Lexical Accent in Languages with Complex Morphology

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This dissertation develops a theory of lexical accent where the central role is given to the notion of accent competition as the defining property of lexical accent systems. Languages with complex morphology (traditionally known as 'polysynthetic') are the empirical basis for this study as they provide a particularly fruitful ground for investigating the effects of both phonological and morphological factors in the assignment of lexical accent. Novel in-depth analyses are developed for Arapaho (Plains Algonquian), Nez Perce (Sahaptian), Ichishkiin Sɨnwit (Sahaptian), and Choguita Rarámuri (Uto-Aztecan). I argue that accent competition across languages is resolved in formally similar ways and that no idiosyncratic, language-specific analyses for individual lexical accent systems are warranted. It is thus proposed that the idiosyncrasy in lexical accent systems is found in the distribution of underlying accents, but not in the rules of the systems. I propose a typology of lexical accent systems and argue that they fall into one of two types based on the mechanism of accent competition resolution: I. *Cyclic*: In an accent competition, accent in the outermost derivational layer within the domain wins, or II. *Directional*: In an accent competition, either the right-most or the left-most accent within the domain wins.

The second group of proposals made in this dissertation concerns the status of fundamental properties of stress and prosody – Culminativity and Obligatoriness of stress (Trubezkoy 1939/1960; Hyman 2006, 2009), and primary versus non-primary stress. It has previously been claimed that Culminativity of stress can be breached in highly synthetic languages (e.g. Blackfoot, Stacy 2004; Arapaho, Bogomolets 2014a,b; Mapudungun, Molineaux 2018; Yupik, Woodbury 1987). I argue that stress is in fact always culminative, but

Culminativity should be regarded as a macroparameter allowing for a set of language-specific ways to implement it, including a mechanism of clash avoidance and an enforcement of 'one and only one' stress within domains smaller than a morphological word. Finally, this dissertation addresses the general structure of the word-level prosodic system. I propose that the word-level prosodic system is not bipartite: primary stress vs. rhythm, but tripartite: primary stress vs. secondary stress vs. rhythm.

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ABBREVIATIONS AND SYMBOLS

1	first person
2	second person
21	first person plural inclusive
3	third person
>	direction of action (e.g. 3>2: third person acting on second person)
Ø	zero exponent
A	agent-like argument of canonical transitive verb
ABL	ablative
ABS	absolutive
ACC	accusative
ADJ	adjective
ADV	adverb(ial)
AGR	agreement
AGT	agent
ALL	allative
ANIM	animate
APPL	applicative
AUG	augmentative
AUX	auxiliary
BEN	benefactive
BI	broken implicature
CAUS	causative
CER	certainty
CISLOC	cislocative
CLF	classifier
COM	comitative
COMP	complementizer
COMPR	comparative
COMPL	completive
COND	conditional
COP	copula
CUST	customary
CVB	converb
DAT	dative
DECL	declarative
DEF	definite
DEM	demonstrative
DESID	desiderative
DET	determiner
DIST	distal
DIR	direct
DISTR	distributive
DU	dual
DUR	durative
EP	epenthetic
ERG	ergative
EXCL	exclusive

F	feminine
FRUS	frustrative
FOC	focus
FUT	future
GEN	genitive
IC	initial change
IMP	imperative
INC	incompletive
INCL	inclusive
IND	indicative
INDF	indefinite
INF	infinitive
INSTR	instrumental
INTR	intransitive
INTRA.DR	intraverse directional
INV	inverse
IPFV	imperfective
IRR	irrealis
LOC	locative
M	masculine
MOT	motion
N	neuter
N-	non- (e.g. NSG nonsingular, NPST nonpast)
NEG	negation, negative
NMLZ	nominalizer/nominalization
NOM	nominative
OBJ	object
OBL	oblique
PASS	passive
PFV	perfective
PL	plural
POSS	possessive
PRED	predicative
PRF	perfect
PRS	present
PROG	progressive
PROH	prohibitive
PROX	proximal/proximate
PST	past
PTCP	participle
PURP	purposive
Q	question particle/marker
QUOT	quotative
REC	recent past
REAL	realis
RECP	reciprocal
REFL	reflexive
REL	relative
RES	resultative
REV	reversive

S	single argument of canonical intransitive verb
S_{BJ}	subject
S_{BJV}	subjunctive
SF	stem formative
S_G	singular
S_{IM}	simulative
SP	satellite person
TA	transitive animate
T_{OP}	topic
T_R	transitive
T_{RLOC}	translocative
V_{OC}	vocative
V_{BLZ}	verbalizer

CHAPTER 1. INTRODUCTION AND BACKGROUND

1.1 Introduction

This dissertation investigates stress assignment in lexical accent systems within the framework of the Accent-First Theory (van der Hulst 1984, 1996, 2012, 2014). The main empirical object of this dissertation are languages which are traditionally called polysynthetic or incorporating (see for example Fortescue et al. 2017; Mattissen 2014 for an overview of the terminological issues in this area). Provided wildly different criteria have been put forward as definitional for a 'polysynthetic' language depending on the theoretical preferences of the authors, I refrain from the term 'polysynthetic' and use theoretically neutral terms 'highly synthetic languages' or 'languages with complex morphology' throughout this dissertation. The signature trait of these languages which makes them particularly interesting for a study of prosody is the so-called holophrasis, i.e. it is common for a whole sentence to consist of a single morphologically complex verb form in such languages. A number of morpho-syntactic traits conspire to achieve this, including arguments being marked on the verb, noun incorporation, and incorporation of adverbial and auxiliary morphemes into the complex verb (see Mattissen 2014 for a discussion of possible combinations of different morpho-syntactic traits in languages traditionally described as polysynthetic). In-depth case studies are presented for Arapaho (Plains Algonquian), Nez Perce (Sahaptian), Ichishkíin Sɨnwit (Sahaptian), and Choguita Rarámuri (Uto-Aztecan), with additional data throughout the thesis coming from Cupeño, Mapudungun, Bininj Gun-wok, Plains Cree, Tahltan, Nahuatl, Satipo Ashaninka, Murrinhpatha, Pasamaqquoddy, Ojibwa, Buriat, Chamorro, North Saami, Waalubal, Apurinã, Pintupi, Osage, Sibutu Sama, Cayuvava, and Salishan languages. This dissertation develops a theory of lexical accent where the central role is given to the notion of accent competition as the defining property of lexical accent systems. I argue that accent competition across languages is resolved in formally similar ways and that there is no need for idiosyncratic, language-specific analyses

for lexical accent systems. It is thus proposed that the idiosyncrasy in lexical accent systems is found in the distribution of underlying accents, but not in the rules of the systems.

1.1.1 Goals

The goals of this thesis fall into two sets. The first set is empirical and analytical in nature. The main empirical goal of this dissertation is to assemble a representative (meaning geographically and genetically diverse) set of languages with complex morphology which would exhibit properties of lexical stress in their prosodic organization. Languages chosen as the object of study for this thesis are largely under-studied which makes them particularly interesting for an in-depth linguistic investigation. Detailed case studies as well as additional data from multiple unrelated languages with complex morphology are intended to serve as an accessible reference for future studies focused on lexical stress. The main analytical goal of this thesis is in presenting comprehensive analyses of lexical stress systems across languages with complex morphology. An additional empirical motivation for this study comes from the fact that the vast majority of languages with complex morphology analyzed in this dissertation are endangered and thus deserve a special attention.

The second set of goals of this thesis is theoretical. The main theoretical goal of this thesis is in deepening our understanding of the phenomenon of lexical stress. Languages with complex morphology are a particularly fruitful ground for achieving this goal as 'typical' words in such languages provide the necessary phonological 'length' and morphological complexity to investigate the effects of both phonological and morphological factors in the assignment of lexical stress. It is thus not surprising that the only two large-scale studies fully devoted to lexical stress – Revithiadou (1999) and Alderete (2001) – are to a large extent based on data from languages with complex morphology. The current thesis builds upon the insights of these previous studies and develops a theory of lexical stress where the central role is given to the notion of accent competition as the defining property of lexical stress systems.

