails to draw the main prominence on to itself. To capture this we however do not need any new constraint. For the undominated anti-lapse constraint sees to it that not more than one syllable remains unparsed at the initial edge where iteration starts. Remember, high-ranking ALIGN-L, being the highest of the alignment constraints in this language, dictates that the *directional foot-edge* is the *right* edge of a foot. Any weak beat (i.e. a syllable) at the left edge of a foot is unlicensed unless it is adjacent to word-edge. This forces another mini ranking.

163. *LAPSE(DE) ≫ WSP
    (ó.βi).(ʃàɸ) ≻ *o.βi.(ʃáɸ)

Emergence of successive feet in the optimal parsings is obviously under duress of WSP and at the cost of the edge-oriented alignment constraints ALL-FT-R and ALL-FT-L,

which enforce underparsing to yield ternarity (cf. 96). Formalizing this ranking argument gives the following piece of mini hierarchy.

164. WSP ≫ ALL-FT-R ≫ ALL-FT-L[30]

Again, initial underparsing of a light syllable noted in words like *a.(nɔ́n.dɔ)* is also under pressure from WSP. The implication for the grammar therefore is that WSP dominates PARSE-σ too.

Finally, as is exemplified in (160c-d) successive heavy syllables do not project two feet. Certainly this is in deference of a constraint that prohibits stress clash. In OT this is captured in terms of a negative constraint *CLASH.

We have now all the required constraints and the relevant ranking arguments to construct the OT grammar for explaining the metrical facts attested in TB trisyllables. The undominated status of FT-BIN and TROCHEE continues to remain unassailed as in case of light sequences.

165. FT-BIN, TROCHEE, *CLASH, *LAPSE(DE) ≫ WSP ≫ ALIGN-L ≫ ALL-FT-R ≫ ALL-FT-L ≫ PARSE-σ

We illustrate this ranking for TB words with heavy syllables in the following tableaux. Since no candidate can emerge optimal with any violation either of FT-BIN or TROCHEE, we assume their undominated status and continue to suppress them from the forthcoming rankings unless otherwise necessary.

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[30] Meanwhile the ranking relation ALL-FT-R ≫ ALL-FT-L must remain intact for the independent reason of right-orientedness of trochees in TB sequences of light syllables.

166.

/anɔndɔ/	*CLASH	*LAPSE(DE)	WSP	ALIGN-L	ALL-FT-R	ALL-FT-L	PARSE-σ
☞ a. a.(nɔ́n.dɔ)				*		*	*
b. (á.nɔn).dɔ			*!		*		*
c. a.(nɔ́n).dɔ				*	*!		*

167.

/oβiʃaɸ/	*CLASH	*LAPSE (DE)	WSP	ALIGN -L	ALL-FT -R	ALL-FT -L	PARSE -σ
☞ a.(ó.βi).(ʃàɸ)					*	**	
b. o.βi.(ʃáɸ)		*!		*		**	**
c. (ó.βi).ʃaɸ			*!		*		*

168.

/ʃɔŋrɔkkɔn/	*CLASH	*LAPSE (DE)	WSP	ALIGN -L	ALL-FT -R	ALL-FT -L	PARSE -σ
☞ a. (ʃɔ́ŋ.rɔk).(kɔ̀n)			*		*	**	
b. (ʃɔ́ŋ).(rɔ̀k.kɔn)	*!		*		**	*	
c. (ʃɔ́ŋ).(rɔ̀k).(kɔ̀n)	*!*				* **	* **	
d. (ʃɔ́ŋ.rɔk).kɔn			**!		*		*

In all the tableaux above the ranking (165) predicts the grammatical outputs. In the first two no violation of WSP is tolerated. But the dominated status of WSP is proved in (168) where within a (HH) trochee one heavy remains without stress. But that violation of WSP cannot but be minimal is proved by the suboptimal status of the candidate (168d). (168b) and (168c) justify the dominance of *CLASH over WSP. We find additional support in favour of the ranking in (165) from words of longer sequences. For lack of space we shall however be very selective in providing tabular illustrations. A set of representative data[31] precedes the tableaux.

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[31] For more examples see Appendix, Part II

169.

a. ɔ́.na.sìʃ.ʈi   (ˈLL)(ˋHL)   'a strange affair'

o.bíg.ga.ɸɔ̀n   L(ˈHL)(ˋH)   'intimation'

ɔ́.β'i.b'a.bɔ̀k   (ˈLL)L(ˋH)   'guardian'

báb.zaiʈ.ʈa.mi   (ˈHH)LL   'adamancy'

b. ɔ.ʃáb.da.nɔ.ta   L(ˈHL)LL   'carelessness'

ɔ́.ɸo.ri.bɔ̀t.tɔn (ˈLL)L(ˋHH)   'changelessness'

ɔ.ʃɔ́ŋ.ʃu.dɔ.nèrL(ˈHL)L(ˋH)   'on non-correction'

ɸɔ́k.kɔ.ɸa.tìt.tɔ   (ˈHL)L(ˋHL)   'partisanship'

c. ɸá.rɔ.dòʃ.ʃi.kɔ.ta   (ˈLL)(ˋHL)LL   'expertness'

ɔ́.ɸo.ri.bɔ̀t.ti.tɔ   (ˈLL)L(ˋHL)L   'unchanged'

d. ɔ́.ɸo.ri.bɔ̀t.to.ni.yɔ   (ˈLL)L(ˋHL)LL   'unchangeable'

e. ɔ́.ɸo.ri.bɔ̀t.to.ni.yɔ̀.ta   (ˈLL)L(ˋHL)L(ˋLL)   'unchangeablity'

170.

/ɔnasiʃʈi/	*CLASH	*LAPSE (DE)	WSP	ALIGN-L	ALL-FT-R	ALL-FT-L	PARSE-σ
☞ a. (ɔ́.na).(sìʃ.ʈi)					**	**	
b. ɔ.na.(síʃ.ʈi)		*!		*		**	**
c. (ɔ́.na).siʃ.ʈi			*!		**		**
d. (ɔ́.na).(sìʃ).ʈi					* **!	**	*

In the above tableau perfect binarity emerges as a consequence of the presence of a heavy

third syllable. Remember in four-syllable light sequences no secondary stress is attested.

No secondary stress is necessitated if satisfaction of WSP coincides with the initial main

prominence as is shown in the following tableau.

171.

/babzaiʈʈami/	*CLASH	*LAPSE (DE)	WSP	ALIGN-L	ALL-FT-R	ALL-FT-L	PARSE-σ
☞ a. (báb.zaiʈ).ʈa.mi			*		**		**
b. (báb).(zàiʈ).ʈa.mi	*!				** ***	*	**
c. (báb.zaiʈ).(ʈà.mi)			*		**	*!*	
d. (báb).zaiʈ.ʈa.mi		*!	*		***		***

A comparison of (170) & (171) brings out a significant aspect of rhythm in TB: but for WSP, rhythmic alternation always tends to be ternary rather than binary. Given a chance ternarity prevails even at the cost of WSP. For illustration, in (171b) WSP is fully gratified with no violation at all. Yet the candidate fails since it instantiates stress clash. On the contrary, (171a) is deemed optimal despite one violation of WSP. Further support in favour of ternarity is available from the following illustrations of longer sequences.

172.

/ɔʃabdanɔta/	*CLASH	*LAPSE (DE)	WSP	ALIGN -L	ALL-FT -R	ALL-FT -L	PARSE -σ
☞ a. ɔ.(ʃáb.da).nɔ.ta				*	**	*	***
b. (ɔ́.ʃab).(dà.nɔ).ta			*!		* ***	**	*
c. ɔ.(ʃáb).da.(nɔ̀.ta)				*	***!	* ***	**
d. ɔ.(ʃáb).(dà.nɔ).ta	*!			*	***	* **	**
e. ɔ.(ʃáb).da.nɔ.ta		*!		*	***	*	****

The very fact that three weak beats are allowed at the right edge of the word (cf. 172a), reminds us of the metrical pattern in words of length $3n+1$ (i.e. four and seven) (light) syllables in TB discussed in earlier sections. Persistent footing is avoided through the ranking ALL-FT-L ≫ PARSE-σ. But more importantly, the revised anti-lapse constraint *LAPSE(DE) provides a licensor to each of the three final weak beats in (172a) precluding the necessity of a secondary stress (and hence a secondary foot). The net result of this is ternarity. This crucial role of *LAPSE(DE) in obtaining ternarity becomes all the more conspicuous in the suboptimal status of candidate (172e). The exclusion of all the remaining candidates with two feet each provides further evidence for ternary rhythm in TB.

We now compare the evaluations of two six-syllable words to demonstrate that local binarity is the consequence of high ranked WSP.

173.

/ɔɸoribottitɔ/	*CLASH	*LAPSE (DE)	WSP	ALIGN -L	ALL-FT -R	ALL-T -L	PARSE -σ
☞ a. (ɔ́.ɸo).ri.(bɔ̀t.ti).tɔ					* ****	***	**
b. (ɔ́.ɸo).ri.(bɔ̀t).(tì.tɔ)	*!				** ****	*** ****	*
c. (ɔ́.ɸo).(rì.bot).(tì.tɔ)			*!		** ****	** ****	
d. (ɔ́.ɸo).ri.(bɔ̀t).ti.tɔ					** ****!	***	***
e. ɔ.(ɸɔ́.ri).(bɔ̀t.ti).tɔ				*!	***	***	**

174.

/ɸarɔdoʃʃikɔta/	*CLASH	*LAPSE (DE)	WSP	ALIGN -L	ALL-FT -R	ALL-FT -L	PARSE -σ
☞ a. (ɸá.rɔ).(dɔ̀ʃ.ʃi).kɔ.ta					** ****	**	**
b. (ɸá.rɔ).(dɔ̀ʃ).ʃi.kɔ.ta		*!			*** ****	**	***
c. (ɸá.rɔ).(dɔ̀ʃ.ʃi).(kɔ̀.ta)					** ****	** *!***	
d. (ɸá.rɔ).(dɔ̀ʃ).(ʃì.kɔ).ta	*!				* *** ****	** ***	*

In (173) ternary rhythm prevails since WSP is satisfied through the stressing of a heavy syllable in a position where in a light sequence a secondary stress is placed. This coincidence obscures the role of WSP in disrupting ternary rhythm by forcing rhythmic binarity. This role of WSP is however evident in (174) where a heavy third syllable receives the secondary stress pushing the latter one syllable to the left from its normal location (i.e. fourth syllable from the left edge). This results in the shifting of the secondary foot maximally to the left yielding rhythmic binarity at that edge. No persistent footing is necessitated since the last two syllables (i.e. the weak beats represented by them) are duly licensed according to *LAPSE(DE). The suboptimal status of all the remaining candidates in both the tableaux is self-explanatory. The same observation that the effect of WSP in forcing binarity is invisible when a heavy syllable is distanced from the preceding stressed syllable by two intervening light syllables is also borne out by the prevalence of ternarity in words of greater lengths. The following two tableaux demonstrating the evaluations of seven and eight syllables respectively are presented for

illustration. For lack of space we suppress the presence of the mini ranking ALL-FT-L ≫

PARSE-σ.

175.

/ɔɸoribɔttoniyɔ/	*CLASH	*LAPSE(DE)	WSP	ALIGN-L	ALL-FT-R
☞ a. (ɔ́.ɸo).ri.(bɔ̀t.to).ni.yɔ					** *****
b. (ɔ́.ɸo).ri.(bɔ̀t).to.(nì.yɔ)					*** *****!
c. ɔ.(ɸɔ́.ri).(bɔ̀t.to).ni.yɔ				*!	
d. (ɔ́.ɸo).(rì.bɔt).(tò.ni).yɔ			*!		* *** *****

176.

/ɔɸoribɔttoniyɔta/	*CLASH	*LAPSE (DE)	WSP	ALIGN-L	ALL-FT-R
☞ a. (ɔ́.ɸo).ri.(bɔ̀t.to).ni.(yɔ̀.ta)					*** ******
b. (ɔ́.ɸo).(rì.bɔt).(tò.ni).(yɔ̀.ta)			*!		** **** ******
c. ɔ.(ɸɔ́.ri).(bɔ̀t.to).ni.(yɔ̀.ta)				*!	*** *****
d. (ɔ́.ɸo).ri.(bɔ̀t.to).ni.yɔ.ta		*!			*** ******

Finally, let us turn to shorter sequences namely disyllables. In such words primary

(and only) prominence is invariably on the initial syllable irrespective of the internal

make-up of the syllables contained. For examples look at the following set TB

disyllables.

177.   a. ɸá.til   (ˊLH)   'earthen pot'
       b. mál.ʃa   (ˊHL)   'big metal bowl'
       c. ʃɔ́r.kar   (ˊHH)   'government'

The crucial case is that of (177a) where despite the second syllable being heavy and the

first light, the first syllable carries the primary prominence. Such a stress distribution

contradicts our observation in longer words where a second heavy syllable always attracts

stress causing an obligatory initial underparsing of one syllable (cf. 172a). To

accommodate this conflicting phenomenon the OT grammar of TB need not however

suffer from any ranking paradox. All that is required to resolve the crisis is to introduce a

constraint that prohibits the placement of the primary prominence on the final syllable. The proposed constraint is a version of NON-FINALITY (NON-FIN) as stated below.

178. NON-FIN
　　Primary prominence is never final in a PrWd.

This constraint is necessarily distinct from the one used in Kager (1994) (based on Prince and Smolensky 1993) to account for final extrametricality in Finnish (cf. (80) in the present chapter) in the sense that the latter prohibits the occurrence of any prosodic head – whether a head foot or a stressed syllable – in the final position of a PrWd. The present version of NON-FIN is motivated by the fact that in TB a secondary stress can occur on a final heavy syllable.[32] Since in a disyllable the demand of WSP is overridden by that of NON-FIN, the ranking argument between the two is automatic:　NON-FIN ≫ WSP. NON-FIN however is never violated in TB as the main stress is never final in a PrWd. This argues for the ranking of this constraint among the undominated ones. With the undominated FT-BIN the OT grammar therefore successfully predicts the optimal parse in a TB disyllable like *ɸá.til* where a canonical anti-trochee (´LH) is formed in violation of WSP.

179.

/ɸatil/	FT-BIN	NON-FIN	WSP
☞　a. (ɸá.til)			*
b. ɸa.(tíl)		*!	
c. (ɸá).til	*!		

The remaining two patterns noted in (177b-c) also fall out from this basic ranking.

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[32] Final heavy monosyllable attracting stress is also attested in SCB as is mentioned in Mitra and Das (2000). In the latter the authors make substantial use of this version of NON-FIN.

180.

/malʃa/	FT-BIN	NON-FIN	WSP	ALL-FT-R
☞ a. (mál.ʃa)				
b. (mál).ʃa				*!
c. mal.(ʃá)		*!	*	

181.

/ʃɔrkar/	FT-BIN	NON-FIN	WSP	ALL-FT-R
☞ a. (ʃɔ́r.kar)			*	
b. ʃɔr.(kár)		*!	*	
c. (ʃɔ́r).kar			*	*!

The final ranking for TB metrics explaining the stress distribution patterns in both types of words – i.e. words containing only light syllables and words containing heavy as well as light syllables – is therefore as the following.

182. FT-BIN, TROCHEE, *CLASH, *LAPSE(DE), NON-FIN ≫ WSP ≫ ALIGN-L ≫ ALL-FT-R ≫ ALL-FT-L ≫ PARSE-σ

In sum, this section gives a picture of the distribution of stress in words containing heavy syllables whether in combination with light syllables or all by themselves. The crucial constraint is WSP, which makes stress placement on heavy syllables mandatory. This results in the emergence of binary rhythm in an otherwise predominantly ternary pattern. WSP however is not an undominated constraint, as it has to respect the demands of *CLASH and NON-FIN, both undominated. In consequence of *CLASH ≫ WSP two successive heavy syllables are debarred from initiating two separate feet. NON-FIN ≫ WSP rules in favour of the canonical anti-trochee (´LH) in

disyllables. The section finally projects a complete picture of the constraint ranking responsible for the rhythmic effects in all types of words in TB.[33]

2.8 Conclusions

This chapter provides a strong argument in favour of redefining the anti-lapse constraint in view of the fact that the existing one proposed in E&K is unable to account for the metrical pattern of a living language like TB. In the latter there is sequence of three weak beats at the right edge of words of $3n+1$ (i.e. three and seven) syllables length. According to the rhythmic theory of E&K based on their anti-lapse constraint which we have renamed as *LAPSE(E&K), a metrical pattern like the one attested in TB cannot exist. In the face of the strong counterevidence provided by the latter against such a prediction, it becomes the responsibility of any theory claiming to have both descriptive and explanatory adequacy to modify its analytical apparatus to meet the new challenge. Accordingly we have proposed a new constraint *LAPSE(DE) which substitutes the strong beat as one of the licensors of weak beats in a grid with the *directional foot-edge*. The latter stands for the edge of a foot coinciding with the direction of rhythmic alternation. In this theory foot-dominance has no role to play; licensor of a weak beat is only a domain edge: either foot-edge or word-edge. The new theory explains the diverse metrical patterns of all the languages, which have provided empirical justification for the anti-lapse constraint of E&K. Coming to factorial typology, the new rhythmic theory scores much better than its predecessor:

      a) it reduces the typology of ternary rhythms by one number by eliminating

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[33] Monosyllables do not necessarily form a part of our discussion since they do not produce any rhythmic effect.

'Iambic Cayuvava', a pattern overgenerated by *LAPSE(E&K);

b) it accommodates an attested pattern like that of TB undergenerated by *LAPSE(E&K);

c) it perfectly unifies the picture of bidirectional ternary rhythm by reorganizing one of the two possibilities of the subtype called *simple bidirectional loosely aligned* system even though such a system is unattested as yet.

In consequence of (c), each member emerges as a perfect mirror image of the other member belonging to the same subtype.

As far as the theory is concerned, certain observations are in order in consequence of the preceding discussion. First, for the sake of vindicating the truly universal character of the anti-lapse constraint it should not be employed to enforce any specific type of rhythm. Second, for deriving free variants it is advantageous to use the canonical OT practice of *local* reranking of constraints in a hierarchy for the sake of a unified approach. Third, foot-persistence is uniformly a consequence of the ranking PARSE-σ ≫ ALL-FT-X; non-persistent footing results from the reverse ranking of the two. This is because in the event of foot-dominance being divested of any role in the licensing of weak beats in the new approach, the all-important condition of E&K that if foot-dominance and starting edge of iteration match then persistent footing is automatic and conversely, if the two contradict each other then the relative ranking of PARSE-σ and ALL-FT-X determines the (non-)persistent footing, becomes irrelevant. This is perhaps another feather in the cap of our rhythmic theory based on domain-edge licensing.

To conclude the chapter and to give a complete picture of the metrical pattern in TB we have discussed the relevant constraint ranking that is capable of explaining stress distribution in words consisting of heavy as well as light syllables. It has been noticed that the core constraint ranking that accounts for light sequences also explains sequences containing only heavy syllables and also those having both light & heavy syllables provided it incorporates three new constraints -- *CLASH, NON-FIN and WSP. Of these the first two are undominated and WSP is ranked quite high standing immediately below the undominated ones. This necessitates a minor reorganization of the constraint ranking, as WSP has to dominate over ALIGN-L, a constraint that remains undominated in the ranking for light sequences in TB.

CHAPTER III

PROSODICALLY CONDITIONED LICENSING AND WEAKENING IN TB

3.0 Introduction

In the previous chapter we have constructed an OT grammar for the metrical pattern in TB. As per our analysis in all types of words in this variety of Bangla a unidirectional ternary rhythm prevails which is only occasionally forced into binary alternation on the surface due to the role of the high ranked constraint WSP requiring heavy syllables to be stressed. Ternary rhythm does not compel ternary feet however. In keeping with the current trend of discounting ternary foot as a primitive of metrical systems we have constructed binary (trochaic) feet with Weak Local Parsing, to use Hayesian terminology. That is, ternary rhythm is explained as a binary foot separated from its neighbour by an unparsed syllable. We have taken every pain to establish such an analysis through various constraints currently available in the OT literature to account for ternarity. First we have tried with the foot-repulsion constraint *FTFT which we have rejected subsequently owing to its non-universal character of being typically ternarity-specific. Our next effort was to apply the anti-lapse constraint proposed by E&K which we renamed as

*LAPSE(E&K). This effort also proved futile since it failed to accommodate the presence of three successive weak beats at the right edge of words of four and seven syllables in TB. Explanation for these so-called *deviant* forms in TB was ultimately found in the reformulation of the anti-lapse constraint itself. The latter was distinctively termed *LAPSE(DE) since it allows two types of domain edges – foot-edge and word-edge – to license a weak beat.

Now, one may logically ask if so much effort were worth the eventual gain, which is merely an analysis of ternary rhythm in terms of binary feet. Things would have been much simpler and intuitively justified if ternary rhythm were explained in terms of ternary feet making special provisions for occasional binarity.

Such efforts were made many a time to explain rhythmic ternarity for the handful of languages, which attest such a system (cf. Halle and Vergnaud 1987, Levin 1988, Dreshser & Lahiri 1991, Hewitt 1992, Rice 1992). But the ultimate rejection of ternary foot analysis both in the derivational and non-derivational approaches proves the futility of such an endeavour. In fact, ternary foot analysis fails to offer a principled account to many a phonological process, both segmental and metrical, which a binary foot analysis easily accomplishes. Take for instance the case of consonant weakening in TB: voiceless velar plosive weakens to *h* if it occurs in an open unstressed syllable immediately after a stressed syllable. *k* however retains its underlying featural identity if it stands one syllable away to the right of the stressed syllable. A ternary foot analysis has no explanation for such a variable behaviour of *k*. In terms of binary foot analysis this is a case of weakening restricted to the non-head position within a foot. The segmental phonology of

TB also offers other instances of such foot-bound activities and all these strongly argue in favour of a binary foot analysis of the concerned metrical system.

In the present chapter we offer arguments based on two phonological processes of licensing and weakening both of which are prosodically conditioned. The first one deals with a phenomenon in which the underlying featural identity of certain (marked) vocalic segments are preserved only if they occur in the first stressed syllable from the left, which is obviously the most prominent syllable in a word. This is a clear pointer to the fact that in TB there is stress distinction involving at least two levels: primary and secondary. Justifying this observation will lead us to make a brief survey of the underlying vowel inventory of TB. The second argument bears more directly on the issue of binary foot construction. It deals with the process of weakening of the two plosives *k* and *b* when the latter do not occur in a prosodic head position namely a stressed syllable within a foot. Instantiating two complementary aspects of prosodic licensing -- retention of underling featural identity in the prosodic head position and the partial loss of some of the features in the non-head position – these phonological activities provide clinching evidence in favour of binary foot parsings of ternary rhythm in TB.

The chapter is organized as follow: §3.1 argues on the basis of evidence from prosodic licensing that TB makes distinction of at least two levels of prominence, primary and secondary: the two marked vowels *o* and *e* are licensed only in the most prominent syllable of a word. In §3.2 we discuss how prosodic licensing offers a convincing explanation of the weakening of *b* and *k* provided binary feet are constructed. § 3.3 contains the conclusions.

3.1 Prosodic Licensing and evidence for prominence-distinction in TB

The concept of prosodic licensing as originally propounded in Itô (1988) is a general theory of prosodic licensing to account for syllable-based phonotactics. She interprets syllabification as template matching. Building on McCarthy's (1979) idea that phonemic material that fails to map to the template is suppressed, she extends stray erasure to a general constraint on phonological representation: all phonological segments must be prosodically licensed. There are two ways to achieve prosodic licensing: association to the syllabic template or declaration as extrasyllabic at the edge of the relevant prosodic domain (for marginal consonant clusters). Material that is not prosodically licensed is deleted by Stray Erasure.

Since Itô's primary concern was syllabification and syllable-based phonotactics, the specific details of her theory do not concern us directly here. But the very concept of prosodic licensing abstracted away from the details of its original proposal and its potential expandability to other prosodic categories has rendered it an attractive theoretical apparatus in the subsequent research in phonology (cf. Goldsmith 1990, Kaye, Lowenstamm, and Vergnaud 1990, Steriade 1995). To be specific, just as there can be intra-syllabic phonotactic restrictions against the occurrence of a certain segment or segment sequence in a designated position such as onset or coda in a particular language, there can be phonotactic restrictions against the occurrence of a particular segment in a syllable if the latter does not occupy a designated position in the higher prosodic categories such as foot, prosodic word etc.

In OT the concept of prosodic licensing is a more generalized one in the sense that OT looks upon licensing as faithfulness to prosodic heads or as positional faithfulness. 'There are', to quote Beckman (1998: vii) 'a variety of phonological asymmetries exhibited by segments which appear in perceptually or psycholinguistically prominent positions such as roots, root-initial syllables, stressed syllables, and syllable onsets. In such positions, segmental or featural contrasts are often maintained, though they may be neutralized in non-prominent positions. Segments in prominent positions frequently trigger phonological processes such as assimilation, dissimilation and vowel harmony; conversely, they often block or resist the application of these processes.' Resistance to neutralization is attributed to constraints that license features in specific positions, which are linguistically privileged. The OT mechanism to capture prosodic licensing is a ranking schema in which markedness constraints are sandwiched between positional and general faithfulness constraints: IO-Faithfulness (*prominent positions*) $\gg$

Markedness $\gg$ IO-Faithfulness (*general*).

In what follows we shall find a particular use of the concept of prosodic licensing in accounting for the absence of two marked vowels *o* and *e* in other than the most prominent syllable of a word. Though developing an OT account for such an asymmetric distribution of these vowels is beyond our primary concern, as far as the present thesis is concerned the following discussion provides ample support in favour of the existence of primary stress in TB.

Irrespective of their theoretical persuasions, the majority of the researchers (including Chatterji 1926, Sarkar 1979, 1983-84, 1986, Dasgupta 1982, Paul 1985, 1986,

Dan 1992, Ghosh 1996 etc.) working on the various aspects of Bangla phonology have argued for a seven-vowel system in SCB. These are: *i, e, ε, a, ɔ, o, u*. Going one step further in respect of subtlety of analysis and working on SCB vowel harmony with special reference to the verbal forms, Ghosh (1996) claims that Bangla verbal forms have two vowel systems: a five vowel system for the verbal stems and a full seven vowel system for the suffixes. The former include *e, ε, a, ɔ, o* (i.e. excluding the high vowels) and the latter *i, e, ε, a, ɔ, o, u*. It is surprising to note that the SCB verbal stems systematically lack the two high vowels *i,u* while even the simplest of vowel systems – a three-vowel system containing *i, u, a* -- attested in natural languages make use of these peripheral points in the vowel space. We shall have more discussion on this accidental gap in the utilization of the vowel space in Bangla before long.

With these observations for the standard dialect in mind, let us survey the distribution of vowels in TB. To start with we make a general inspection of the non-verbal stems and then come back to verbal roots before we arrive at a comprehensive picture of the underlying inventory of vowels in TB.

3.1.1 Distribution of vowels in stems in TB

183.a *i* represents the front high unrounded vowel uniformly distributed over the initial, medial and final positions in words.

Initial		Medial		Final	
idal	'stone throw'	hiʃab	'calculation'	nodi	'river'
indur	'rat'	g'ilu	'brain'	adali	'lick'

183.b *e* is a front mid unrounded vowel, which occurs in all positions.

esi	'sneezing'	keɟi	'small'	ke	'who'
eʈki	'hiccup'	geɟi	'neck'	te	'he'

183.c *ɛ* is a front low unrounded vowel and unlike in SCB its occurrence is disallowed finally.

ɛk	'one'	ɸɛk	'clay'	--
ɛtɔ	'so much'	ɸɛrɔt	'untidy person'	

183.d *a* This back low unrounded vowel is found in all positions.

aga	'top/peak'	salu	'smart'	oza	exorcist'
aɖu	'knee'	ɸɔtaka	'flag'	ɸola	'boy'

183.e *ɔ* is a back low unrounded vowel, which occurs in all positions.

ɔlɔʃ	'idle'	rɔg	'artery/vein'	ɔlɸɔ	littlebit'
ɔga	'stupid'	bɔlɔd	'bullock'	duʃʈɔ	'naughty'

183.f *o* is a back mid rounded vowel and it occurs in all the positions.

oʃud	'medicine'	zora	'joint'	bo	'bride'
ogɔl	'kind of fish'	ǵora	'horse'		

183.g *u* is the back high rounded vowel occurring in all the positions.

ural	'flight'	ɸʰul	'flower'	aβu	'baby'
una	'less by one'	dul	'earring'	alu	'potato'

3.1.2 *ɛ~e* alternation and implications for vowel inventory

It appears from the above data that there are seven vowels *i, e, ɛ, a, ɔ, o, u* in TB. But before we arrive at any conclusive decision a close scrutiny of the distributional gap noted in case of *ɛ* (cf. 183c) is necessary. It would be unrewarding, however, to consider this phenomenon in isolation. A careful observation reveals that there exists a kind of complementarity between *e* and *ɛ*: *e* occurs in all the positions while *ɛ* does only non-finally. This along with the phonetic proximity that the two share might give one the

impression that *ɛ* is in fact a positional variant of *e*. But this could be easily argued against. Word initial and word medial occurrence of *e* is exclusively conditioned by the presence of a following high vowel.

184. éli   'whining'   zeɖu   'father's elder brother'
       beʃi   'much'   lezur   'tail'
       beɖi   'woman'   kelu   'SCB, sl.'

Besides, there are very few words with final *e* in TB. *ke* 'who', *te* 'he, fam.', *ze* 'who', *he* 'he/she', *de* 'give/surname' *ne* 'take' perhaps exhaust the list of mono-morphemic words with final *e*.[34] This means, word finally, use of neither *e* nor *ɛ* is productive in mono-morphemic sequences; but non-finally the latter enjoys a greater distributional freedom as we see below.

185.   ɛk   'one'   ɛmɔn   'like this'   kɛra   'centipede'
         ɛkla   'alone'   kɛmne   'how'   bɛla   'time'
         ɛlai   'profuse'   tɛrɔ   'thirteen'   lɛz   'tail'
         ɛlan   'recline'   bɛtɔn   'salary'   dɛʃ   'country'

Unlike *e, ɛ* can occur in a closed syllable and also before any non-high vowel. On the basis of the above one could feel justified to say that *e* is a variant of *ɛ*.