Another theoretical goal of this thesis is in re-evaluation of the fundamental properties of stress and prosody: demarcation, culminativity, stress domains, primary and secondary prominence, as informed by the languages with complex morphology. These theoretical notions are significant not only within the theory of prosodic organization, but also because they have a direct effect on our ideas of language acquisition and perception. An investigation into these demarcation issues is centered around the following hypotheses (H), (1):

(1) Demarcative function of stress: Hypotheses

H1. Phonological length and morphological complexity of morphological words in languages with highly synthetic morphology creates less pressure to demarcate morphological words which diminishes the relevance of Culminativity and Obligatoriness of stress in such languages as traditionally understood.

H2. We expect to find an emphasis on demarcation of morphemes or sub-word morphological domains.

The hypotheses in (1) raise three relevant research questions (RQ), (2):

(2) Demarcative function of stress: Research Questions

RQ1. Do highly synthetic languages present counterexamples to the hypothesized universals of accent - Culminativity and Obligatoriness?

RQ2. Is prominence in highly synthetic languages dependent on the demarcation of word-internal morphological domains?

RQ3. Does prominence in highly synthetic languages demarcate morphological words?

Relatedly, the issue of primary and secondary prominence is addressed in detail with the goal of developing a theory of organization of word-level prosodic system that would be able to explain the various patterns of assignment of primary and secondary prominence in languages with complex morphology.

I consider both sets of goals – empirical and theoretical – to be of equal importance, and in fact, one of the main outcomes of this thesis, the proposed typology of lexical stress systems, is informed by both. It should also be noted that conclusions and proposals made in this dissertation on the basis of data from languages with complex morphology are envisioned to be general and extendable to languages of other morphological profiles.

1.1.2 Outline of the thesis

Following the introductory chapter, the remainder of this thesis is structured as follows. Chapter **2** presents the first of the two types of lexical accent systems proposed in this dissertation – *Directional Accent* systems. It is argued that despite being *lexical accent* systems, languages with *Directional Accent* do not require access to any morphological information in the process of stress assignment. Lexical accent in a Plains Algonquian language Arapaho is analyzed in detail as a case study in Chapter **2**.

Chapter **3** presents the second type of lexical accent systems proposed in this dissertation – *Cyclic Accent.* Two case studies of stress in Sahaptian languages are presented – Nez Perce and Ichishkiin Sɨnwit. Sahaptian stress systems have previously been analyzed as Affix-Controlled (Hargus and Beavert 2002, 2006a,b, 2016), and have been viewed as a rare example of stress systems that seemingly require a high ranking of the Affix Faithfulness constraints over the Root Faithfulness constraints (cited as such, for instance, in Inkelas 2014). I argue that these languages do not warrant positing high-ranking affix faithfulness. Instead, I propose to treat these systems as examples of lexical accent being assigned cyclically, thus eliminating the need to posit the third typologically marked type of lexical accent systems.

Chapter **4** is dedicated to a revision of evidence for Root-Controlled Accent (Alderete 1999, 2001) as a separate type of lexical accent systems. I propose that all accent systems previously analyzed as Root-Controlled can in fact be reanalyzed as either *Directional* or *Cyclic* eliminating the need to posit the third (typologically marked) type of Root-Controlled

Accent. I review evidence from two Uto-Aztecan languages to support this proposal: Cupeño as analyzed in Alderete (2001) and as analyzed in Yates (2017), and Choguita Rarámuri (Caballero 2008, 2011; Caballero and Carroll 2015). I adopt Yates' (2017) analysis for Cupeño, and I propose a novel analysis for Choguita Rarámuri and show that an account in terms of *Directional Accent* not only accounts for all the patterns which are accounted for with the Root-Controlled Accent account, but in fact has a greater empirical coverage making correct predictions for the data which remain unaccounted for under the Root-Controlled Accent analysis.

Chapter **5** addresses the issue of Culminativity and Obligatoriness of stress, which is especially acute in dealing with stress in languages with complex morphology. Data from a number of genetically and geographically diverse languages with complex morphology are considered and it is proposed that the domains of stress Culminativity vary from language to language. I argue that the observed variation should be captured with a macroparametric definition of Culminativity.

In Chapter **6,** a novel view on the organization of word-level prosodic system is proposed. Based on data from multiple languages with complex morphology, I argue that the word-level prosodic system is not bipartite: primary stress vs. rhythm, but tripartite: primary stress vs. secondary stress vs. rhythm. Secondary accent is defined as abstract marking for inherent prominence phonetically realized as non-primary stress. Rhythm is defined as automatic iterative alternation of strong and weak syllables. I show that secondary accent and rhythm regularly exhibit non-trivial discrepancies in their phonological behavior, and I propose that these discrepancies stem from two different sets of parameters governing the two properties. It is argued that secondary accent is governed by the same parameters as primary accent, but the settings of the relevant parameters for primary and secondary accent within a single language may be conflicting. This is taken to suggest that separate applications of the

accent-assigning algorithm are required for primary and secondary accent leading to the proposed tripartite structure of the prosodic system.

Chapter **7** reviews the main proposals of the thesis and draws the final conclusions: (i) lexical accent systems are categorized depending on the strategy employed in the situations of accent competition. Crucially, only two such strategies exist cross-linguistically: accent competition can be resolved *directionally,* or it can be resolved *cyclically.* (ii) Culminativity of stress in its application to languages with complex morphology should be re-evaluated and should be regarded as a macroparameter. (iii) The notion of non-primary prominence on the word level should be deconstructed to include *secondary accent* and *rhythm* as separate and prosodic properties.

1.2 Assumptions about stress

This section provides the background on the main object of investigation of this thesis – the notion of (lexical) stress. In particular, it addresses the terminological issues involved with *stress* and *accent* and situates the current study within the Accent First Theory (also known as the Separation Theory; van der Hulst 1996, 2009, 2012) (§**1.2.1**). Additionally, this section discusses assumptions about the treatment of lexical accent adopted throughout this dissertation (§**1.2.2**).

1.2.1 Accent and stress

In this dissertation, I follow the distinction between *accent* and *stress* elaborated in detail in van der Hulst (1996, 2011, 2012, 2014a,b and other works)[1]. In this view, the term *accent* is used to mean an abstract property of a unit, a mark which does not provide any information about the phonetic cues, while *stress* (or 'stress-accent') is used to mean the phonetic

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[1] This view follows the insights of Abercrombie (1991) where *stress* is treated as a phonetic realization of an abstract property – *accent.*

manifestation of accent (see also Hyman 2006, 2009 for a discussion of the two terms). *Accent* is thus viewed as *underlying stress:*

> "[…] the 'abstract use' of the term 'accent' (as *underlying* stress) refers to a lexical property of lexemes (morphemes or words) which marks the location of certain types of observable stress properties that occur in words: often, then, the term 'stress' is simply used as a cover term for these observable phonetic properties (such as greater duration, greater intensity, etc.) […]." (van der Hulst 2014b:5)

The phonetic (or, specifically, acoustic) correlates, associated with stress differ from language to language, but in general include (some combination of) changes in duration of vowels and/or consonants, changes in fundamental frequency, intensity, and formant frequencies (see Roettger and Gordon 2017 for a cross-linguistic survey).