Given these conflicting possibilities of either of the vowels being the basic, one would do better to look for minimal pairs involving the two as clinching evidence for the

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[34] Two other words frequently used are *aste* 'slowly' and *baze* 'useless'. The first one is a Persian loan in Bangla (<*ahista*) and as the gloss shows it behaves like a derived adverb. Chatterji (1926) does not enter *baze* (SCB *badʒe*) as a lexical item of Bangla in its present sense. Though of doubtful origin its semantic affinity with the Sanskrit derived adjective *bordʒo* 'to be rejected' may be argued for. The latter also has its regular survivor in SCB compounds like *bordʒo podartʰo* 'waste'. Considered thus both *aste* and *baze* should be treated as derived words as the native speakers in fact do.

phonemic status of both. Though very rare there is still proof that the two vowels are in fact distinctive in TB. They contrast medially in *dɛk* 'see, Present imperative (ord.)': *dek* 'give, Future imperative, 3P (non-hon)'; *nɛk* 'tendency': *nek* 'take, Future imperative, 3P (non-hon)'. The proof of the fact that the vowel in *dɛk* & *nɛk* and the one in *dek* & *nek* are not the same is available from their different realizations under the suffixation of the same morpheme whose high vowel provides the trigger for alternation in the root vowel.

186.   Verb root   Suffix
     dɛk   i   → dehi   'see, 1P, Pres.'[35]
     de   i   → dii   'give, 1P, Pres.'
     ne   i   → nii   'take, 1P, Pres.'

Both the vowels *ɛ* and *e* undergo harmonic raising by one notch in the vertical scale of vowel space under the influence of the following suffixal high vowel. But while the former reaches to *e* the front mid high vowel, the other touches the front high mark symbolized by *i*. This is therefore a strong piece of evidence that *ɛ* and *e* are two distinct vowels in TB.

However, it is difficult to build up a strong case in favour of *e* belonging to the core inventory of TB. In fact the above structuralist diagnostics gives only a static and imperfect view of the underlying inventory of a language and fails to say anything about a language in change. This is because there are not many non-derived lexical items including verbal stems in this dialect, which contain *e* without being followed by a high vowel. A survey of the verb roots reveals that there are only two roots *de* and *ne* in TB,

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[35] No word can be formed by suffixing -i to *nɛk*. However a non-sense word like *neki* is easily acceptable.

which retain *e* against an overwhelming trend of restructuring the verbal roots by substituting *i* for *e*. This is proved by the following comparison of the same verbal roots in SCB and TB[36].

187.	SCB	TB		SCB	TB	
	ʃekʰ	ʃik	'learn'	gel	gil	'swallow'
	ken	kin	'buy'	ʈep	ʈiɸ	'press'
	peʈ	ɸiʈ	'beat'	tʃen	sin	'know'
	pʰer	ɸʰir	'return'	gʰer	g'ir	'surround'
	tʃʰẽʈ	s'ir	'tear'	ʈek	ʈik	'last'

All the verbal roots containing *e* in SCB are realized with *i* in TB. *de* and *ne* (not in (187)) stand out as exceptions as these roots are pronounced identically in both the dialects. It is logical therefore to say that *de* and *ne* are just two remnants reflecting the transitional phase of the vowel system of TB neutralizing the contrast between *e* and *i* in favour of the latter.

Beside verbal roots underived lexical items belonging to various other categories also show this general tendency of restructuring. Compare for instance the following set of words belonging to SCB and TB.

188.	SCB	TB		SCB	TB	
	pẽadʒ	ɸiaz	'onion'	beʈal	biral/bilai	'cat'
	bʰedʒa	b'iza	'wet'	ʃekoʈ	ʃikɔr	'root'
	teto	tita	'bitter'	ʃeal	ʃial	'fox'
	dʒed	zid	'anger'	ʃeddo	ʃiddɔ	'boiled'
	petol	ɸitɔl	'brass'	bʰetɔr	b'itɔr	'inside'

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[36] In all these cases verbal root corresponds to the Second Person Imperative (ordinary) form, which bears no overt morphological marker.

Against this general backdrop of *e* neutralizing to *i,* a logical question crops up regarding the underlying identity of *e* present in so many mono-morphemic sequences in TB. In the absence of alternation it becomes difficult to establish the underlying form of any linguistic item. A null hypothetic suggestion would be to hold the underlying representation as identical to the surface realization. By such an account *e* will be accorded a substantial position in the core inventory of segments of TB and this certainly is contradicted by the preceding observations (cf. 187-188) where *e* is found to be neutralizing to *i* in TB. This change is independent of any phonological conditioning. In fact any instance of harmonic alternation of *e~i* induced by a trigger, palpable or otherwise, other than those in the members of the verbal paradigms of *de* and *ne* is unattested in TB.[37] Given this overall absence of any harmonic *e~i* alternation on the one hand and the general picture of *e~i* neutralization on the other, one has a strong reservation against the underlying presence of *e* in TB stems. We have therefore no concrete suggestion as yet for what could be the underlying form of the surface *e* in TB.

Contrary to the absence of *e~i* alternation, there is a large number of cases where *ɛ* harmonizes to *e* under the influence of a suffixal high vowel[38]. The following set of

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[37] Ghosh (1996) explains harmonic raising of *e* to *i* (among others) in SCB as an instance of [+ATR] spreading from a phonetically present or deleted high vowel: *ken* → *kini/kinlam*, *gel* → *gili/gilbe* etc. In addition he also notes qua Basu (1975) that SCB attests instances of "Mutual Vowel Harmony" whereby *bilat* → *bilet* → *bilet-i* → *biliti* 'foreign', *deʃi* → *diʃi* 'native' etc. Such alternations are unattested in TB.

[38] Unlike in SCB verbal paradigms for these roots, presence of the suffixal high vowel in the inflectives is a must in TB: *bɛs-i* → *besi*, but *bɛs-il-am* → *bɛslam/*beslam* etc. This distinction in terms of transparency of the conditioning factor is likely to have a substantial bearing on the interpretation of vowel

examples representing various lexical categories in both derivational and inflectional

morphology, bear this out.

189a. Verbal inflection

Root		Suffix				
lɛk		i	→	lehi	'write, 1P, Pres.'	
dɛk		i	→	dehi	'see, 1P, Pres.'	
bɛs		i	→	besi	'sell, 1P, Pres.'	

189b. Denominal adjectives/nouns

Noun		Suffix				
dɛʃ	'country'	i	→	deʃi	'native'	
tɛz	'anger'	i	→	tezi	'angry'	
kɛʃ	'hair'	i	→	keʃi	'hairy'[39]	
bɛʃ	'dress'	i	→	beʃi	'person wearing that dress/look'	

189c. Nominal inflections: gender

Noun		Suffix				
bɛɖa	'male'	i	→	beɖi	'female'	
zɛɖa	'uncle'	i	→	zeɖi	'aunty'	
b'ɛra	'ram'	i	→	b'eri	'ewe'	

In all the examples above the surface realization of *e* is contingent upon the presence of

the suffixal high vowel in the following syllable and more significantly, in all cases the

stem contains *ɛ*. This *ɛ~e* alternation is therefore a strong piece of evidence that a rule of

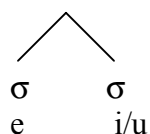harmonic raising involving the two vowels is already there.

For further corroboration of the same phenomenon, let us now introduce evidence

from mono-morphemic sequences. In such sequences, in the absence of any palpable

harmonic alternation, distributional properties of a particular segment functions as a

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harmony in TB as opposed to that in SCB. Discussion of vowel harmony in TB is however outside the scope of this thesis.
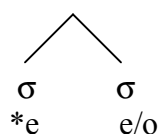
[39] This and the words like the following normally exist as the second member of compounds which function both as noun and adjective: *kalɔ-kɛʃ* → *kalɔ-keʃi* 'black haired (fem. N/A)', *sɔddɔ-bɛʃ* → *sɔddɔ-beʃi* 'disguised (N/A)'.

canonical diagnostics. On the strength of the insight achieved from the derivational

phenomena in (189), it may be hypothesized that *e* occurs only in a context preceding a

high vowel. Examples in (184) above have already familiarized us with this phenomenon.

However, a thorough survey is well warranted for a clear-cut statement. Let us look at the

following examples, which are uniformly non-derived.

190. a.

      σ   σ
      e   i/u

b.

      σ   σ
      *e   e/o

191. a. ɸeti   'petty'   b.   belun 'balloon'

       ɸeʃi   'muscle'   redu   'radio'

       beli   'a kind of flower'   ketu   'last of the nine planets

       keɖi   'small'   renu   'pollen'

       meni   'a kind of small fish'   meru   'polar'

       triβeni 'confluence of three streams' ʃumeru 'the North Pole'

No underived word in TB instantiates the distribution of *e* graphically presented

in (190b). In fact the closest approximation to a sequence of '*e e*' across syllable is '*ɛ ɛ*':

ɖɛrɛʃ 'lady's finger', *b'ɛrɛʃ* 'bull'. Similarly a phonotactic restriction against

occurrence of *e* and *o* in successive syllables results in the realization of SCB words like

the following with a sequence of *ɛ* and *ɔ* in TB.

192. SCB   TB   SCB   TB

      tero   tɛrɔ 'thirteen'   reʃon   rɛʃɔn 'provisions'

      beton   bɛtɔn 'salary'   beʃon   bɛʃɔn 'powdered pulse'

      reʃom   rɛʃɔm 'silk'

Consideration of the words in (191-192) shows that the deciding factor behind the

occurrence of *e* is the presence of the succeeding high vowel even in mono-morphemes.

So let us now put together the facts about the front vowels of TB and their possible implications for the vowel inventory.

193. a. *e* never harmonizes to *i* (except in *de* and *ne*)
      b. *e* neutralizes to *i.*
      c. *ε* harmonizes to *e* under influence of the following high vowel.
      d. Presence of *e* in mono-morphemes is preconditioned by the presence of a succeeding high vowel.
      e. A non-high vowel in the following syllable exercises a lowering effect on the preceding *e* in TB vis-à-vis SCB.

By analyzing the above facts it can be logically deduced that there is a virtual gap in the utilization of the vowel space in TB compared to that in SCB. The stem phonology of TB has hardly any underlying *e* and this gap is filled at the phonetic level by the harmonic raising of the next lower vowel i.e. *ε* to *e*. This dispersion of the vowel quality towards the periphery runs counter to the observed phenomenon in SCB, especially in the verbal stems which instantiate a systematic absence of the high vowel *i* (and also *u*) and the gap is filled up by harmonic raising of the next lower vowel *e* (cf. Ghosh 1996). A comparative picture of the situations prevailing in the two varieties of Bangla can be diagrammatically presented as in (194).

194   a. SCB   b. TB

*i   i

e   *e

ε   ε
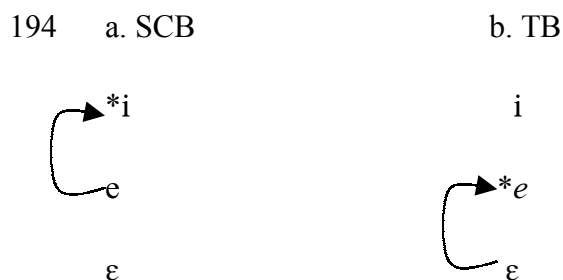
* indicates the absence of the concerned vowel in the underlying inventory.

By the standard of universal conventions this is a rather strange situation. For universally because of their perceptual salience peripheral vowels are treated as

'unmarked' and hence 'primary'. Consequently, as Crothers (1978), notes even the smallest known systems tend to contain (only) high and low vowels; and the complexity of quality distinction increases along the vertical axes in proportion to the number of points contrastively exploited by a particular language in between the peripheries. SCB stands out as an odd exception in this respect. The process of major restructuring supplanting *e* with *i* observed in TB is therefore a logical development towards restoring the Bangla vowel system in general to the dicta of universal conventions. May be in course of time this restoration process will also invade through the lexicon of the standard variety if the existing rule of harmonic alternation of *e~i* in SCB is any indication to go by. Seen in this light the disturbing remnants of underlying *e* in TB should be construed as symptomatic of transitional instability.

3.1.3 *ɔ~o* alternation and implication for vowel inventory

A similar picture emerges in respect of the underlying relation between *o* and *ɔ* in TB. Compared to the latter independent occurrence of the former in non-initial position is highly restricted. *bo* 'bride' (183f) is perhaps the only underived word with final *o*.[40] In the non-final position occurrence of *o* is preconditioned by the presence of a succeeding high vowel unless *o* occurs in the *initial* syllable[41]: *nɔd* 'river' ~ *nodi* 'river', *gɔd* 'routine' ~ *godi* 'cushion', *g'ɔr* 'home' ~ *g'ori* 'watch' etc. Again distributionally *ɔ*

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[40] *lo, go* are both clitics as they can occur only as an adage to another word: *hɛ̃-go, ma-go, koi-lo, ʃoi-lo* etc. Words like *b'alo* 'well', *kalo* 'black' are latest entries and bear strong signs of SCB. The typical TB words for these are *b'ala* and *kala. ko* 'where' is again a contracted form of more commonly used *koi.*

[41] The word *initial* is deliberately italicized to imply that the statement is only partially true since in the subsequent discussion it will be argued that *o* can occur independently (i.e. without being licensed by a high vowel in the following syllable) only if the host syllable is the most prominent one in the word.

enjoys a much greater freedom than *o*. Understandably such factors point towards a so-called complementary relationship between the two. But such an option is at once preempted by the presence of such contrastive occurrence of the two vowels in pairs of words like the following.

195. rɔg   'artery/vein'   tɔla   'bottom'   gɔla   'throat'
      rog   'disease'   tola   'unit of weight'   gola   'granary'

We have encountered a similar paradox in the previous section in case of identifying the underlying identity of *e* and *ɛ*; and in the ultimate analysis this conflicting state of affairs is found to be indicative of a deep rooted process of restructuring underway in the vowel inventory of TB. Perhaps we are in for another such experience especially given the fact that *o* is also a non-peripheral vowel like *e* and across languages, preference for non-peripheral vowels is more marked than that for peripheral ones. An inquiry of the phenomenon is therefore in order.

Since the present study is specific to stem vowels and since verbal stems constitute a sizable body of it, let us start with a comparative survey of the verb roots of SCB and TB to see if there is any instance of root vowels gravitating towards *u* from *o*. Remember, a corresponding evidence in respect of *e~i* provided the first major argument in favour of the absence of *e* in the underlying inventory of TB. Let us therefore consider the following set of data.

196.a.