In the treatment of stress-accent and rhythm, this dissertation relies on the framework of the (Primary) Accent-First Theory proposed and argued for in multiple works by van der Hulst: see, for example, van der Hulst (1996, 2009, 2012), Goedemans and van der Hulst (2014). This theory formally separates the representation of primary stress and the representation of rhythmically strong syllables (also known as rhythmic beats). The Accent-First Theory is in opposition to the assumptions of standard Metrical Phonology (Halle and Vergnaud 1987; Hayes 1980, 1995; Idsardi 1992; Liberman and Prince 1977) in that it proposes a non-rhythmic account for primary accentuation. Standard Metrical Phonology derives primary accentuation by first grouping syllables into feet, and then 'promoting' the head of one of the peripheral feet to the status of primary accent. The heads of the remaining feet then carry non-primary, or rhythmic, prominence. In contrast, the Accent-First Theory treats primary accent and rhythmic prominence as assigned by two separate mechanisms at different stages of prosodic derivation. Crucially, as the name of the theory suggests, primary accent is argued to be assigned first, i.e. prior to the assignment of rhythm and independently of the rhythmic

structure[2]. Unlike the classical Metrical Theory approach, the Accent-First Theory approach does not require accent assignment to refer to the foot structure. In fact, as noted in van der Hulst (1996), the initial motivation for developing the Accent-First Theory was in the observation that in many languages with phonologically predictable accent (namely, in languages with bounded accent), the location of primary accent can be computed with the reference to a single foot at one of the edges of the word. It was thus argued that primary accent assignment does not require exhaustive footing. Goedemans and van der Hulst (2014) further show that traditional foot-based theories fail to account for the stress patterns attested in weight-sensitive bounded stress systems (see also Gordon 2014 for a suggestion that some of the edge-oriented accent systems may not require foot structure). In fact, while it has been demonstrated that some languages provide clear evidence for foot structure (e.g. Yidiny or Japanese, cf. Dixon 1977; Poser 1990), many do not (eg. French, Murrinhpatha, Turkish, cf. Jun and Fougeron 2002; Mansfield *forth.;* Özçelik 2016). Taking into account both theoretical and empirical evidence outlined above, in this thesis, I do not assume universality of foot structure or the requirement of exhaustive footing. This assumption is additionally related to the main assumption regarding prosodic structure adopted in this dissertation, namely that prosodic structure is process-defined. I assume that certain prosodic constituents exist or are active in a language if there are phonological processes that reference them (on Prosodic Hierarchy being process-driven see Hannahs 1996; Nespor and Vogel 1986; Selkirk 1986; Scheer 2008, 2010; Vigário 2010)[3].

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[2] I refer the reader to chapter **6** of this dissertation where I propose, based on the Accent-First Theory, to not only treat *primary stress* and *rhythm* as separate prosodic phenomena, but also to treat *secondary stress* as separate from primary stress and rhythm.

[3] I should note that even though phonological processes are commonly taken to be evidence for prosodic constituents, it is also common to assume that all levels of the traditional Prosodic Hierarchy are universally present in every language even if no evidence for each level exists in every language (e.g. Hayes 1989: 220; Nespor and Vogel 1986: 11). The approach to feet (as well as to other prosodic constituents) taken here is different: a constituent is present in the prosodic structure of a language if phonological processes refer to that constituent.

Van der Hulst (1996, 2012, 2014) proposes to account for the variety of accent behaviors observed cross-linguistically with a small set of parameters. Firstly, the source of accent in languages is parametrically determined, and a distinction is made between weight-sensitive accent languages and lexical accent languages (discussed in the next section). Secondly, the mechanism of accent assignment is governed by two sets of parameters: the Domain parameters and the Accent Placement parameters within the designated domain:

(3)   Accent parameters

Accent Domain	(BOUNDED) (R/L)
	(SATELLITE) (R/L)
Accent Placement	SELECT (R/L)
	DEFAULT (R/L)

The application of parameters in (3) is discussed in detail in the case study chapters; the parameters can be briefly defined as follows. The first parameter – BOUNDED (R/L) determines whether stress is assigned within a bounded domain at one of the domain edges, Right or Left. If a language assigns stress in a bounded domain, a primary stress has to surface within the first or the last two or three syllables of the domain (as opposed to being assigned anywhere within the domain). It is indicated by the parentheses that this parameter can be active or inactive. In case the Bounded parameter is inactive, the domain of accent assignment is equivalent to the word, producing an unbounded accent system. In case this parameter is active, it determines the edge of the word which coincides with the accent domain. The second domain parameter – SATELLITE (R/L), if active, produces a trisyllabic domain and determines whether an extra syllable is adjoined to the right or to the left of a disyllabic accent domain. The 'Accent Placement' parameters – SELECT (R/L) and (d) DEFAULT (R/L) deal with a competition of more than one accents (Select), and with absence of accent (Default), assigning accent to the leftmost or the rightmost accentable unit in a domain. In this thesis, I add two additional parameters to

the list of accent parameters in (3), based on the parametric view of Culminativity and Obligatoriness of accent (Hyman 2006, 2009)[4]: thus, CULMINATIVITY (Y/N) and OBLIGATORINESS (Y/N) determine whether words with multiple stresses or no stresses are allowed.

1.2.2 Lexical Accent

The main object of investigation in this dissertation is the phenomenon of *lexical accent.* I use the term *lexical accent* to refer to an abstract prosodic feature which is supplied for some syllable(s) within particular morphemes in the lexicon of lexical accent languages. The terms *free stress, lexical stress,* or *lexical accent* can be found in the literature for this type of stress. Following van der Hulst (1999, 2010), lexical accent marks are viewed as marking a special status of a syllable for the purposes of stress assignment. Such lexically marked syllables behave as heavy syllables would in weight-sensitive accent systems. In other words, syllables carrying such unpredictable underlying lexical accent marks can be viewed as carrying *diacritic weight.* In the approach adopted in this dissertation, the abstract prosodic feature of *accent* is formally represented as a grid mark projected onto the stress plane, and the computation of the outcome accent pattern is carried over the marks on the grid; section **1.3** of this introduction describes the details of accent assignment mechanism in lexical accent languages as proposed in this thesis. Lexical accent, i.e. underlying marking for diacritic weight, can be present in an accentual system in two possible ways. Firstly, accent systems where the location of accent is generally phonologically predictable may have a limited set of exceptionally accented morphemes, i.e. of morphemes exceptionally marked with underlying accent disrupting the predictable accent pattern. Such accentual system is observed in many languages, for example Dutch (van der Hulst 1984; van Oostendorp 2012), Squamish (Dyck

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[4] Refer to chapter **5** for a novel proposal on treating Culminativity as a macroparameter comprising of a set of microparameters.

2004), Turkish (e.g. Inkelas 1999; Inkelas and Orgun 2003; Kabak and Vogel 2001; see also Kabak and Revithiadou 2009 on the development of lexical accent from phonologically predictable accent). This dissertation, however, is mostly concerned with lexical accent in languages where underlying marking of morphemes for phonologically unpredictable accent is the norm rather than an exception. This latter type of languages is referred to as the *lexical accent languages* in this thesis. Lexical accent languages are contrasted with languages which have rule-governed or phonologically predictable accent where accent placement can be predicted from syllable weight and/or distance from the word edges. Although the main focus of prosodic literature in the past half a century has been on such predictable accent systems, a number of studies have addressed lexically determined accent in individual languages or language families, for example: Alderete (1999, 2001), Halle (1997), Halle and Kiparsky (1977, 1981), Halle and Vergnaud (1987), Hill and Hill (1968), Kiparsky (1973, 1982), Melvold (1990). Other formal studies on lexical accent systems deal with the representation of underlying accents: Alderete (2013), Idsardi (1992), Inkelas (1999), Kiparsky (1982), Revithiadou (2007), Tsay (1990), van der Hulst (1996), Vaxman (2016); and, finally, with the principles governing the competition of lexical accents: Alderete (1999, 2001), Revithiadou (1999).