SCB	TB		b. SCB	TB	
kʰõʈ	kʰor	'dig'	bodʒʰ	buz	'understand'
tʃʰol	s'ol	'peel off'	gʰor	g'ur	'turn around'
dʒoʈ	zor	'attach'	oʈʰ	uʈ	'get up'
tol	tol	'lift'	kʰõʈ	kʰuʈ	'erase with nail'
kʰol	kʰol	'open'	gol	gul	'dilute'
doʃ	doʃ	'blame'	ʃon	ʃun	'hear'
ʃo	ʃo	'sleep'	dʒʰol	zu'l	'swing'
tʰo	tʰo	'keep'	tʃʰoʈ	s'uʈ	'run'
dʰo	d'o	'wash'	bʰol	b'ul	'forget'
ro	ro	'plant'	ʃod	ʃud	'repay'
no	no	'bend forward'	bon	bun	'weave'
tʃʰõ	s'o	'touch'	poʃ	ɸuʃ	'rear'
do	do	'milk'	dʒʰõk	z'uk	'bend'

In all the words above the verbal form for the Second Person Imperative (ordinary) is treated as the root because of the absence of any overt morphological augment. (196) contains a fairly exhaustive survey of verbal roots containing both *o* and *u*. In (196a) the controversial root vowel is identical both in the standard and the non-standard dialects. But an equal number of roots also instantiates restructuring of *o* to *u* as shown in (196b).[42] Though the picture is not as radical as that prevailing in case of *e~i* noted in (187), nevertheless there is no denying the fact that the process of supplanting *o* with *u* has already diffused through a sizable chunk of the TB lexicon. Again, that this process of *o~u* neutralization is not confined to verb roots alone is proved by the following set of cross-categorial non-derived words from TB.

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[42] Significantly, at least one verb root meaning 'to count' undergoes restructuring through vowel lowering in TB vis-à-vis SCB: *gon* (SCB) → *gɔn* (TB). This is exactly like what happens in case of the verb meaning 'to write' where SCB *e* is lowered to *ɛ* in the TB counterpart: *lekʰ* (SCB) → *lɛk* (TB).

197.

SCB	TB			SCB	TB		
dʒʰol	z'ol	~ z'ul	'gravy'	kol	kol	~ kul	'lap'
kʰor	khor	~ khur	'addict'	dʒõk	zok	~ zuk	'leech'
lol	lol	~ lul	'saliva'	rog	rog	~ rug	'disease'
poka	ɸok	~ ɸuk	'insect'	dʒuto	zota	~ zuta	'shoe'
moʈa	moɖa	~ muɖa	'fat'	gʰoɽa	g'ora	~ g'ura	'horse'
kon	kona	~ kuna	'corner'	loha	loa	~ lua	'iron'
kumɽo	komra ~ kumra		'pumpkin'	gõʃai	goʃai	~ guʃai	'preceptor'

We have already noticed that for harmonic alternation physical presence of the trigger is commonplace in TB both in morphologically simple and complex circumstances[43]. Consequently, absence of any succeeding high vowel functioning as a trigger rules out the possibility of harmonic raising as opposed to neutralization. Optionality in this respect merely signifies a state of transitional indeterminacy.

(196) and (197) put together argue for the fact that there exists a strong undercurrent of replacing *o* with *u* in TB though the degree of success in this respect is not as spectacular as in case of *e~i*. Nearly 50% of verb roots (cf. 196b) have undergone vowel neutralization in favour of the peripheral vowel *u*[44] and the picture is symmetrical to that of *e~i* neutralization. But what is perhaps more important from the theoretical point of view is that it seeks to fill up the underlying gap in the vowel inventory of Bangla which (qua Ghosh 1996) lacks the high vowels *i* and *u* against the universal practice of giving primacy to peripheral vowels over medial ones. Understandably such a

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[43] There are at least two counterexamples where the trigger is physically absent in the context: *tol* →*tultam* 'lift, 1P. Past', *kʰol* → *kʰultam* 'open, 1P. Habitual Past'.

[44] The remaining 50% of the verb roots containing *o* undergo harmonic raising under the influence of suffixal high vowel as it happens also in SCB. Such phonologically conditioned alternations being theoretically inconsequential for the underlying inventory, do not merit focused consideration here.

proposition entails the responsibility of critically responding to the host of counterexamples offered by TB.

For a clearer view of the underlying identity of these counterexamples it is advisable to start out with the palpable cases of alternations for which derived context is the ideal. As in case of other alternations discussed in the preceding section the harmony factor rests in the suffixal high vowel. Counterexamples to *o~u* neutralization fall into two categories: those verbal roots, which are presumably yet to undergo restructuring; and those, which come to contain *o* as a consequence of raising under suffixation. We shall address the former in a subsequent section for reasons to be clear in due course. In the latter case the root vowel obviously originates as *ɔ* i.e. one notch down in the vertical scale as we notice in the following.

198. Verb root   Suffix
      sɔl   i   →   soli   'walk, 1P. Pres'
      ʃɔr   i   →   ʃori   'move aside, 1P, Pres'
      gɔn   i   →   goni   'count, 1P, Pres'
      lɔr   i   →   lori   'waver, 1P, Pres'

The conclusion is the same as that for *ɛ~e* alternation: *ɔ* is raised to fill up the virtual vacuum created by the neutralization of the *o* to *u*. But this raising is only a surface phenomenon and fails to affect the underlying inventory: *ɔ* nowhere neutralizes to *o*.

Since the scope of present inquiry is primarily confined within stems, for clinching evidence one should look at the non-alternating sequences and in this respect examining the phonotactics of vowel distribution provides the chief methodological help.

Guided by the insight offered by the derived contexts in (198), we expect to find *o* in a word provided it is followed by a high vowel in the next syllable.

199.a.

```
        σ       σ                              σ       σ
        o      i/u                             o      *e/o
```

b.
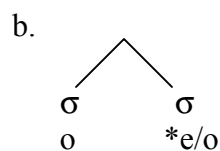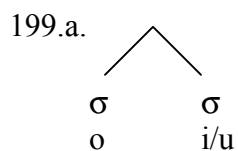
200.a. boli   'ritual sacrifice'   b. kosu   'arum'
        koβi   'poet'   mod'u   'honey'
        kosi   'tender'   goru   'cow'
        nodi   'river'   zorul   'naevus'
        ʃorir   'body   korul   'bamboo seedling'
        gorib   'poor'   korun   'sad'
        ɔtoʃi   'kind of flower'   roʃun   'garlic'

Illustrations in (200) justify the claim that for phonotactic reasons occurrence of *o* is dependent upon a following high vowel. This claim is indirectly supported by the following set of negative evidence derived through a comparison of some SCB words having a sequence of '*ɔ o*' across syllable boundary with their counterparts in TB. In the latter the vowel of the second syllable weakens to *ɔ* since it is not licensed by a succeeding high vowel.

201.   SCB   TB   SCB   TB
        ʃɔrot   ʃɔrɔt 'autumn'   kɔlom   kɔlɔm   'pen'
        gadʒor   gazɔr 'carrot'   ʃohor   ʃohɔr   'city'
        naʈok   naʈɔk 'drama'   kʰobor   kʰoβɔr   'news'
        gorom   gorɔm 'hot'   bɔʃonto   bɔʃɔntɔ[45]   'spring time'

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[45] In terms of the concept of prosodic licensing or faithfulness to prosodic heads, *o* in the medial syllable, which is also the most prominent syllable in this word, should have retained its underlying features. But it should be kept in mind that we are dealing with an ongoing process of *o~u* restructuring which has acquired nearly 50% success. All that we argue for in this thesis is that the instances of *unchanged o* are arrested only in the most prominent syllable unless there is a high vowel in the following syllable.

No mono-morphemic word in TB has a sequence of '*o e*'. The SCB sequence of '*o o'* is reduced to '*o ɔ*' in the absence of a succeeding high vowel in words like *ʃolo* (SCB) → *ʃolɔ* (TB) 'sixteen', *gopon* (SCB) → *goɸɔn* (TB) 'secret' etc. We do not address here the issue of what protects the initial *o* from being reduced to *ɔ* since a detailed discussion follows on this in the succeeding section.

Let us now summarize the phonological facts concerning *o* and what do they imply for the status of *o* in the underlying vowel system of TB.

a. A major restructuring of lexical categories enforces neutralization of *o* to *u*.
b. *ɔ* harmonizes *o* to under influence of the following high vowel.
c. Presence of *o* in mono-morphemes is conditioned by the presence of a
   succeeding high vowel.

The gist of the whole story is that there is another gap in the vowel inventory of TB in the form of the absence of *o*. But this gap is yet to emerge as an absolute one compared to the near-complete one in case of *e*. This gap however is phonetically filled up for surface requirement by harmonic raising of the next low vowel *ɔ*. This restructuring of the vowel inventory is in perfect harmony with the cross-linguistic practice of according unmarked value to the peripheral vowels compared to the non-peripheral ones. Seen in this universal perspective, certain directionality of language change becomes predictable from the analysis of the emergent vowel inventory: in the long run TB, and perhaps Bangla as a whole, may move towards a five vowel inventory for non-derived lexical items with the following members: *i, u, ε, ɔ, a;* presence of *e* and *o* will be restricted to surface alternation.

3.1.4 Prosodic Licensing and evidence for primary prominence

In course of this brief exposition of the underlying inventory of vowels in TB and Bangla in general, we have seen that the undercurrent of restructuring which is gradually eroding the phonemic basis of *e* and *o,* has achieved only 50% success in case of *o* in comparison to the degree of its success registered in respect of *e.* In the latter instance the process is nearly complete.

It would be theoretically interesting to examine the distribution of the so-called exceptional occurrences of *e* & *o* in TB. In (201) we formalize the contexts of the occurrence of the latter.

202.   a. #(C)o(C)
   b. #Co.CV(C)
   c. (**.** **.**).Co.Ci/u(C)

(202a-b) imply that *o* can occur in the initial syllable irrespective of the presence and nature of the following vowel. We have already seen the presence of *i, u, ɔ, a* in the syllable following the one containing *o*. That *e* can also occur following *o* is proved by the following examples from derived contexts: *tol-e* 'lift, 3P. Pres.', *khol-e* 'open, 3P. Pres.', *kol-e* lap, Loc.' etc. In all other contexts i.e. in word medial syllables, occurrence of *o* is strictly determined by the presence of a high vowel in the following syllable (cf. 202b). Stated differently, word-internal distribution of *o* is phonotactically determined, as it is contingent upon a succeeding high vowel. Consequently there is some phonetic grounding in the word internal distribution of *o* in the form of what Ghosh (1996) following Pulleyblank (1993) designates as [+ATR] harmony while discussing similar

cases in SCB. In fact evidence from derived contexts[46] (cf. 198) show that stem internal ɔ

harmonizes to *o* in response to [+ATR] harmony present in the suffixal high vowel. By

contrast no such factor is perceptibly at work in enforcing the occurrence of *o* in word

initial syllables. The question to ask therefore is what is so special about the initial

syllable that it can be a legitimate licensor of an otherwise marked segment. Answer to

this question lies in the concept of prosodic licensing or faithfulness to prosodic heads

(cf. §3.1).

The occurrence of *o* is restricted to the word-initial syllable unless it is followed

by a high vowel in the next syllable. Obviously this word-initial syllable enjoys some

special status compared to others in the word. In our analysis of TB metrics in the

previous chapter the locus of the primary stress has been shown to be the initial syllable

unless it is followed immediately by a heavy syllable. But that was merely an

assumption; we did not offer any argument in favour of the distinction between primary

and secondary stresses in TB. The phonotactics of *o* now offers an evidence for primary

stress.

In TB normally the initial syllable is stressed and seen in the context of the

phonotactics of *o*, this implies that this vowel can occur only in a stressed syllable. In that

case we expect to find *o* in all foot initial syllables since TB constructs trochees from left

to right. But since *o* is not attested in the head syllable of other than the initial foot (when

not licensed by a succeeding high vowel), the logical conclusion to be drawn is that

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[46] In derived words it is primarily the presence of the suffixal high vowel that ensures the occurrence of *o* in the immediately preceding syllable which inevitably belongs to the stem whether initial or not: *ʃahɔʃ-i* → *ʃahoʃi* 'courageous', *manɔb-i* → *manobi* 'woman', *kɔr-i* → *kori* 'do, 1P Pres.' However if the monosyllabic stem contains *o* and that syllable occupies the initial position in the derived word the role of the suffixal vowel is irrelevant: *tol-ɔn* → *tolɔn* 'lifting', *zor-ɔn* → *zorɔn* 'attaching' etc.

occurrence of this marked segment is restricted to iteration initial foot which being the head foot universally contains the most prominently stressed syllable. And TB feet being only trochees the locus of *o* is the most prominent syllable in a word.[47] Obviously this is a case of prosodically conditioned licensing or faithfulness to prosodic head; and this provides clinching evidence in favour of our implicit assumption in the metrical analysis of TB that the latter makes distinction between primary and (at least) secondary stresses.[48]

An even stronger evidence for *o* being licensed only in primary stressed syllable in TB is offered by the following set of trisyllables in which the heavy second syllable attracts primary stress and consequently ensures the preservation of the underlying featural identities of the vowel it contains. A comparison with the corresponding SCB forms makes the point clear.

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[47] The following set of words is likely to prove a potential source of counterexamples especially due to progressive increase in literacy as well as the influence of SCB. But a careful observation shows that the native TB speakers are prone to replace *o* in the SCB counterparts of the words with *u* and less often with *ɔ*.

SCB	TB		SCB	TB	
alotʃɔna	alusɔna / alɔsɔna	'discussion'	ʃudʒog	ʃuzug	'chance'
ʃɔmalotʃɔna	ʃɔmalusɔna / ʃɔmalɔsɔna	'criticism'	ʃodʒa	ʃuza	'straight'

SCB	TB		SCB	TB	
niyog	niyug	'appointment'	ayodʒɔn	ayuzɔn/ayɔzɔn	'arrangement'
niyom	niyɔm	'rules'	ʃɔɲʃodɔn	ʃɔɲʃudɔn	'correction'
biyog	biyug	'deduction'	ʃɔŋdʒodʒɔn	ʃɔŋzuzɔn	'addition'

[48] Attempt to make further distinction in the degrees of prominence is theoretically unrewarding and hence not pursued here.

203. SCB   TB
      ʃudʒóggɔ   ʃuzóggɔ   'perfectly eligible'
      aróggɔ   aróggɔ   'curable'
      alóʃʃɔ   alóʃʃɔ   'idleness'
      atʃódna   asódna   'idiot, sl'
        --   aɸóŋɖa   'wicked, sl'
      (?)aghomʈa   ag'ómɖa   '(woman) without headgear'[49]

Remnants of *e* found only in the initial syllable of the six mono-morphemic (mono-syllabic) words -- *ke* 'who', *ze* 'who rel.', *te* 'he', *he* 'she', *de* 'give' and *ne* 'take' – further substantiate the observation that the TB makes distinction between primary and secondary stresses: this marked vowel is licensed only in the most prominent syllable of an underived word. The reason why *e* does not occur even in disyllables unless licensed by a succeeding high vowel is perhaps because its restructuring is nearly complete unlike that of *o*.

In sum, we have strong evidence from the vowel phonology of TB in support of our claim that there is a distinction between the primary and non-primary level of prominence. The two marked vowels *e* & *o*, which are gradually losing their phonemic status as a consequence of restructuring of the vowel inventory of Bangla, can still survive independently – i.e. when not licensed by a succeeding high vowel -- iff they occur in the most prominent syllable of the word. A principled explanation of the phenomenon follows if licensing is looked upon as faithfulness to prosodic heads.

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[49] An objection may be raised against the point being made here on the basis of the *counterexamples* like *anɔ́ndɔ* 'joy', *ɔhɔ́ŋkar* 'pride', *aʃɔ́ŋka* 'apprehension' etc. But such an objection is at once nullified if it is remembered that all that we are advocating for is that neutralization of *o* to *ɔ* or *u* is a part of the general restructuring (on going) of the vowel inventory of TB. The remnants of *o* are attested only in the most prominent syllable of a word thanks to the well-attested, widespread phenomenon of faithfulness to prosodic heads.

Presenting an OT account of the phenomenon is however outside the scope of the present research.

3.2 Prosodic Licensing and evidence for binary foot

The converse of licensing is, of course, weakening and weakening in non-head position is also attested in TB. Underlying phonological features of certain consonants are licensed in prosodic heads but weakened/neutralized in other positions. This distinction between head and non-head position automatically implies the presence of the relevant prosodic category. The latter we assume is a binary foot (trochee) constructed maximally i.e. disyllabic foot.

Consonant weakening is a typical character of the non-standard dialects belonging to the eastern part of the greater Bengal. In Das (1996) I have noted various weakening processes such as fricativization of affricates (*tʃ, tʃʰ, dʒ, dʒʰ*), deletion of plosives (*k, p*), substitution of palato-alveolar fricative *ʃ* by the placeless fricative *h* etc. etc. in the Noakhali dialect of Bangla (henceforth NKB). In TB we notice different types of obstruent weakening taking place: *tʃ, tʃʰ →s; dʒ, dʒʰ →z; ʃ→h, p→ɸ* etc. These changes take place across the board.[50]   But there are some consonants that undergo weakening rather

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[50] *p~ɸ* alternation is however resisted in clusters, geminated or otherwise. For evidence let us look at the following set of TB words compared with their SCB counterparts to highlight the distinction brought about in them by weakening. We shall not go into the phonological factors that license non-weakened *p* in case of clusters and geminates in this thesis.

SCB	TB		SCB	TB	
peʈ	ɸɛʈ	'belly'	tʃɔppol	sɔppɔl	'slippers'
bipod	biɸɔd	'danger'	kʰɔppor	kʰɔppɔr	'trap'
alap	alaɸ	'conversation'	ʃɔmpod	ʃɔmpɔd	'asset'

selectively. For instance fricativization of the voiced labial is restricted to certain limited contexts. But predicting these contexts is a real challenge as the following examples suggest.

204a.			b.		
SCB	TB		SCB	TB	
baba	baβa	'father'	dʒɔbabi	zɔβabi	'in reply'
bibi	biβi	'wife'	hiʃabi	hiʃabi	'calculating'
bibek	biβɛk	'conscience'	abiʃkar	abiʃkar	'discovery'
ʃabol	ʃaβɔl	'shovel'	abirbʰab	abirβ'ab	'advent'
			poribeʃ	ɸoribɛʃ	'environment'

Scrutiny of the words in (204a) suggests a simple observation: *ß* occurs intervocalically while *b* occurs only elsewhere. But this observation fails to explain why the labial resists fricativization in *hiʃabi, ɸoribɛʃ, zɔßabi* etc. despite being intervocalic. More intriguingly, in *abirßab, b* occurs in between vowels, while *ß* occurs between a consonant and a vowel.

A principled account of this baffling distribution of *b* & *ß* follows if we assume that in TB a) feet are disyllabic trochees; b) feet are never ternary; and c) a (heavy) monosyllabic foot is always terminal. Assumption (a) means the range of possible foot shapes (trochees) in TB include (´HL), (´HH), (´LL). The anti-trochaic combination (´LH) is permitted only in disyllables owing to the undominated restriction against word final primary prominence (cf. NON-FIN (178)). Assumption (b) states that the maximal size of the foot in TB is binary which is obviously fulfilled at the syllabic level. Assumption (c) implies that the occurrence of a (heavy) monosyllabic foot is always restricted to the word final position as in (´LL)(`H). The question how this monosyllabic foot is going to

fulfill the requirement of maximal foot construction (by proposing a catalectic syllable at the right edge of the PrWd or through any other means) is a debatable issue and the present thesis does not address this.

With these assumptions we can answer the question why the labial stop weakens to a fricative in the second syllable of *baßa* and *bißi*. The second syllable is unstressed and hence the weak position within a binary foot. By contrast the first syllable in these words are stressed and hence strong positions. Cross-linguistically it is an attested fact that weakening takes place in such prosodically non-prominent positions. Owing to universal conventions of faithfulness to prosodic heads stressed syllables are capable of licensing the otherwise marked linguistic items. In the case at hand we witness that against the general tendency of fricativization of labial stop *b,* the latter is licensed in the prosodically strong positions while it is subjected to weakening in weak positions. Such a convincing explanation of the phenomenon is the consequence of assuming that feet are maximally binary in TB.

One might argue at this point that given that TB is a quantity sensitive system where heavy syllables attract stress (cf. previous chapter) why the second syllable in the remaining words in (204a) which have an internal make-up of (LH) should instantiate consonant weakening. The answer is simple. In TB disyllables (as we have seen in the previous chapter), irrespective of the distribution of light and heavy syllables, it is the initial syllable that receives the (primary) stress because of the inviolable restriction against the placement of the primary prominence on the final syllable in a PrWd. In a word like *ʃaßɔl* which has a metrical pattern like *(ʃá.ßɔl)*, the second syllable despite

being heavy is an unstressed one and hence a prosodically weak position. The labial stop *b* is predicted to undergo weakening in this position by the theory of prosodic licensing interpreted as positional faithfulness or more appropriately in the present context, as contextual neutralization.

The apparently idiosyncratic distribution of the labial stop and fricative in (204b) also falls into place in the wake of the explanation provided by prosodic licensing. *zɔßabi* and *hiʃabi* contain only light syllables. In both a trochee is constructed over the first two syllables and the last syllable remains unfooted: (ˊLL)L. This unparsed syllable (standing outside the domain of a foot) is prosodically *invisible*. Hence the question of its being prominent or non-prominent is irrelevant. Equally irrelevant therefore is the issue of why the labial in this syllable should or should not undergo weakening. On the contrary, the foot-internal labial in *(zɔ́.ßa).bi* predictably undergoes weakening since the latter does not occupy a prosodic head position.

We now extend the same analysis based on prosodic licensing to *abiʃkar* and *abirßab*. In the former the labial resists fricativization. This is because in TB words longer than disyllables, the initial primary prominence shifts to the heavy second syllable in case the first syllable is light owing to undominated WSP, the constraint that stipulates that heavy syllables be stressed. In disyllables this requirement is overridden by the stronger need of avoiding word-final main stress (cf. NON-FIN). The stress distribution pattern in *abiʃkar* is therefore L(ˊHH). Obviously the labial occurs in a stressed syllable i.e. a prosodic head and consequently resists weakening.

Another crucial observation in this connection is that two successive heavy syllables in TB do not initiate two feet as that would result in stress clash. The latter is strongly prohibited by the undominated ranking of anti-clash constraint *CLASH. This information has a direct bearing on the unraveling of the mystery behind the variable realizations of the labial obstruents in a word like *abirßab*. Descriptively, the heavy second syllable attracts (primary) stress due to WSP and the heavy third syllable is prohibited from projecting a separate foot because of *CLASH. This results in a stress pattern of L(´HH). Being in the unstressed syllable within a foot the second *b* undergoes lenition.[51] *ɸoribɛʃ* offers another nice study in repetition with variation. It has a parsing of (´LL)(`H). The last syllable being heavy forms a foot without outraging the demands of *CLASH and NON-FIN. Consequently the stressed syllable functions as a licensor of the [-cont] feature, among others, of the labial consonant qua the principle of faithfulness to prosodic heads.

In sum, a logical explanation of the phenomenon of consonant weakening is possible iff foot-binarity is assumed as the basic principle of metrical parsing for TB. The concept of prosodic licensing interpreted as faithfulness to prosodic heads then fleshes out the specific details of the explanation: underlying contrasts are neutralized in the non-head position and preserved in head position. To further justify this analysis and to derive

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[51] We do not offer any explanation for the word final realization of the labial stop (which is incidentally in the foot-internal weak syllable in *abirßab* since projecting a comprehensive picture of the segmental phonology is beyond the scope of our present research. Yet it can be suggested that the word final syllable is also considered as a linguistically privileged position that can license underlying contrasts. For example consider the following observation of Beckman (1998:1): Positions which are psycho-linguistically prominent are those which bear the heaviest burden of lexical storage, lexical access and retrieval, and processing: root–initial syllables, roots and, to some degree, final syllables….

additional support for binary foot parsing in TB we look at another spectacular phenomenon of consonant weakening in the following sub-section.

3.2.1 *k*-weakening and evidence for binary foot

As noted at the beginning of this chapter obstruent weakening is a characteristic feature of the eastern dialects of Bangla. Among obstruents the voiceless velar plosive is the most affected one. In the dialects of Dhaka and Cumilla intervocalic *k* weakens to *h*. In the Sylhet and Chattagram dialects *k* is pronounced as χ. In the NKB this velar is deleted in between two vowels (cf. Das 1996). Universally, weakening progresses through a process of 'stop → oral fricative → glottal fricative → deletion'.[52] Given this, there is an aerial distribution of the chain *k*→χ →*h* →Ø among the various eastern dialects of Bangla with different dialects exemplifying different phases of weakening. Despite the composite character of TB (born out of the commingling of many dialects of eastern Bengal) in this dialect the stage of weakening for *k* coincides with *h*.

k→*h* is not a random process in TB however. A careful study reveals that there is a predictable pattern of velar weakening sensitive to certain prosodic conditions. To understand this properly let us first look at the following set of comparative data.

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[52] As Lass (1984) notes all Germanic *h* are from χ from Indo-European *k*. In Uralic, Ostyak, Hungarian, Yurak *h* is from *k*. In Manda, Kui also *h* originates from *k*. *h* however can be a weakened realization of many other obstruents: in Armenian and also in Dravidian, in Kannada it is from *p*; in Latin from *g*; in Classical Greek from *s;* in Pengo, Kuvi from *c;* and in NKB it is from *ʃ* and *p*.

205.

a.

SCB	TB		SCB	TB	
kaka	(ká.ha)	'uncle'	tʃakor	(sá.hɔr)	'servant'
kaki	(ká.hi)	'aunt'	ʃaikel	(sái.hɛl)	'bicycle'
ʈaka	(ʈɛ́.ha)	'money'	ʃɔkal	(ʃɔ́.hal)	'morning'
ɖake	(ɖá.he)	'call, 3p. Pres.'	bikal	(bí.hal)	'afternoon'
ɛka	(ɛ́.ha)	'alone'	ʈhakur	(ʈʰá.hur)	'god/priest'

b.

SCB	TB		SCB	TB	
ɛkaki	(ɛ́.ha).ki	'alone'	tagada	(tá.ha).da[53]	'urging/hurry'
bekari	(bɛ́.ha).ri	'bakery'	pɔtaka	(ɸɔ́.ta).ka	'flag'
tʃalaki	(sá.la).ki	'cleverness'	obikol	(ó.βi).(kɔ̂l)	'identical'
kʰoraki	(kʰó.ra).ki	'provisions'			

c.

SCB	TB	
onukɔron	(ó.nu).kɔ.(rɔ̂n)	'imitation'
onukɔmpa	(ó.nu).(kɔ́m.pa)	'compassion'

d.

SCB	TB	
porikɔlpona	(ɸɔ́.ri).(kɔ̂l.pɔ).na	'planning'

In the examples above we do not find any instance of word-final occurrence of *k.* Nor is there any word where *k* constitutes a part of a cluster. This is because in both these contexts the velar does not instantiate weakening. To delve into the probable factors responsible for these is however outside the purview of the present thesis. In all the cases wherever the velar weakens it occupies an intervocalic position. But the converse of the clause, that is, whenever the velar appears in between two vowels it weakens, is not true. The situation is identical to the one we have come across in respect of *b~ß.*

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[53] The fact that the SCB form of the word contains an intervocalic voiced velar stop in stead of a voiceless stop could be the result of intervocalic obstruent voicing at some point of time in history. For, to assume that even voiced velars can also get fricativized in between vowels is too radical at this stage for TB.

In the disyllables in (205a) a comparison of the TB words with the corresponding SCB forms shows that the velar in the onset of the second syllable weakens to *h*. Each disyllabic form is a trochee with the internal make-up of either (´LL) or (´LH). Obviously in the stressed (initial) syllable the velar stop retains its underlying features. By contrast when it occurs in the unstressed (second) syllable lenition takes place. Arguing from the theory of prosodic licensing as we have done in case of the voiced labial stop in the previous section, it is a case of prosodically determined phenomenon of segmental phonology. And explanation of such a phenomenon is crucially dependent on the construction of a binary foot form: only in the foot-internal weak position the velar weakens to a fricative. Final heavy syllables in disyllables do not attract stress owing to the undominated role of NON-FIN. Hence such a heavy syllable is a prosodically weak position and thus an ideal context for initiating obstruent lenition.

This analysis is further substantiated by the distribution of velars in the trisyllables in (205b). The critical case is that of *(é.ha).ki*. Any native speaker of TB straightway rejects the alternative forms like **(é.ha).hi* or **(é.ka).hi*. They would rather tolerate the SCB version than accept these alternative forms. This certainly reflects their strong verdict in favour of the prosodic analysis of the phenomenon we have offered here: an intra-foot non-head position is the ideal context for lenition. An unfooted syllable is insensitive to such phonological changes owing to its being prosodically *invisible* presumably. The absence of weakening in a word-final heavy monosyllabic foot in *(ó.ßi).(kɔl)* is also predicted straightway in terms of our analysis of weakening as based on the concept of prosodic licensing read as faithfulness to prosodic heads. In the longer

sequences (205c-d) too the same story is repeated. But what is so significant for us as well as for the theory is that the crucial factor behind the emergence of such an elegant analysis of the velar weakening process attested in TB is the adoption of binary foot as the fundamental unit of metrical parsing. With ternary foot the picture becomes chaotic.

3.3 Conclusions

In this chapter we have discussed two vital pieces of evidence from the segmental phonology in favour of the metrical analysis of TB offered in Chapter II. Both the pieces of evidence are based on the concept of prosodic licensing or faithfulness to prosodic heads. Consideration of the underlying vowel inventory has offered us clinching support for assuming the presence of stress distinction instantiating at least two levels of prominence: primary and secondary. The two marked vowels *o* and *e* are licensed only in the most prominent syllable in a word. Secondly, the two processes of obstruent weakening *b→ß* and *k→h* can be given a neat and principled explanation iff binary foot is assumed as a basic metrical unit for parsing. Both undergo weakening only in the non-head position of a binary foot (trochee) in TB though a fully fleshed-out OT analysis of licensing and weakening in TB must await future research.