1.3 The Proposals

This thesis makes two major proposals. First, I propose a typology of lexical accent systems and argue that such typology ought to be based on the definitional traits of lexical accent languages, i.e. traits pertinent to every lexical accent system. I identify these traits as lexical marking of morphemes for accent and competition between input lexical accents for being realized as primary stress. The proposed typology is based on identifying the particular strategies of resolving accent competitions. It has been previously observed that even though accent placement is phonologically unpredictable within any given morpheme in a lexical

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accent language, the winning accent in a word with multiple underlying accents is usually predictable based on a limited set of possible rules governing the resolution of stress competition cross-linguistically (van der Hulst 2014 attributes this insight to Garde 1965). I argue that accent competition in lexical accent languages can be resolved in one of two ways: either *cyclically*, involving some morphological information, or *directionally* (or post-cyclically) involving only phonological information in resolving accent competitions. The proposed typology is couched in the framework of the Accent-First Theory (van der Hulst 1984, 1996, 2012, 2014) and makes predictions regarding lexical accent systems which should not be possible. Specifically, I predict that (i) lexical accent systems should not resolve accent competition by appealing to the differences in morpheme identities (e.g. prefixes vs. roots vs. suffixes), and that (ii) syllable weight distinctions cannot be the deciding factor in lexical accent competition.

The second proposal made in this dissertation concerns the status of fundamental properties of stress and prosody – Culminativity and Obligatoriness of stress (Trubezkoy 1939/1960; Hyman 2006, 2009) and primary versus non-primary stress in their application to languages with complex morphology. It has previously been claimed that Culminativity of stress can be breached in highly synthetic languages (e.g. Blackfoot, Stacy 2004; Arapaho, Bogomolets 2014a,b; Mapudungun, Molineaux 2018; Yupik, Woodbury 1987 to name a few). I argue that stress is in fact always culminative, but Culminativity should be regarded as a macroparameter allowing for a set of language-specific ways to implement it, including enforcing 'one and only one' stress within domains smaller than a morphological word and clash avoidance. Secondly, I propose that the word-level prosodic system is not bipartite: primary stress vs. rhythm, but tripartite: primary stress vs. secondary stress vs. rhythm. Traditionally, a broad distinction is made between primary stress and non-primary stress (or rhythm). This distinction is assumed in all the influential theories of word prominence: in the

classical Metrical Theory, where primary stress assignment is derived from the rhythmic structure (Hayes 1989, 1995; Liberman and Prince 1977; Prince 1983), in Accent-First theory, where primary stress is assigned independently and prior to the calculation of rhythmic structure, and rhythm is dependent on primary accent (van der Hulst 1996, 2009, 2010, 2012), as well as in non-derivational models (Prince and Smolensky 1993). I argue that languages which are the main focus of this dissertation provide evidence for treating rhythm and secondary accent as distinct prosodic phenomena. I present a typology of secondary accent systems, arguing that we find striking parallels between primary accent assignment and secondary accent assignment, but not between secondary accent assignment and rhythm assignment. I account for this observation by proposing that secondary accent is governed by the same parameters as primary accent, while the rhythmic module is governed by a separate set of parameters.

1.3.1 Typology of Lexical Accent languages

Lexical stress systems are particularly interesting for the theories of the morpho-phonological (or, rather morpho-prosodic) interface because they potentially can be sensitive to both morphological and phonological factors. Some of the definitional properties of lexical stress systems have traditionally been identified as follows:

(4)   Lexical stress systems: traditional definitions (e.g. Garde 1965; Hayes 1995; van der Hulst 2014)

  (a) phonology does not determine stress placement, i.e. stress is phonologically unpredictable;

  (b) stress assignment is sensitive to morphology;

  (c) stress is used contrastively.

However, a closer look at lexical accent in highly synthetic languages shows that none of these three properties is absolute in a lexical stress system. The investigation into the distribution of

lexical stress in languages with complex morphology shows that (a) although it holds across the board that accent is phonologically unpredictable within a morpheme, the stress mechanism *always* requires access to phonology at least in the assignment of the default stress, and, potentially, in the resolution of stress competition. (b) Many lexical stress systems do not require **any** morphological information for stress assignment. Finally, (c) the contrastive power of lexical stress appears to be weakened in highly synthetic languages due to the notorious morphological complexity of an 'average' word in such languages[5]. In fact, we find highly synthetic languages with lexical stress where none of the three canonical properties in (4) hold; one of such languages – Arapaho – is the focus of chapter **2** of this thesis. The question thus arises: *What properties are definitional of lexical stress systems?*

Two properties of lexical stress systems that do appear to hold across the board were stated in Revithiadou (1999, 82): lexical accent systems are primarily identified by (i) the pervasive presence of marking of the morphemes as being inherently accented or unaccented, and by (ii) the competition of lexical accents for stress. Building on this insight, I propose a typology of lexical stress languages based on (ii). In the core of this typology is the way in which accent competition gets resolved.

A number of proposals have been previously made in the literature to account for the resolution of accent competition in lexical accent languages. Such proposals have often been centered on accounting for the stress competition patterns in individual languages producing idiosyncratic constraints or rules (e.g. Bjorkman 2010 for Nez Perce; Hargus and Beavert 2006 for Ichishkiin Sinwit; Caballero 2008, 2011 for Choguita Rarámuri). While careful descriptions of the stress patterns provided in such studies are invaluable, the idiosyncratic nature of the proposed analyses is undesirable if one seeks to eliminate language- or language family-

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[5] The issue of wordhood in languages of various morphological profiles is beyond the scope of this dissertation, but see Shiering, Bickel & Hildebrandt (2010); as well as various works in Dixon and Aikhenvald (2003) and Fortescue, Mithun, & Evans (2017).

specific mechanisms in the linguistic theory. Two prominent accounts of lexical accent aiming to derive the patterns of lexical accent competition from universally available mechanisms were introduced in recent scholarship: (i) stress assignment depends on hierarchical relations between morphemes in the word whereby an accent in the morphological head of a word always wins (Revithiadou 1999), and (ii) accent in roots overrides accent in affixes (Alderete 1999, 2001). I will show throughout this thesis that neither (i) nor (ii) can be applied to account for all cross-linguistic patterns of accent competition since not all lexical accent languages require access to morphological information in the resolution of accent competition. Additionally, I will show that no clear examples of lexical accent systems of the type (ii), the so-called Root-Controlled Accent systems (Alderete 1999, 2001), have been reported, and I derive this typological gap in a principled way (refer to **1.3.1.3** for details).

Departing from the idea that each lexical accent system might require an idiosyncratic mechanism for accent assignment or accent competition resolution, and from the idea that *all* lexical accent languages require access to some morphological information in accent assignment, I propose that lexical stress systems fall into one of two types depending on the type of the accent competition resolution[6].

(5)   Typology of lexical stress systems

    (a)   *Directional Accent.* In an accent competition, either the right-most or the left-most accent wins, i.e. competition is resolved *directionally.*

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[6] I should note that the basis of the classification of accent competition resolutions proposed in Garde (1965) was in fact quite similar to the one proposed here: on the basis of three languages, Garde showed a gradual change in complexity in the resolution strategies. German was taken as an example of the simplest strategy where, according to Garde, only the root can bear an underlying accent and thus stress is predictable if the underlying accent position is known. Italian was presented as a case of an intermediate complexity where both roots and affixes can be underlyingly accented, but the competition resolution is governed by a simple rule whereby the rightmost of the underlying accents receives primary stress (these are the *Directional Accent* systems in the typology in (5)). Finally, Russian was presented as an example of a lexical accent system with the most complex resolution rules dependent upon the specific interactions between multiple morpho-phonological classes of morphemes.

(b)   *Cyclic Accent.* In an accent competition, accent in the outermost derivational layer within the relevant morpho-prosodic domain wins, i.e. competition is resolved *Cyclically*.

As is evident from the proposed definitions of the two types of lexical accent in (5), only *some* lexical accent languages would require access to *some* morphological information, namely the *Cyclic Accent* systems. The *Directional Accent* systems, on the other hand, only require the information about linear position of accented syllables within the relevant domain. This dissertation thus proposes a highly restricted theory of lexical accent to account for the cross-linguistic patterns whereby the idiosyncrasy in lexical accent systems is found in the distribution of underlying accents, but not in the rules of the systems.

1.3.1.1 Directional Accent systems

An example of a highly synthetic language with *Directional Accent* – Arapaho – will be analyzed in detail in chapter **2**. Consider for instance examples of clash resolutions in the Arapaho noun in (6) below. The root *hooˈxeb(in)* 'spring' carries an underlying accent on the final syllable. This accent is realized as primary stress if there is no competition: consider (6a) where the word consists of the single root morpheme. It is also realized as primary stress or if the root is combined with an underlyingly unaccented affix as in (6b). However, if the root is combined with an underlyingly accented suffix and a clash occurs, the root loses its accent and the underlying accent of the suffix is realized as primary stress; consider (6c) where the pre-accenting locative suffix *-eʔ* realizes its accent as stress on the final syllable of the root:

(6a) hooˈ**xeb**   'spring'

(6b) hooˈ**xe**bin-o   'springs'

(6c) hooxeˈ**bin**-eʔ   'in the spring'

In chapter **2,** I show that 'the rightmost wins' pattern holds in accent competition in Arapaho across the board, and I propose to formalize it with the appropriate setting of the Select

parameter: Select (R). Two other languages which I analyze as *Directional Accent* systems – Cupeño and Choguita Rarámuri – will be discussed in Chapter **3.**

1.3.1.2 Cyclic Accent systems

In the lexical accent systems of the *Cyclic* type, in contrast to *Directional Accent* systems, the stress mechanism must have access to morphological structure in order to determine the winner in an accent competition. Assuming hierarchical morphological structure in complex words, the phonological cycle theories propose that the phonological or prosodic grammars reapply successively at each morphological constituent, starting with the most embedded one (Chomsky, Halle, & Lukoff 1956; Chomsky and Halle 1968). Thus, much of debate in phonological theory has been centered on trying to define precisely *which* morphological constituents induce the reapplication of phonological grammar (for different approaches see for example Bermúdez-Otero 2011; Kean 1974; Kiparsky 2000; Marvin 2002; Mascaró 1976; Newell 2008; Piggott and Newell 2014). It has also been argued that while phonology is sensitive to some aspects of morphological structure, the relations between morphological constituents and phonological cycles are non-isomorphic (e.g. Bjorkman and Dunbar 2010). I treat phonological, or rather, prosodic, cyclicity as diacritical (see also Schwayder 2015). In other words, in *Cyclic* lexical accent systems, morphemes which are marked with underlying accent, induce a new prosodic (*lexical accent*) cycle and a grid mark in that cycle. Accent competition resolution in such systems is dependent on the way accent gets assigned: accent in the outermost derivational layer within the relevant morpho-prosodic domain receives primary stress.

The clearest example of *Cyclic Accent* was discussed in Chung (1983) for an Austronesian language Chamorro where crucially directionality ('rightmost' or 'leftmost' accent) cannot account for the patterns of competition, and rather the winning accent is always

the one in the outermost derivational layer. Consider the change in the stress position between the forms in (7) versus (8); stressed syllables are in bold:

(7a) ˈ**kwen**tus   (7b) kwenˈ**tus**-i   (7c) ˈ**a-k**wentus-i

speak   speak-to   RECP-speak-to

'to speak'   'to speak to'   'to speak to one another'

(8a) manˈ**ti**ka   (8b) ˈ**mi**-mantika   (8c) mi-mantika-ˈ**ŋa**

fat   abounding.in-fat   abounding.in-fat-COMPR

'fat'   'abounding in fat'   'more abounding in fat'

<div align="right">(Chung 1983: 41)</div>

In Chamorro, as Chung convincingly argues, primary stress is assigned *cyclically,* i.e. necessarily in the outermost derivational layer, as schematically shown in (9a) for the form in (7c) and in (9b) for the form in (8c):

(9a)   x   Cycle 3

x   x   Cycle 2

x   x   x   Cycle 1

[a[[kwentus]i]]

(9b)   x   Cycle 3

x   x   Cycle 2

x   x   x   Cycle 1

[[mi[mantika]]ŋa]   (adapted from Chung 1983: 41)

I argue that we observe a variety of *Cyclic Accent* systems cross-linguistically which is due to the differences in morpho-prosodic domains relevant for stress assignment in a particular language. The burden of 'sensitivity to morphology' is thus shifted from accent being sensitive to differences between individual morphemes to accent being sensitive to differences between domains. The domains significant for the resolution of accent competition across languages with complex morphologies are: phonological root (PRoot), phonological stem (PStem), and phonological word (PWord).

Two case studies of highly synthetic languages of the *Cyclic Accent* type will be presented in this dissertation – Ichishkiin and Nez Perce (Chapter **4**). Ichishkiin and Nez Perce are sister languages of the Sahaptian family. Genetically related languages are chosen for the comparison and analysis of this type of lexical accent as it provides an opportunity to assess the microvariation in lexical accent systems of the *Cyclic* type.

1.3.1.3 Predicted typological gaps

The typology of lexical accent systems proposed in this dissertation states that only two types of lexical accent systems are attested cross-linguistically: systems where accent competition is resolved *post-* the morpho-prosodic derivation, and systems where accent competition is resolved *during* the derivation. Let us illustrate the two systems in more detail. In the former type – the *Directional Accent* systems, the placement of lexical accents within morphemes is unpredictable, but the winning accent is always either the rightmost or the leftmost one in the relevant domain. Consider the schematic representations in (10a-b) below. As outlined in **1.2,** I adopt the formal representation of accent proposed in van der Hulst (1996), where lexically accented (LA) syllables project a mark ('x') onto the accent grid. In *Directional Accent*

systems, there is no inherent hierarchy between the grid marks, cf. the linear configuration in

Line 1 in the hypothetical schematic forms in (10)[7].

(10)   Directional Accent systems

(10a) Rightmost 'x' wins

                        x   Line 2: Promote Rightmost 'x'
    x   x   x   Line 1: Project LA
    ˈσ σ - σ σ ˈσ σ- σ ˈσ σ

    Surface form   Assign primary stress to the promoted 'x'
    σ σ - σ σ σ σ- σ ˈ**σ** σ

(10b) Leftmost 'x' wins

    x   Line 2: Promote Leftmost 'x'
    x   x   x   Line 1: Project LA
    ˈσ σ - σ σ ˈσ σ- σ ˈσ σ

    Surface form   Assign primary stress to the promoted 'x'
    ˈ**σ** σ - σ σ σ σ- σ σ σ

Importantly, as simplistically shown in (10), the accent competition mechanism in *Directional*

Accent systems operates over the grid marks projected by the inherent lexical prominence of

some syllables in some morphemes within the wordform. In *Cyclic Accent* systems, the accent

assigning mechanism is formally similar: lexically accented syllables project a mark ('x') onto

the accent grid, and the grid marks are in competition for being realized as primary stress.

However, the crucial difference is in the presence of a hierarchy between grid marks created

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[7] Note that the algorithm of the accent competition resolution is schematized in (10)-(11) simplistically; all the relevant parameters and mechanisms involved at each step are elaborated on throughout the case studies.

by the cyclic application of the accent assignment algorithm. Consider the hypothetical derivation in (11); lexical accent cycles are represented with square brackets:

(11)   Cyclic Accent systems

x	Line 1
[σ σ ˈσ σ]	Cycle 1: Project LA on Line 1

x	Line 2
x x	Line 1
[ˈσ σ -[σ σ ˈσ σ]]	Cycle 2: Project LA on Line 2

x	Line 3
x x	Line 2
x x x	Line 1
[[ˈσ σ- [σ σ ˈσ σ]]- ˈσ σ]	Cycle 3: Project LA on Line 3

Surface form	Assign primary stress to the 'x' in the outermost derivational layer
σ σ-σ σ σ σ- ˈ**σ** σ	

As schematically shown in (11), the resolution of accent competition in *Cyclic Accent* systems proceeds cyclically, thus it is sensitive to the relative structural positions of the morphemes within the wordform, in contrast to the *Directional Accent* systems exemplified in (10). However, there is an important formal similarity in how accent competition is resolved in both types, namely, the only information available to the accent competition mechanism is the information supplied by the grid: the linear string of 'x' marks in the case of *Directional Accent* systems and the bracketed hierarchical structure of 'x' marks in the case of *Cyclic Accent* systems.