Chapter IV

ISSUES IN THE PHONOLOGY OF TRIPURA BANGLA ENGLISH

4.0 Introduction

In the preceding chapters our discussion was predominated by the concern to develop an appropriate analytical device to account for the diverse rhythmic effects – binary and ternary – noted in the bounded systems of world's languages. In terms of OT, it has been shown that a redefined lapse constraint *LAPSE(DE) ranked appropriately with the alignment constraints can predict all the attested patterns in natural languages and its range of overgeneration is more restricted than that of its competitor, namely *LAPSE(E&K). In the present chapter we extend this analysis to TBE (or Tripura Bangla English). Our main point of interest in this respect is to provide a principled account to the *deviant* realization of the English stress pattern in the use of this language by the speakers of TB. Theoretically, this will have significant bearing on the issue of second language acquisition: how the latter is affected by the core patterns (of prosodic phonology) of the first language. Application wise, this will provide significant clues to

more effective teaching of English as a second language to the TB learners of English. But more significantly, as far as metrical phonology is concerned, certain basic issues are thrown up by the stress distribution pattern in TBE that severely contradict one of the canonical principles of metrification namely, the 'Iambic-Trochaic Law' (Hayes 1985, 1987, 1991, McCarthy and Prince 1986, 1990, Prince 1991, Vijver 1998). Offering a full-fledged explanation of these issues is however outside the scope of the present thesis and is left for future research.

The chapter is designed as the following. §4.1 discusses the metrical facts of TBE. §4.2 compares the metrical patterns of English and TBE. §4.3 provides a comparative analysis of the principles of stress assignment in TB & TBE and a representative OT analysis of the latter. § 4.4 states certain metrical features of TBE that go against the fundamental durational asymmetry between iambic and trochaic systems. §4.5 contains the conclusion.

4.1 Facts of TBE

TBE is a quantity sensitive system: heavy syllables attract stress. But only closed syllables count as heavy as in TB. Open syllables, whether containing a diphthong or a monophthong, are never considered for syllable weight distinction. Stress assignment proceeds from left to right with the main stress within the first two syllables. The general principle of main stress placement on the first syllable is violated only when the initial syllable is light and the second syllable is heavy. Syllabic trochees are constructed iteratively. A final heavy syllable can however initiate a foot. In the absence of heavy syllables stress is placed on every third syllable provided the word contains more than

four syllables. In sequences of up to four light syllables only one (initial) stress is attested. Morphological factors – such as affixation or category shift -- never play any role in determining stress location. We present the following set of TBE words is support of the above observations.

206.

édit	ároma	réfugee	sólidify	veránda	mágnanimòus
rély	hórizòn	anécdote	Ámerica	éxercìse	ánalỳticàl

The above pattern of stress distribution in TBE differs considerably from that of English. This becomes clear when we compare the metrical patterns of the two systems. We undertake this comparative analysis in the following section.

4.2 The metrical patterns of English and TBE

It is difficult to arrive at an uncontroversial generalization stating the core properties of the metrical patterns of English. Phonologists are divided over the issue of whether English rhythm is binary or ternary. Burzio (1994), for instance, strongly advocates ternary scansion for English. The majority opinion for metrification in English however, goes in favour of constructing binary feet (trochees) (cf. Liberman and Prince 1977, Hayes 1981, 1982, Halle and Vergnaud 1987, Halle 1990, among others). The reason for this is also not very difficult to find.

Word stress placement in English is sensitive to syllable weight as well as distance from the end of the word. The latter is also partially dependent on lexical category information. For example, verbs stress the final syllable if it is heavy and otherwise the penultimate syllable. Nouns, on the other hand, stress the penultimate syllable if heavy and otherwise the antepenult. Adjectives behave like verbs when

unsuffixed and like nouns when they are suffixed. Various extrametricality rules have been suggested to iron out such differences (cf. Hayes 1981, 1982, Giegrich 1992). For example, the weight sensitivity in the rule for verbs (207a) and underived adjectives (207b) can only be maintained if extrametrical status is accorded to word-final consonants and thus preventing the final syllables from counting as heavy in words like the following.

207. a. astóni\<sh\>   maintaí\<n\>   colláp\<se\>
          édi\<t\>   eró\<de\>   tormén\<t\>
          consíde\<r\>   applý   exhaús\<t\>

      b. fránti\<c\>   remó\<te\>   succínc\<t\>
          hándso\<me\>   discrée\<t\>   immén\<se\>
          stúrdy   extré\<me\>   robús\<t\>

It is possible to construct a uniform stress placement rule for nouns (208a) and derived adjectives (208b) as well provided the entire final syllable in the following words is treated as extrametrical.

208. a. Améri\<ca\>   aró\<ma\>   verán\<da\>
          metrópo\<lis\>   coró\<na\>   utén\<sil\>
          véni\<son\>   thrombó\<sis\> consén\<sus\>

      b. orígi\<nal\>   medié\<val\>   fratér\<nal\>
          signífi\<cant\>   anecdó\<tal\>   expén\<sive\>
          ´inno\<cent\>   defí\<ant\>   depén\<dent\>

The stress placement rule that emerges from the examples in (207-208) can thus be stated as: stress the final syllable if it is heavy otherwise stress the penult. But this simple account of stress assignment in English is not without its exceptions and the latter are in fact plenty. The lack of consensus among the accounts of English word stress

found in the metrical literature is mainly because of this plethora of exceptions. For instance, adjectives such as *módest* fail to fit the pattern, as do a large number of prefixed verbs such as *permít, repél, abét, forgíve*. Again, we have seen that adjectival suffixes and the final syllables of nouns are systematically ignored by the stress placement rule in English we have constructed above. However, not all suffixes or final syllable types behave in the same way: nouns ending in *–áire, -éer, -eé, -é/eť* and *–ése* as in *qestionáire, enginéer*, *referée*, *café* (US), *ballét* (US) have their final vowel stressed. In addition, certain syllables in underived nouns behave as though they are suffixes and get the stress: *machíne, platóon, antíque, políce, canóe, regíme* etc. Things get further complicated when we take note of the large number of polysyllabic nouns ending in long vowelled syllables in which the stress falls on the 'wrong' syllable, as in the following cited from Chomsky and Halle (1968: 78): *húrricàne, ánecdòte, pédigrèe, níghtingàle, cándidàte, cávalcàde* etc. Verbal forms ending in *-ate* behave in a rather similar way: *désignàte, cóncentràte, cónfiscàte, sálivàte* etc. Finally, we find dialect differences or doublets within a single dialect in which the stress genuinely alternates, e.g. *gásolìne ~ gàsolíne, súbmarìne ~ sùbmaríne*.

For the sake of the present discussion it is sensible to skirt the details of this controversy and focus instead on the salient aspects of stress distribution in English words. The advantage of such a restrictive approach is that it helps us to highlight the most spectacular points of similarities (if any) and dissimilarities between English and

TBE. As we shall see subsequently, the equation is highly tilted in favour of the latter i.e. dissimilarities.

To start with, English is a quantity sensitive system as heavy syllables (i.e. syllables with long vowels, diphthongs and coda consonant(s)) attract stress. Final closed syllables with a simple coda however do not count as heavy and hence fail to attract stress. This is because a word-final consonant is extrametrical in English,[54] as we have seen in (207) above. A second major feature of English stress system is that stress is assigned from right to left. Again in English stress is category sensitive. Category distinction between otherwise homophonous sequences is realized through variation in stress placement. The following set of verbs is distinguished from their nonverbal counterparts only by having distinct stress location.[55]

209.

Verb	Noun/Adjective	Verb	Noun/Adjective
presént	présent	expórt	éxport
abstráct	ábstract	convíct	cónvict
diréct	dírect	cocért	cóncert
absént	ábsent	digést	dígest

In the derived contexts stress assignment in English is determined in a large number of cases by the phonological behaviour of the affixes. There are two types of affixes: stress-affecting and stress-neutral.[56] Ever since Lexical Phonology (Mohanan 1982/1986, Halle & Mohanan 1985, Kiparsky 1982a, 1982b, 1985, Strauss 1982,

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[54] The term English is used here as a general one without reference to any particular variety.

[55] There are of course words like *límit*, *órder*, *remárk*, *vísit* etc., which are accented on the same syllable irrespective of whether they are used as nouns or as verbs.

[56] Based on their phonological behaviour English affixes can be grouped in two broad classes: neutral and non-neutral. Neutral affixes have no phonological effect on the base to which they are attached. But non-neutral ones affect the base in some way or other: either segmentally or prosodically. Since we are concerned only with stress placement here, we conveniently classify the English affixes as stress-neutral and stress-affecting.

Pulleyblank 1986) the stress-affecting affixes have come to be known as Level I affixes and the stress-neutral ones as Level II affixes. For justification of such a classification let us consider the phonological behaviour of the following two sets of suffixes: *-ness & -less* and *-ic & -ee*. The former do not affect the stress placement of the base.

210. a.	ábstract	ábstractness	b.	hóme	hómeless
	sérious	sériousness		pówer	pówerless
	alért	alértness		páper	páperless

-ic & -ee, by contrast, force a relocation of the main stress in the base.

211. a.	strátegy	stratégic	b.	detáin	detaineé
	mórpheme	morphémic		absént	absenteé
	phótograph	photográphic		páy	payeé
	démocrat	democrátic		emplóy	employeé

-ic being what is traditionally known as a pre-accenting suffix, pulls the main stress of the base to its immediately preceding syllable (cf. 211a). *-ee* is even more radical. This auto-stressed suffix draws the primary stress from the base on to itself (cf. 211b).

Both English and TBE agree in making quantity distinctions among syllables and in both heavy syllables attract stress. But there is a subtle distinction between the two systems in their respective definitions of a heavy syllable. In English, where vowel length is phonemic, syllables with long vowels, diphthongs and also with an arresting consonant count as heavy. But in TBE only closed syllables are regarded as having extra weight and in this respect TBE does not make any distinction between a word-final closed syllable and a non-final one. It should be remembered that in English final closed syllables having a simple coda are light since the final consonant is extrasyllabic and hence fails to make

any contribution to the weight of the host syllable. To illustrate these characteristic features of the two systems let us look at the stress patterns of the following set of English and TBE words, transcribed for the sake of greater clarity.

212. a. English   b.   TBE

və.rǽn.də	ba.rán.da	'veranda'
si.nɔ́p.sis	si.nɔ́p.sis	'synopsis'
daì.ə.lék.tl	ḍai.lék.ʈal[57]	'dialectal'
tri.mén.dəs	ʈri.mɛ́n.ḍas	'tremendous'

213. a. English   b.   TBE

mein.teín	mɛ́n.ʈein	'maintain'
ə.pié	é.piar	'appear'
hə.raí.zn	hó.rai.zɔ̀n	'horizon'
ɑ́:.sə.nl	ár.sɛ.nàl	'arsenal'
me.dí.si.nl	mé.ḍi.si.nàl	'medicinal'
ǽ.dʒek.taí.vl	ǽḍ.zɛk.ʈai.b'àl	'adjectival'
mæg.nǽ.ni.məs	mǽg.ne.ni.màs	'magnanimous'

In (212) there is a virtual identity between the stress distribution patterns in the words of English and TBE: both respect the demand of a heavy syllable to receive stress. But this surface identity does not reflect any fundamental uniformity in the principles of stress assignment obtaining in the two systems. In English primary stress is generally antepenultimate unless a heavy syllable intervenes: *América, cínema, análysis* vs. *aróma, horízon, Minnesóta*. In addition, extrasyllabicity of the word-final consonant

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[57] In the English word *daì.ə.lék.tl* there are four syllables and the first two constitute a foot with initial (secondary) stress. But in the TBE word *ḍai.lék.ʈal* there are only three syllables. The first syllable *ḍai* containing a diphthong fails to attract any prominence, which instead shifts to the next heavy syllable. This clearly justifies that diphthongs in TBE are underlyingly monomoraic.

    We have seen in Chapter III (§3.1.2 and §3.1.3) that *e* & *o* are realized as *ɛ* & *ɔ* respectively in TB unless they occur either in the most prominent syllable or followed by a high vowel in the next syllable. Presumably the same rule applies in TBE too. But restructuring of *e* being almost complete it loses featural identity even in prosodic head positions.

prevents the word-final closed syllable from being considered as a heavy one. Consequently it is the heavy second syllable from the end (Remember direction of stress assignment in English is right-to-left.) that receives the stress. On the contrary, in TBE stress is assigned from left to right. Primary stress is usually word-initial unless there is a heavy second syllable following an initial light syllable in words longer than disyllables. In the latter case it is the heavy second syllable that receives the main stress: *ba.rán.da* vs. *á.me.ri.ka*. A word-final closed syllable is always heavy in TBE and normally gets stress unlike in English. But such a syllable goes without stress whenever there is a possibility of stress clash i.e. when this final heavy syllable is preceded by another stressed syllable as in *ɛ.nék.ɖɔṭ* vs. **ɛ.nék.ɖɔ̀ṭ;* or in a disyllable where stress is always initial as in *é.ɖiṭ,* 'edit', *ǽ.rɛsṭ,* 'arrest'. All these factors function in unison to produce a penultimate stress pattern in words like *si.nóp.sis*, 'synopsis', *ɖai.lék.ṭal,* 'dialectal' *ṭri.mén.ɖas* 'tremendous' etc.

The actual implications of the two discrete sets of principles of stress assignment obtaining in the two languages are manifested in the distinct location of stress in the same set of words in the pronunciation of the native speakers of the two (cf. (213a) vs. (213b)). In observance of the principle of initial main stress all the words in TBE in (213b) have their main stress located in the leftmost syllable. The demands of WSP are also duly fulfilled except in disyllables where the restriction against word-final main stress (NON-FIN) takes precedence over WSP. In the English examples in (213a) the rule of antepenultimate main stress prevails except when there is a heavy syllable immediately to

the right of the antepenult. In the latter case, the heavy syllable attracts primary stress (cf. *me.dí.si.nl* 'medicinal' vs. *hə.raí.zn*, 'horizon').

Category sensitive stress assignment is a typical feature of English word stress. Otherwise homophonous lexical categories especially verbs are distinguished from nouns and/or adjectives through stress relocation (cf. 209). No such word formation process is attested in TBE. The general rule of *word-initial main stress, except when there is a heavy second syllable following the initial light syllable in sequences longer than disyllables*, obtains every where. As a result there is no phonological clue to differentiate between say, *present* as a noun/adjective and as a verb, which is always *présent*. In such cases communication is precariously dependent on contextual hints.

Morphological determination of stress assignment is also noted under regular affixations in English. The examples in (211) illustrate two such instances of stress location where the base is affected following suffixation. Other such stress-affecting suffixes in English include *–ion, -ic, -ical, -ically, -ious, -ial, -ially* and *–ity*. Such systematic stress shift owing to morphological factors is by and large unattested in TBE. This is exemplified by the variable stress placement in the same set of words in English and TBE as in (214) and (215).