This predicts two typological gaps. Firstly, it is predicted, albeit surprisingly, that the identity of morphemes (e.g. prefixes vs. roots vs. suffixes) cannot play a role in the resolution

of accent competition. This prediction clearly contradicts the theory of Root-Controlled Accent previously proposed in Alderete (1999, 2001). However, consider the schematic representations of the two accent types in (10) and (11) one more time. On one hand, there is no way to signal to the grid the privileged status of the root in *Directional Accent* systems. On the other hand, in the *Cyclic Accent* systems, the root will always be the most embedded cycle. Thus, the root is not predicted to win the accent competition by the definition of the *Cyclic Accent* systems in (5b). I will argue in this dissertation that this prediction in fact holds: I will show that the only two highly synthetic languages ever analyzed as having Root-Controlled Accent (Cupeño; Alderete 1999, 2001 and Choguita Rarámuri; Caballero 2008) can be reanalyzed as *Directional Accent* systems which in fact accounts for all the data including the data which was problematic for the Root-Controlled Accent analyses. I will thus argue that we only find 'Root-Controlled Accent' in systems which are outside of the typology proposed in this dissertation, namely in the systems which do not have an accent competition – for instance, in systems where only roots can be marked for lexical accent, but all affixes are underlyingly unaccented. Multiple examples of such systems have been reported, for instance, Gitksan (Penutian; Forbes 2015), Wappo (Yukian; Sawyer 1991), Jamul Tiipay (Yuman; see Rice 2010 for an overview). I also review the reverse pattern, i.e. the so-called Affix-Controlled Accent, previously proposed for Ichishkíin Sɨnwit (Sahaptian; Hargus and Beavert 2002, 2006, 2016). This pattern is also predicted to be impossible since it would require a reference to the morpheme identities in the accent competition resolution. I argue that postulating an Affix-Controlled Accent type is unwarranted and that it can be reanalyzed in a typologically unmarked way as *Cyclic Accent* (refer to chapter **3**).

The second typologically and theoretically significant prediction made by this theory is that accent competition in lexical accent systems cannot access information about syllable weight. This means that no lexical accent competition should be resolved by appealing to the

differences in phonological weight between the syllables projecting the competing accents. Consider again the schematic representations of accent derivation and accent competition in (10) and (11). The 'x' marks in a lexical accent system are projected by underlying (phonologically unpredictable) accents in morphemes constituting a word. In both cases, i.e. in the *Directional Accent* systems and in the *Cyclic Accent* systems, according to the theory proposed in this dissertation, the accent competition mechanism only has access to the information projected onto the grid: the linear string of 'x' marks in the case of *Directional Accent* systems and the hierarchical structure of 'x' marks in the case of *Cyclic Accent* systems. At the point where accent competition might arise, the accent algorithm thus can only evaluate the relative positioning of the grid marks on the grid and not the qualitative or quantitative properties of syllables associated with those grid marks. This prediction appears to hold cross-linguistically as no lexical accent system refers to syllable weight in the resolution of accent competition, to the best of my knowledge.

1.3.2 Demarcative function of stress and levels of prominence

The second group of proposals made in this dissertation re-evaluates the defining properties of stress and prosody – Culminativity and Obligatoriness of stress and primary versus non-primary stress in their application to languages with complex morphology. Firstly, I argue that even when on the surface it might seem that some lexical accent languages with complex morphology have non-culminative stress, they still have culminative stress if Culminativity is defined as a macroparameter consisting of a number of relevant microparameters. I propose the following definition of Culminativity:

(12)   Stress Culminativity microparameters

	i.	Is stress culminative in *some* domain in the language?	Y/N, if Y:
		a. Is stress culminative in roots?	Y/N
		b. Is stress culminative in stems?	Y/N

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      c.   Is stress culminative in MWord?   Y/N

ii.   Is stress clash banned in some domain?   Y/N

The motivation behind stating (12-i) and (12-ii) as the microparameters of Culminativity of stress comes from the fact that the positive setting for either of these microparameters would trigger an application of a stress competition resolution active in a particular language. I compare predictions made by the traditional definitions of Culminativity and the predictions made by the macroparametric definition of Culminativity in (12), and I show that the definition proposed in this dissertation accounts for the cross-linguistic data more successfully. This bears on the issue of demarcation (see Hypotheses and Research Questions in **1.1.1**). A survey across a number of highly synthetic languages with both phonologically predictable stress and with lexical stress presented in chapter **5** of this thesis suggests the following conclusions regarding the role of Culminativity and Demarcation in stress systems in languages with complex morphology:

Research Question	Answer	Evidence
RQ1. Do highly synthetic languages present counterexamples to the hypothesized universals of stress – Culminativity and Obligatoriness?	No	All languages surveyed either (i) have culminative stress in *some* domain, or (ii) ban stress clashes, or both (i) and (ii).
RQ2. Is prominence in highly synthetic languages dependent on the demarcation of word-internal morphological domains?	Yes	Highly synthetic languages show stress patterns demarcating individual morphemes (eg. Arapaho, Nez Perce, Bininj Gun-wok) or word-internal domains (Mapudungun, Plains Cree, Athabaskan languages).

RQ3. Does prominence in highly synthetic languages demarcate morphological words?	Yes	All the surveyed languages demarcate the word boundaries through (i) edge-oriented accent, or (ii) edge-oriented default, or (iii) culminative stress within a morphological word.

Table 1. Summary of the Culminativity and Demarcation research questions

Finally, I re-evaluate the organization of word-prosodic phenomena of primary accent, secondary accent, and rhythm. This dissertation proposes that the word-level prosodic system is not bipartite: primary stress vs. rhythm, but **tripartite: primary accent** vs**. secondary accent** vs**. rhythm**. *Secondary accent* is defined as abstract marking for inherent prominence phonetically realized as non-primary stress; *Rhythm* is defined as automatic iterative alternation of strong and weak syllables. I show that secondary accent and rhythm regularly exhibit non-trivial discrepancies in their phonological behavior and propose that these discrepancies stem from two different sets of parameters governing the two properties. It is argued that secondary accent is governed by the same parameters as primary accent, while rhythm requires a separate set of parameters.

I argue that secondary accent assignment parallels the assignment mechanisms common in primary accent and does not parallel the mechanisms common in the assignment of rhythm. Three strategies of primary accent assignment are considered and are shown to be paralleled by secondary accent systems. Firstly, primary accent can be **fixed**, i.e. primary accent always falls on the same syllable, normally at one of the edges of the morphological word (e.g. Polish). Fixed secondary accent, in parallel, may be located at the edge of a domain (e.g. at one of the edges of a morphological word). This type of secondary accent is found, for instance, in Passamaquoddy where primary stress falls on the penultimate syllable, and secondary stress

falls on the initial syllable (LeSourd 2013; (12) below). An identical pattern has been reported in van der Hulst (2014) for Maithili, Biangai, and South Conchucos Quechua.

Secondly, just like primary accent, secondary accent assignment may depend on **syllable weight**. This is found, for instance, in Khalkha and Buriat: primary stress falls on the last syllable if it is the only heavy in the word, otherwise on the rightmost nonfinal heavy, otherwise on the initial syllable. Secondary stress falls on all heavy syllables, including the final syllable (Walker 1997). Syllables with branching nuclei are heavy for the purposes of both primary and secondary stress assignment:

(13a) ˌxy:xenˈge:ˌre: (13b) ˌbu:zaˌnu:ˈdi:je

'by one's own girl'   'steamed dumplings.acc'   (Walker 1997: ex. 33)

Importantly, secondary accent assignment does not obey the same constraints as primary accent in Buriat which is evident from the fact that secondary stress can fall on the final syllable while primary stress cannot.

The third common type of accent is **phonologically unpredictable** or **lexical stress**. I argue that secondary accent, just like primary accent, can be lexical. In Nez Perce (Sahaptian), multiple morphemes in a morphologically complex word can be underlyingly marked for unpredictable accent. One of these accent is realized as primary, while the remaining underlying accents are realized as secondary (see Crook 1999: 383-387 and chapter **4** of this dissertation). Similarly, in Chamorro (Austronesian), secondary stresses result from cyclic lexical accents (Chung 1983). In Northern Saami (Finno-Ugric) a number of derivational suffixes are lexically specified to always carry secondary stress (Aikio and Ylikoski 2010). I thus argue, that we find close parallels in the behavior of primary stress and secondary stress.

On the other hand, secondary accent and rhythm do not exhibit much parallelism in their behavior. All the logical combinations of rhythm and secondary accent are attested: (i) languages with only primary stress and rhythm, (ii) languages with primary stress and

secondary stress but no rhythm, and (iii) languages with primary stress, secondary stress, and rhythm. In the interest of space, only languages of type (iii) are discussed here as the most informative for separating rhythm and secondary stress. In Passamaquoddy, primary stress falls on the penultimate syllable, secondary stress falls on the initial syllable, and regular trochaic rhythm falls on alternate syllables from the primary stress right-to-left. Consider the forms in (14); both rhythm and secondary stress are marked in the examples with the IPA diacritic <ˌ>, rhythmically prominent syllables are additionally underlined:

(14a) ˌteh.ˌsah.kwa.ˌpa.sol.ˈti.ne   (14b) ˌwi.ˌcoh.ke.ˈke.mo

'let's walk around on top'   'he helps out'   (LeSourd 1988: 140-143)

We also observe evidence for all three prosodic properties in languages with phonologically unpredictable secondary accent. Rhythm in these languages, however, just as in languages like Passamaquoddy, is fully predictable and regular. The case in point comes from Chamorro. All lexical accents in words with multiple underlying accents are retained in Chamorro: one of them is realized as primary stress, and all the others are realized as secondary. In addition, Chamorro has a regular rhythm assigned to alternating syllables right-to-left from the primary stress. Secondary accent and rhythm in Chamorro not only are assigned by different parameters (the former being phonologically unpredictable and the latter being fully automatic), their interaction with morpho-phonology is different. This is evident in the processes of Umlaut and Gemination (Chung 1983; Crosswhite 1998) which are triggered by secondary accent and never by rhythm.

I propose that both primary and secondary accent are governed by the set of parameters presented in **1.2.1:** (a) BOUNDED (R/L): determines whether stress is assigned within a bounded domain at one of the domain edges, Right or Left. (b) WEIGHT-TO-ACCENT (Y/N): determines whether stress is weight-sensitive. (c) SELECT (R/L) and (d) DEFAULT (R/L) deal with a competition of more than one stresses (Select), and with absence of stress (Default), assigning

stress to the leftmost or the rightmost stressable unit in a domain. (e) CULMINATIVITY (Y/N) and (f) OBLIGATORINESS (Y/N) determine whether words with multiple stresses or no stresses are allowed.

I propose that only three parameters are required cross-linguistically for rhythm assignment. (a) ANCHOR (Primary/Secondary): rhythm is assigned to alternating syllables from primary stress, or to alternating syllables from secondary stress. (b) LAPSE (Y/N): determines whether rhythm is binary or ternary. (c) NonFinality (Y/N) decides whether the final syllable is extrametrical. Crucially, by virtue of being dependent on the same set of parameters, primary accent and secondary accent are formally united, while rhythm is treated as formally different.

1.4 Prosody in highly synthetic languages: Overview

This section presents a brief overview of the literature on (word-level) prominence in languages with highly synthetic morphologies. I provide a brief overview of the geographic coverage of prosodic studies on languages with highly synthetic morphology in section **1.4.1**, and I focus on some of the major theoretical and empirical topics in the existing studies in **1.4.2**. These include interactions between phonology and morphology in stress assignment, the role of stress in studies on prosodic hierarchy in languages with complex morphologies, primary stress and rhythm, and phonetic manifestation of word-level stress and phrase-level accent.

1.4.1 Geographic and genetic coverage of prosodic studies on languages with highly synthetic morphologies

Although highly synthetic languages as a typological group have never been a central object of an extensive cross-linguistic study of word prominence, a number of relevant questions have sporadically been raised in the literature. The collection of works on word accent edited by van der Hulst, Goedemans and van Zanten (2010) contains discussions of word prominence in a variety of highly synthetic languages, while the volume edited by van der Hulst (2014) devotes separate chapters to a number of relevant questions, including the question of universality of

word accent (Hyman 2014), the question of defining prominence at different prosodic levels (Gordon 2014), specific issues arising in the analysis of word-level prominence in some of the highly synthetic languages of Americas (Rice 2014). Theoretical assessments of the prosodic systems in languages with highly synthetic morphologies are largely based on a limited set of such languages which lacks geographic and genetic breadth. Languages of North America have undoubtedly received the most amount of attention in the literature on the topic. Salishan (Barel and Watt 2000; Czaykowska-Higgins 1993, 1997; Dyck 2004; Revithiadou 1999), Athabaskan (Bob & Alderete 2005; Gordon and Luna 2004; Hargus 2005; Leer 2005 a.o.), Algonquian (Bogomolets 2014a,b, forth.; Brittain 2000; Goddard 1979; LeSourd 2013; Milligan 2005; Newell 2008), Iroquoian (Chafe 1977; Dyck 2009; Foster 1982; Uchihara 2016), Pomoan (Buckley 1991, 1994, forth.), Wakashan (Elfner forth.; Stonham 1999), Uto-Aztecan (Alderete 1999, 2001; Caballero 2008; Guion et al. 2010; Miller 1996), Yup'ik and Innuit (Arnhold et al. 2018; Hayes 1995; Miyaoka 1985), Muskogean (Gordon and Martin forth.; Munro and Ulrich 1984) are some of the language families of Americas that have featured prominently in the literature on prosody. Rice (2014) notes a great diversity in the prominence systems in the languages of North America with respect to positioning of primary stress, the role of syllable weight, the degree of interaction between stress and morphology, and salience of rhythm. Similarly, Rice (2014) notes the existing diversity in the phonetic cues of stress across the languages of North America. Despite this diversity, however, she points to the left-edge bias in both primary stress and rhythm, and to modulations of pitch as the primary (or the only) cue of stress detected in many languages of the area.

Several relevant areal overviews of stress systems (although in each case – mixed between highly synthetic languages and non-highly synthetic languages of the respective areas) are found in van der Hulst, Goedemans, and van Zanten (2010). These include an overview of stress systems in Australian languages (Goedemans 2010), Austronesian languages (van

Zanten, Stoel, and Remijsen 2010), stress, accent and tone in Papuan languages (van Zanten and Dol 2010), a survey of South American stress systems (Wetzels and Meira 2010), and prosodic systems in languages of Africa (Downing 2010).

An upcoming multi-authored volume edited by Bogomolets and van der Hulst (forth.) presents a broad geographical and genetic coverage of prosodic systems in highly synthetic languages. The book includes chapters on a variety of theoretical issues involved in studying prominence in highly synthetic languages, such as interactions between word-level and phrase-level prominence in these languages (van der Hulst forth.), and interplay between intonational and stress properties in such languages (Gordon forth.). The book includes descriptions and analyses of prominence in highly synthetic languages of North America, including discussions of stress in Inuktitut (Arnhold, Elfner, and Compton forth.), an overview of stress and tone patterns in Plains Algonquian languages (Bogomolets forth.), word prominence in Kwak'wala (Elfner forth.), as well as an analysis of interactions between morphological and phonological domains in Kashaya (Buckley forth.), and an overview of prosodic traits of Muskogean languages (Gordon and Martin forth.). Importantly, the book also includes an overview chapter on prosody of highly synthetic languages of Australia (Mansfield forth.), and three chapters on stress, tone and prosody of highly synthetic languages of Eurasia: a discussion of wordhood in Nivkh (Matissen forth.), of prosody in Circassian languages (Gordon and Applebaum forth.), and of prosodic traits in highly synthetic languages of Asia (Hildebrandt and Anderson forth.). Finally, the volume also devotes four chapters to stress and prosody in languages of South America addressing phonological and morphological factors in stress assignment in Mapudungun (Molineaux forth.), metrical and intonational prominence in Satipo Ashaninka (Mihas and Maxwell forth.), and an analysis of a complex system of stress assignment in Ese Ejja (Rolle forth.).