214a.	English	b.	TBE	
	i.kɔ́.nə.mi		í.kɔ.no.mi	'economy'
	ì:kə.nɔ́.mik		í.kɔ.no.mìk	'economic'
	ì:kə.nɔ́.mi.kl		í.kɔ.nɔ̀.mi.kɛ̀l	'economical'
	ì:kə.nɔ́.mi.kə.li		í.kɔ.no.mì.ke.li	'economically'

215a. fəú.tə.grɑ:f   b. pʰó.ʈɔ.gràɸʰ   'photograph'
        fə.tɔ́.grə.fi   pʰó.ʈɔ.gra.ɸʰi   'photography'
        fəừ.tə.grǽ.fik   pʰó.ʈɔ.gra.ɸʰừk   'photographic'
        fəừ.tə.grǽ.fi.kl   pʰó.ʈɔ.grà.ɸʰi.kèl   'photographical'
        fəừ.tə.grǽ.fi.kə.li   pʰó.ʈɔ.gra.ɸʰừ.ke.li   'photographically'

The English words in (214a) instantiate stress shift in the wake of suffixation. The main stress shifts from the second to the third syllable complying with the pre-accenting character of the suffixes –ic, -ical, -ically. By contrast, no stress relocation takes place in the TBE counterparts of the same set of words (214b). Instead, secondary prominences emerge in response to WSP and lapse-avoidance. Comparison of the two sets of examples in (215a) and (215b) offers further evidence in support of the fact that in TBE prosody functions independently of morphology.

From this comparative study of the two stress patterns in English and TBE it becomes obvious that the latter has an independent set of principles to regulate stress assignment in lexical categories. But are these really independent principles characteristic of TBE? Or do they reflect any influence of the stress rules of the first language (i.e. TB) of the speakers of TBE? Finding an answer to these questions, guides the course of discussion in the following section.

4.3 Metrical patterns of TB and TBE

The general characteristics of stress assignment in TBE noted in §4.1 and §4.2 remind one of the fundamental aspects of words stress in TB discussed in Chapter II. Both are quantity sensitive and both construct binary trochees iteratively from left to right. In both ternary rhythm is the norm unless heavy syllables intervene and force stress relocation.

Primary stress is normally word-initial but the presence of a heavy second syllable following the initial light syllable compels the primary stress to shift to the second syllable. In disyllables the rule of heavy syllables attracting stress is overruled by the restriction against word-final primary stress. Hence in disyllables main stress is always aligned with the left edge of the prosodic word. A strong inclination for observing rhythmic ternarity as opposed to binarity rules out the possibility of a secondary stress in a sequence of up to four light syllables. In a sequence of light syllables secondary stress occurs only if the word contains a minimum of five syllables. Again, both TB and TBE impose a strong restriction against successive stressed syllables as the latter results in a stress clash. In the normal course, foot binarity is interpreted at the syllabic level; but foot binarity can perhaps be realized on the moraic level too, since a word-final heavy syllable can project a foot all by itself.[58] Additionally, a single light syllable is never found to project a foot. Morphological factors never influence stress placement: there is no stress-affecting (i.e. Level 1) affixes in either TB or TBE. Stress shift takes place for purely phonological reasons such as initial main stress, the need to stress heavy syllables, avoidance of stress clash etc. etc. The following set of TB and TBE words justifies the above observations.

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[58] The issue however is debatable. In Chapter III (§3.2), we assumed a principle of maximal foot construction for TB to explain certain phenomena in segmental phonology. Given this, feet can be only syllabic and explanation of monosyllabic expansions (including word-final heavy monosyllabic feet) would be crucially dependent on catalexis or the presence of a virtual syllable at the right edge of word. Since such peripheral issues do not have any significant bearing on the core issues under investigation in the present thesis namely, explaining rhythmicity in bounded systems, we do not undertake any serious discussion of these here. (However, see Mitra (in progress) for an account of the phenomena in SCB.)

216a.
TB (Light sequences)

nɛ́.ta	'leader'
boí.ra.gi	'mendicant'
bɛ́.na.ro.ʃi	'Benaras silk'
ʃɔ́.ma.lɔ.sɔ̀.na	'criticism'
ó.nu.kɔ.rò.ni.yɔ	'imitable'
ɔ́.no.nu.kɔ̀.ro.ni.yɔ	'inimitable'

b.
TBE (Light sequences)

ré.ɖi	'ready'
gó.ri.la	'gorilla'
á.me.ri.ka	'America'
í.ne.bi.lì.ʈi	'inability'
saí.kɔ.lo.zì.ke.li	'psychologically'
í.ni.mi.ʈè.βi.li.ʈi	'inimitability'

c.
TB (Words with heavy syllables)

mál.ʃa	'big metal bowl'
ɸá.til	'earthen pot'
ʃɔ́r.kar	'government'
ɔ.hɔ́ŋ.kar	'pride'
ʃɔ́ŋ.rɔk.kɔ̀n	'reservation'
o.bíg.ga.ɸɔ̀n	'intimation'
ó.nu.bìk.kɔn	'microscope'
báɸ.zaiʈ.ʈa.mi	'adamancy'
ɔ́.no.nù.kɔ.rɔ̀n	'non-imitation'
ɸɔ́dʒ.dʒa.lɔ.sɔ̀.na	'deliberation'
ʃɔ́ŋ.rɔk.ko.nì.yɔ.ta	'preservability'
ɸá.rɔ.dòʃ.ʃi.kɔ.ta	'expertness'

d.
TBE (Words with heavy syllables)

kán.ʈri	'country'
é.ɖiʈ	'edit'
kén.sɛl	'cancel'
si.nóp.sis	'synopsis'
ɛ́ɖ.dʒek.ʈìb	'adjective'
ɛ.nɛ́k.ɖɔ.ʈàl	'anecdotal'
jú.ni.b'âr.sal	'universal'
kɔ́m.pal.sa.ri	'compulsory'
ɛ́.na.lì.ʈi.kɛ̀l	'analytical'
mɛ́g.ne.ni.mì.ʈi	'magnanimity'
ín.ɸʰlek.si.bì.li.ʈi	'inflexibility'
rí.prɛ.sɛ̀n.ʈɛ.ʃa.nɛ̀l	representational'

The uniform metrical pattern witnessed in the lexical categories of TB and TBE automatically makes one expect that the constraint hierarchy proposed for TB could be used to account for the stress distribution pattern of TBE. We re-present below the constraint hierarchy used in (109) to account for a four-syllable in TB.

217. *Constraint hierarchy for the metrical pattern in TBE (light sequences)*
*LAPSE(DE), ALIGN-L ≫ ALL-FT-R ≫ ALL-FT-L ≫ PARSE-σ

The tableaux below contain the evaluation processes of some representative TBE words of various lengths. Incidentally, justification of the reformulated version of the anti-lapse

constraint LAPSE(DE) is reinforced by the latter's efficacy in delivering the goods in respect of this new system as well. We start with the light sequences.

218.

/amerika/	*LAPSE(DE)	ALIGN-L	ALL-FT-R	ALL-FT-L	PARSE-σ
☞ a. (á.me).ri.ka			**		**
b. (á.me).(rì.ka)			**	*!*	
c. a.(mé.ri).ka		*!	*	*	**

It should be remembered that in terms of our new definition of the anti-lapse constraint *LAPSE(DE), the latter has two licensors of weak beats: *directional foot-edge* and word-edge. Of these the former is determined by the highest ranked of the alignment constraints. In the OT grammar for TBE light sequences, the word-to-foot alignment constraint ALIGN-L stands undominated and hence it determines that the licensing edge of the foot is the opposite of the value of L i.e. *right* edge.

In (218) we notice that of the three potential candidates, (218c) is excluded as it violates ALIGN-L. (218b) has a perfectly binary rhythm with two successive trochees. But it has one extra stress (forcing an extra foot) in excess of what is required to satisfy the higher ranked constraints particularly *LAPSE(DE). Though both the undominated constraints are vacuously satisfied by the binary parse candidate (218b), the latter is failed by ALL-FT-L since its second foot stands away from the left edge of the PrWd by two syllables. (218a) having only one left-aligned foot incurs no such violations. The candidate has three successive weak beats word-finally, each of which is duly licensed: foot internal weak beat *me* is taken care of by the high ranked constraint FT-BIN (suppressed in the hierarchy); the medial weak beat *ri* is licensed by the *right* edge of the

preceding foot; and the final weak beat represented by *ka* finds its licensor in the adjacent word-edge. (218a) therefore is the most harmonic candidate.

Evaluation of the optimal parse in longer sequences of light syllables in TBE is also captured by the same hierarchy as is illustrated in (219-221). It is redundant however to go into the details of the selection processes of individual candidates which are self-explained.

219.

/inebiliți/	*LAPSE (DE)	ALIGN-L	ALL-FT-R	ALL-FT-L	PARSE-σ
☞ a. (í.ne).bi.(lì.ți)			***	***	*
b. (í.ne).(bì.li).ți			* ***!	**	*
c. i.(né.bi).(lì.ți)		*!	**	* **	*
d. (í.ne).bi.<u>li</u>.ți	*!		***		***

220.

/saikɔlozikeli/	*LAPSE(DE)	ALIGN-L	ALL-FT-R	ALL-FT-L	PARSE-σ
☞ a. (saí.kɔ).lo.(zì.ke).li			* ****	***	**
b. (saí.kɔ).(lò.zi).(kè.li)			** ****!	** ****	
c. sai.(kɔ́.lo).(zì.ke).li		*!	* ***	* ***	**
d. (saí.kɔ).lo.<u>zi</u>.<u>ke</u>.li	*!*		****		****
e. (saí.kɔ).lo.<u>zi</u>.(kè.li)	*!		****	****	**

221.

/inimițeβiliți/	*LAPSE (DE)	ALIGN -L	ALL-FT -R	ALL-FT -L	PARSE -σ
☞ a. (í.ni).mi.(țè.βi).li.ți			** *****	***	***
b. (í.ni).(mì.țe).(βì.li).ți			* *** ****!*	** ****	*
c. i.(ní.mi).(țè.βi).(lì.ți)		*!	** ****	* *** *****	*
d. (í.ni).(mì.țe).βi.<u>li</u>.ți	*!		*** *****	**	***
e. (í.ni).mi.<u>țe</u>.(βì.li).ți	*!		* *****	****	***
g. (í.ni).mi.<u>țe</u>.βi.(lì.ți)	*!*		*****	*****	***

Continuing the same vein of discussion, it can be shown that the same constraint hierarchy that accounts for TB sequences constituted of both light and heavy syllables

also explains the metrical pattern in similar words in TBE. This we illustrate below for a five- and six-syllable word. The proposed constraint hierarchy is repeated from (165).

222.   FT-BIN, TROCHEE, *CLASH, *LAPSE(DE) ≫ WSP ≫ ALIGN-L ≫ ALL-FT-R ≫ ALL-FT-L ≫ PARSE-σ

Compared to the constraint hierarchy in (217) there are two new constraints in (222): WSP and *CLASH. (FT-BIN, TROCHEE continue to remain undominated in both the rankings.) *CLASH is invoked to capture the strong restriction against successive stresses in TBE. The constraint therefore remains undominated. WSP formalizes the requirement that heavy syllables be stressed in TBE[59]. Violation of WSP is permitted only in disyllables under pressure to satisfy NON-FIN[60] (prohibiting word-final primary prominence; cf. (178)). The constraint therefore stands dominated, however, only by the undominated ones. Efficacy of such a constraint ranking is illustrated in (223-224).

223.

/ɛnaliṭikɛl/	*CLASH	*LAPSE (DE)	WSP	ALIGN -L	ALL-FT-R	ALL-FT-L	PARSE -σ
☞ a. (ɛ́.na).(lì.ṭi).(kɛ̀l)					* ***	** ****	
b. (ɛ́.na).li.ṭi.(kɛ̀l)		*!			***	***	**
c. ɛ.(ná.li).ṭi.(kɛ̀l)				*!	**	* ***	**
d. (ɛ́.na).(lì.ṭi).kɛl			*!		* ***	**	*

---

[59] However, English long vowels and diphthongs would have to be given a monomoraic representation in the TBE input perhaps enforced by undominated *LONG-V(OWEL) and a specific constraint ruling out a bimoraic interpretation of diphthongs. We do not go into details here, as it will take us too far afield.

[60] NON-FIN being not directly relevant here is kept out of the ranking.

224.

/riprɛzɛnʈɛʃanɛl/	*CLASH	*LAPSE (DE)	WSP	ALIGN -L	ALL- FT-R	ALL- FT-L	PARSE -σ
☞ a. (rí.prɛ).(zɛ̀n.ʈɛ).ʃa.(nɛ̀l)					** ****	** ****	*
b. ri.<u>prɛ</u>.(zɛ́n.ʈɛ).ʃa.(nɛ̀l)		*!		*	**	** *****	***
c. ri.(prɛ́.zɛn).ʈɛ.(ʃà.nɛl)			*!*	*	***	* ****	**
d. (rí.prɛ).(zɛ̀n.ʈɛ).(ʃà.nɛl)			*!		** ****	** ****	

Evaluation of the grammatical forms in these two (randomly selected) TBE words by the constraint ranking (222) underlines the fact once again that the same principles of metrification prevail both in TB and TBE. This reflects the degree of influence TB exercises on the prosodic phonology of TBE and also explains to a considerable extent the mystery behind the so-called *un-English-like* accentuation pattern of the latter. This discovery will certainly throw new lights for more effective teaching of English as an L2 to the TB learners of English.

But more important from the theoretical point of view is the fact that the preceding TBE data reveal certain aspects of accentuation, which are embarrassing for some of the major principles of metrification commonly accepted in phonological research today. Although projecting a complete prosodic profile of TBE is beyond the scope of the present thesis, some of these intriguing issues deserve mention. In the following section we undertake the same.

4.4 Issues in TBE phonology

To start with let us put together the relevant data.

225.
a. ɛ́.na.li.ʈìk   [ɛ́.na.*li*.ʈì:k]   'analytic'
   í.kɔ.no.mìk   [í.kɔ.*no*.mì:k]   'economic'
   pʰó.ʈɔ.gra.ɸʰìk   [pʰó.ʈɔ.*gra*.ɸʰì:k]   'photographic'

b. ɛ́.na.lì.ʈi.kɛ̀l   [ɛ́.na.lì:.ʈi.kɛ̀:l]   'analytical'

   í.kɔ.nɔ̀.mi.kɛ̀l   [í.kɔ.nɔ̀:.mi.kɛ̀:l   'economical'

   pʰó.ʈɔ.grà.ɸʰi.kɛ̀l   [pʰó.ʈɔ.grà:.ɸʰi.kɛ̀:l   'photographical'

The internal make-ups of these TBE words are: (´LL)L(`H) in (224a) and (´LL)(

`LL)(`H) in (225b). The first issue to address is what forces a binary rhythm in the words

in (225b) against the general pattern of ternary rhythm in TBE. Second, and more crucial,

the non-initial stressed vowels in both (225a-b) are fairly long although all vowels are

underlyingly short in TBE. Evidence for this claim can be derived by comparing the

related members of the paradigms in (225a) and (225b). For instance, the vowels in the

italicized syllables in (225a) are short. But all these vowels are lengthened as soon as

stress is assigned to their host syllables (cf. 225b). Again neither in TB nor in English the

word-final heavy monosyllables are long even when these are stressed: [o.bíg.ga.ɸɔ́n] vs.

*[o.bíg.ga.ɸɔ̀:n] (TB) 'intimation' and [ì:kə.nɔ́.mik] vs. *[ì:kə.nɔ́.mi:k] (English). The

question then arises: why does this lengthening take place? And more importantly, how

does the theory account for such lengthening especially in a trochaic system? What will

be the eventual implications for the canonical 'Iambic-Trochaic Law'? (Hayes 1991) Let

us discuss these issues one by one.

In the previous section we have seen that the same constraint hierarchy prevails

both in TB and TBE; and this explains the metrical distinction that differentiates TBE

from English. Both WSP and ALIGN-L are quite powerful constraints in TBE. More often

than not, WSP forces rhythmic binarity on the surface: *á.me.ri.ka* 'America' vs.

jú.ni.b'àr.sal 'universal'. ALIGN-L, requiring a foot to be aligned with the left edge of the word, takes care of initial primary prominence (Recall that in TBE left-headedness is an undominated requirement captured through TROCHEE). This means the ranking TROCHEE ≫ WSP ≫ ALIGN-L (The specific details of ranking arguments holding for the overall TBE metrics is irrelevant here.) accounts for the presence of initial and final stress in the words in (225). But what forces the medial stress in the five-syllable words in (225b)? This is obviously the anti-lapse constraint *LAPSE(DE) disallowing a sequence of three weak beats in other than the word-final position (cf. *á.me.ri.ka* 'America'); word-medially, only two weak beats are permitted. This is because in the five-syllable words in (225b) the last of the three word-medial weak beats (i.e. the second syllable from the end) will remain unlicensed. For illustrations see the tableau (223) once again.

In other words, *LAPSE(DE) which was originally proposed to account for rhythmic ternarity in TB, now explains binary rhythm too. This once again justifies that this constraint is not ternarity-specific.

We now turn to the issue of what forces lengthening in the stressed syllable in a trochaic system. The lapse constraint explains the reason behind stress placement on the third syllables in the TBE words in (225b). But as has been stated earlier, these non-initial stressed syllables are also pronounced fairly long both in (225a-b). All vowels in TBE (as also in TB) including diphthongs are short i.e. monomoraic. There is no evidence for vowel length (in similar contexts) either in the L1 (i.e. TB) or the L2 (i.e. English) of the speakers of TBE.

226.

[ɔ́.ma.no.ʃìk]	vs.	*[ɔ́.ma.no.ʃì:k]	'inhuman'	(TB)
[ó.no.nù.kɔ.rɔ̀n]	vs.	*[ó.no.nù.kɔ.rɔ̀:n]	'non-imitation'	(TB)
[ì:kə.nɔ́.mik]	vs.	*[ì:kə.nɔ́.mi:k]	'economic'	(English)
[ì:kə.nɔ́.mi.kl]	vs.	*[ì:kə.nɔ́.mi.kl:][61]	'economical'	(English)
[fə̀ù.tə.grǽ.fi.kl]	vs.	*[fə̀ù.tə.grǽ.fi.kl:]	'photographical'	(English)

A preliminary explanation for this could be simply to say that stress causes lengthening. But such a statement at once opens up a Pandora's box of theoretical controversy.

This is because ever since Hayes (1985) metrical phonology by and large has accepted as a guiding principle a fundamental asymmetry between iambic and trochaic systems popularly called the 'Iambic-Trochaic Law'. According to this, trochaic systems (those whose feet have initial prominence) are characterized by evenness of duration between the elements of the foot i.e. $(\sigma_\mu \ \sigma_\mu)$. In contrast, iambic systems (those whose feet have final prominence) typically display uneven feet of the form $(\sigma_\mu \ \sigma_{\mu\mu})$, reinforced by vowel lengthening, consonantal gemination, vowel reduction, etc. This asymmetry according to Hayes is grounded in a general principle of rhythmic grouping and extra-linguistic evidence for this was found in the perception experiments in Woodrow (1951)[62]. Languages adopt various strategies to conform to the dicta of this basic asymmetry. For instance in English, which is a trochaic system, long vowels under suffixation are reduced to short vowels even when they are stressed: *di.(vaín) ~ di.(ví.nə).ti, (saí.kl) ~ (sík.lik), (seín) ~ (sǽ.ni.fai)* etc. (Myers 1987, Prince 1991). Other

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[61] The specific details of the phonetic realization of a long syllabic consonant are irrelevant here.
[62] Hayes (1991) summarizes the results of Woodrow's (1951) experiments in the iambic-trochaic law:

Iambic-Trochaic Law (Hayes 1991: 71)
a.   Elements contrasting in intensity naturally form groupings with initial prominence.
b.   Elements contrasting in duration naturally form groupings with final prominence.

trochaic systems with vowel reduction include Latin (Jacobs 1986), Maithili (Hayes 1991) etc. Chugach, as most other Yupik dialects, has a process of iambic lengthening, affecting the stressed syllable of a disyllabic iamb if it is open. Final vowels are however not lengthened as long vowels are prohibited in the final position. We represent the rule-derived length by diacritics (a: etc.) following Kager (1993: 416): *(a.lí)(ka.á) ~ (a.lí:)(ka.á)* , 'she is afraid of it', *(a.kú).taq ~ (a.kú:)taq*, 'akutaq (a food)', *(ta.qú).ma.(lu.ní) ~ ta.qú:)ma.(lu.ní)*, 'apparently getting done' etc. Increment of syllable quantity through vowel lengthening in iambic systems is also attested in Chocktaw, a Muskogean language (Nicklas 1975), the Australian language Yidin[y] (Dixon 1977) etc.

In the face of all these so-called Hayesian asymmetries between iambic and trochaic systems any proposition to the effect that stress enforces length irrespective of the type of foot is discordant. But at the same time the theory cannot shirk its responsibility to account for the *deviant* phenomenon of *trochaic lengthening* noted in TBE. Vijver (1998) makes an attempt to prove that iambs are not primitives of the UG by delving into four questions relating to iambic scansion: a) why do iambs only occur from left to right, b) why do iambic languages eschew stress on the first and on the final syllable, c) why is the leftmost syllable stressed in disyllabic words in iambic languages, and d) why does the canonical iamb not play a role as primitive in prosodic morphology. Vijver (1998) also demonstrates that shortening is attested in iambic systems and lengthening in trochaic systems contrary to the 'Iambic-Trochaic Law'. The theoretically interesting question is if there is trochaic lengthening in TBE, why is it attested only in medial (LL) feet and final (H) feet?

4.5 Conclusions

In this last chapter we concentrated on explaining the features of the metrical phonology of TBE. We have found that the prosody of the latter is highly influenced by that of the L1 of the speakers of TBE namely, TB. In both, the same constraint hierarchy is responsible for their respective stress distribution patterns. This is what lies at the heart of the mystery of the so-called *un-English-like* accentuation pattern of TBE. The distinction is amply highlighted through comparison and contrast of TBE with the metrical system of English. This discovery can, perhaps, lead to devising techniques and materials for the effective teaching of English as an L2 to the TB learners of English. Considered thus this finding promises to have pedagogical value for teaching English as a second language. Finally, we have also mentioned a major theoretical issue which awaits future research, namely *trochaic lengthening*, thrown up by the phonology of TBE.

APPENDIX

PART I

TB WORDS CONTAINING ONLY LIGHT SYLLABLES

1. (ˊLL)

á.ɖu	'knee'	bá.ri	'home'	gí.lu	'brain'
ɸʰú.ɖa	'hole'	bí.ri	'bidi'[63]	rá.za	'king'
nɛ́.ta	'leader'	tú.li	'top'	gó.ra	'root'

2. (ˊLL)L

ɸɔ́.ta.ka	'flag'	ʃú.ɸa.ri	'beetle nut'
zí.ra.bi	'a kind of sweets'	á.to.ri	'intestine'
bá.ta.ʃa	'type of candy'	gó.ra.li	'ankle'
ʃó.na.lu	'kind of tree'	ɸí.ri.ti	'love'

3. (ˊLL)LL

á.lɔ.sɔ.na	'discussion'	ɔ́.na.ba.di	'uncultivated'
á.ra.sa.li	'trouble making'	kɛ́.ra.mo.ti	'ingenuity'
bí.βɛ.sɔ.na	'consideration'	bɛ́.na.ro.ʃi	'Benaras silk'

4. (ˊLL)L(ˋLL)

ɔ́.ɸo.ri.nɔ̀.tɔ	'immature'	ʃɔ́.ma.lɔ.sɔ̀.na	'criticism'
ɔ́.nɔ.mo.nì.yɔ	'rigid'	ɔ́.ʃɔ.hɔ.zù.gi	'non-cooperative'
ɸó.ri.sa.lɔ̀.na	'direction'	ɔ́.mɔ.nɔ.zù.gi	'inattentive'

5. (ˊLL)L(ˋLL)L

ó.nu.kɔ.rɔ̀.ni.yɔ	'imitable'	ɔ́.ʃɔ.hɔ.zù.gi.ta	'non-cooperation'
ɸrɔ́.yɔ.zo.nì.yɔ.ta	'necessity'	ɔ́.mɔ.nɔ.zù.gi.ta	'inattentiveness'

6. (ˊLL)L(ˋLL)LL

ɔ́.no.nu.kɔ̀.ro.ni.yɔ	'inimitable'
ɔ́.no.nu.ʃɔ̀.ro.ni.yɔ	'unfollowable'

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[63] Tobacco rolled in leaf for smoking.

ɔ́.no.nu.dà.βo.ni.yɔ   'unintelligible'

ɔ́.no.nu.grɔ̀.ho.nì.yɔ   'unacceptable'

7. (ˈLL)L(ˋLL)L(ˋLL)

ɔ́.no.nu.kɔ̀.ro.ni.yɔ̀.ta   'inimitability'

ɔ́.no.nu.ʃɔ̀.ro.ni.yɔ̀.ta   'unfollowability'

ɔ́.no.nu.grɔ̀.ho.ni.yɔ̀.ta   'unacceptability'

PART II

WORDS CONTAINING HEAVY SYLLABLES

8. a. (ˈHL)   b. (ˈLH)

   mál.ʃa   'big metal bowl'   ɸá.til   'earthen pot'

   aít.na   'verandah'   ká.rɔn   'reason'

   c. (ˈHH)

   ʃɔ́r.kar   'government'

   tól.ɸar   'agitation'

9. a. (ˈHL)L   b. (ˈHL)(Hˋ)

   ɸák.na.mi   'precocity'   útʃ.tʃa.rɔ̀n   'pronunciation'

   nóŋ.ra.mi   'dirtiness'   bíg.ga.ɸɔ̀n   'advertisement'

   c. (ˈHH)L   d. (ˈLL)(Hˋ)

   ʃɔ́m.pot.ti   'wealth'   ó.βi.ʃàɸ   'curse'

   ʃ´n.tuʃ.tɔ   'satisfied'   ɸó.ri.bèʃ   'environment'

   e. (ˈHH)(Hˋ)   f. L(ˈHL)

   ʃɔ́ŋ.rɔk.kɔ̀n   'reservation'   a.nɔ́n.dɔ   'pleasure'

   ʃɔ́ŋ.kit.tɔ̀n   'singing hymns'   ɸo.rík.ka   'examination'

   g. L(ˈHH)

   bi.ʃɔ́j.jɔn   'immersion'

   ɔ.hɔ́ŋ.kar   'pride'

10. a. (ˊLL)(ˋHL)

ɔ́.na.sìʃ.ʈi   'a strange affair'

ɔ́.nu.kɔ̀m.pa   'compassion'

c. L(ˊHL)L

na.ríŋ.gi.ni   'pretentiousness'

a.bɔ́r.zɔ.na   'garbage'

e. (ˊHL)LL

kúʈ.na.gi.ri   'mischievousness'

dúr.gɔ.ʈɔ.na   'accident'

g. (ˊLL)L(ˋH)

ɔ́.β'i.ba.bɔ̀k   'guardian'

ɔ́.ma.no.ʃìk   'inhuman'

i. (ˊHL)L(ˋH)

ʃáŋ.bi.da.nìk   'constitutional'

b. L(ˊHL)(ˋH)

u.ɸɔ́s.tʰa.ɸɔ̀n   'presentation'

o.bíg.ga.ɸɔ̀n   'intimation'

d. (ˊHL)(ˋHL)

ʃɔ́n.ni.bìʃ.ʈɔ   'embedded'

f. (ˊLL)(ˋHH)

ɔ́.β'i.nɔ̀n.dɔn   'congratulations'

ɸɔ́.ri.b ˋt.tɔn   'change'

h. (ˊHH)LL

báb.zaiʈ.ʈa.mi   'adamancy'

ʃɔ́m.por.ki.tɔ   'related'

j. (ˊHH)L(ˋH)

dúr.bit.ta.yɔ̀n   'criminalization'

11. a. L(ˊHL)LL

ɔ.ʃáb.da.nɔ.ta   'carelessness'

.b ˊr.no.ni.yɔ   'indescribable'

c. (ˊHL)L(ˋL)

ɸɔ́dʒ.dʒa.lɔ.sɔ̀.na 'deliberation'

e. (ˊLL)L(ˋHL)

ɔ́.ɸo.ri.hàidʒ.dʒɔ   'inevitable'

ɔ́.ɸo.ri.ɸɔ̀k.kɔ   'immature'

g. L(ˊHL)L(ˋH)

ɔ.ʃɔ́ŋ.zu.zɔ.nèr   'of non-addition'

ɔ.ʃɔ́ŋ.ʃu.dɔ.nèr   'of non-correction'

i. L(ˊHH)LL

ɔ.ʃɔ́ŋ.rok.ki.tɔ   'unreserved'

b. (ˊLL)(ˋHL)L

ˊ.ʃ .mɔ̀t.ti.tɔ   'unconfirmed'

ɔ́.nu.bɔ̀t.ti.ta   'obedience'

d. (ˊLL)L(ˋHH)

ɔ́.nɔ.bɔ.lɔ̀m.bon   'resourcelessness'

ɔ́.ɸo.ri.bɔ̀t.tɔn   'changelessness'

f. (ˊHL)L(ˋHL)

ɸɔ́k.kɔ.ɸa.tìt.tɔ   'partisanship'

ʃɔ́ŋ.kɔ.ʈa.ɸɔ̀n.nɔ 'beleaguered with crisis'

h. L(ˊ HH)L(ˋH)

ɔ.ʃɔ́ŋ.rok.ki.tèr   'of the unreserved'

ɔ.ʃɔ́ŋ.lɔg.nɔ.tàr   'of inconsistency'

ɔ.ʃɔ́ŋ.lɔg.nɔ.ta   'inconsistency'

12. a. (ˊLL)(ˋHL)LL   b. L(ˊHH)L(ˋLL)
    ɸá.rɔ.dòʃ.ʃi.kɔ.ta 'expertness'   ɔ.ʃɔ́ŋ.rɔk.ko.nì.yɔ   'unreservable'
    á.nu.ʃòŋ.gi.kɔ.ta   'relatedness'

    c. (ˊLL)L(ˋHL)L   d. L(ˊHL)L(ˋLL)
    ɔ́.ɸo.ri.bòt.ti.tɔ   'unchanged'   ɔ.ʃɔ́ŋ.zu.zo.nì.yɔ   'unattachable'
    ɔ́.ɸro.ti.dòn.di.ta 'uncontestedness'

    (ˊLL)L(ˋHL)LL
13. ɔ́.ɸo.ri.bɔ̀t.to.ni.yɔ   'unchangeable'

    (ˊLL)L(ˋHL)L(ˋLL)
14. ɔ́.ɸo.ri.bɔ̀t.to.ni.yɔ̀.ta   'unchangeability'

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