In the following section, I provide an overview of the theoretical topics in studying stress, accent, tone, and prosody more generally where languages with highly synthetic morphologies have played an important role.

1.4.2 Topics in the study of prominence in highly synthetic languages

One of the major topics that research on highly synthetic languages contributes to is *the role of morphological factors versus phonological factors in stress assignment and stress competition* in lexical stress systems. This issue is one of the central topics of this dissertation. Some other research topics where languages with highly synthetic morphologies have played an important role are outlined below.

Stress phenomena in highly synthetic languages provide important evidence for the *theories of prosodic hierarchy*. Some of the major topics of discussion in this area where the highly synthetic languages feature prominently are the following: (i) possible correspondences and mismatches between morpho-syntactic constituents and phonological domains (Bickel and Zuñiga 2017; Dyck 1994; Rice 1993; Russell 1999; Schiering, Bickel and Hildebrandt 2010); (ii) a search for clear phonological and phonetic cues delimitating prosodic domains (Gordon 2005, 2014; Evans, Fletcher and Ross 2008; Windsor 2017); (iii) prosody-specific cues to prosodic hierarchy s.a. word-level stress and phrase-level pitch accent (Baker 2014; Bishop 2002; Gordon 2003, 2005, 2014; Mansfield 2017, 2019, forth.); (iv) differentiation of domains of rule application – prosodic vs. segmental (e.g. Baker and Harvey 2003; Hargus and Beavert 2016; Pentland and Laughren 2005).

Due to the characteristic morphological complexity of the languages in question, an especially large array of mappings between prosodic and grammatical units may exist. For instance, consider the arrangement of prosodic constituents proposed for Chickasaw. Gordon (2005) provides evidence for at least four prosodic constituents above the foot level in this

language: Intonation Phrase, Accentual Phrase, Prosodic Word, and Rhythmic Lengthening domain. Consider example in (15) below illustrating the hierarchical relationship between the four prosodic constituents and the morphological word in Chickasaw:

(15)   Prosodic Constituency in Chickasaw

Intonation Phrase   {   }
Accentual Phrase   {   }{   }
Morphological Word {   }
Prosodic Word   {   }
Rhythmic Length   {   }
                       aː t͡ʃ i m a b iˑ k a t͡ʃ iˑ l i t o k
                       aː- t͡ʃim- abika- t͡ʃi- li- tok
                       there- you- sick- CAUS- 1SG- PST
                       'I made him sick for you there.'   (Gordon, 2005: 325)

The form in (15) above consists of a single Morphological Word isomorphic to the Prosodic Word. The domain of Rhythmic Lengthening consists of the root plus suffixes, while the prefixes are outside of that domain. Notably, the domain of Accentual Phrase, which typically consists of one or more morphological words in languages with less complex morphology, is smaller than the morphological word in Chickasaw: the Morphological Word in (15) contains two tonally defined Accentual Phrases. These two Accentual Phrases are grouped into a single Intonational Phrase which is cued in Chickasaw by pitch accent and in this case is isomorphic to the domains of Morphological Word and Prosodic Word.

A fairly large body of literature addresses the possibility of breaking up a Morphological Word into prosodic domains formally comparable to Prosodic Words in highly synthetic languages (see, for example, Bishop and Fletcher 2005; Fletcher and Evans 2002 for Kunwinykuan languages; Russell 1999 for Cree; Windsor 2017 for Blackfoot). Consider an

example of possible prosodic constituency in Blackfoot (above the syllable level) in its relation to the domain of Morphological Word:

(16)   Prosodic Constituency in Blackfoot

Intonational Phrase	{				}		
Prosodic Phrase	{	}	{		}	{	}
Morphological Word	{	}	{		}	{	}
Prosodic Word	{	}	{	} {		}	{	}

anniksi   a k ɛ ɛ m a x k i c k i n ɛ: k s i   inokaʍa

ann-iksi   aka-iimahkihkinaa-iksi   ino-oka-wa

DEM-ANIM.PL   old-sheep-ANIM.PL   see.TA-INV-21

'Those old sheep see us.'   (adapted from Windsor 2017:4)[8]

Windsor (2017) argues that the syllable in Blackfoot is recognized by a process of obligatory vowel coalescence (resulted in [ɛ] in the example (16) above), while there is no evidence for foot constituent in the language. Syllable is distinguished from the Prosodic Word constituent in that the vowel coalescence process, which is obligatory at the syllable level, is optional between Prosodic Words. Example in (16) crucially shows a mismatch between the Prosodic Word constituent and the Morphological Word boundaries in *akɛɛmaxkickinɛ:ksi* 'old sheep'. Finally, the Prosodic Phrase constituent is cued in Blackfoot with right-edge aspiration. I refer the reader to Windsor (2017) for the details of phonetic and morpho-phonological evidence of the proposed prosodic constituency in Blackfoot.

A number of languages with highly synthetic morphologies have been shown to present a mismatch between the domain of segmental rules application and the domain of prosodic (or, more specifically, stress) rules application, or a mismatch between the domain of primary stress

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[8] The visual representation of the constituents has been changed in order to maintain consistency with other examples in this section. Some phonetic details irrelevant for the present discussion but shown in Windsor (2017) have been omitted in this example.

assignment and the domain of secondary stress assignment, prompting researchers to propose additional layers of structure within Prosodic Hierarchy. Thus, for instance, Pentland and Laughren (2005) propose that two different constituents should be distinguished in Warlpiri – a Phonological Word and a Prosodic Word. The former is argued to be the domain of vowel harmony and phonologically-governed allomorphy rule application, while the latter is the domain of stress assignment. Finally, note that a number of languages discussed in this dissertation warrant positing the Phonological Stem constituent as a separate (process-defined) prosodic constituent.

Related to the issues of prosodic constituency outlined above is another area of prosodic research where highly synthetic languages play an important role – *the relations between primary stress and non-primary prominence*, and, consequently, the metrical theory of stress as a whole. The characteristically long morphological words in these languages make the rhythmic layer of the prosodic structure easily observable. It is thus no coincidence that theories of different types of rhythm (trochaic vs. iambic) and direction of propagation have crucially relied on analyses of highly synthetic languages: for instance, twenty-one of the twenty-two languages cited in Hayes (1995) as examples of iambic lengthening are Native American languages with highly complex morphology. Research in this area includes, firstly, general descriptions and analyses of the rhythmic patterns in highly synthetic languages (for example, see Buckley 1991, forth. for analysis of Kashaya weight-sensitive rhythm; Crook 1999 for interactions of lexical accent, penultimate default and weight-sensitive rhythm in Sahaptin Nez Perce; Munro and Ulrich 1984; Gordon 2004, 2005 for complex interactions between pitch accent, primary stress, and rhythm in Muskogean languages; Rolle 2017 for interactions between morphologically-conditioned accent and rhythm). Secondly, some evidence found in highly synthetic languages appears to be contradicting the core predictions of the Metrical Theory: for example, the reported lack of culminativity of stress (e.g. Blackfoot, Stacy 2004;

Arapaho, Bogomolets 2014a,b; Mapudungun, Molineaux 2018; Yupik, Woodbury 1987)[9],
quantity insensitive iambs (Altshuler 2009 for Osage, Siouan; Weber 2016 for Blackfoot,
Plains Algonquian); word-initial extrametricality (Buckley 1994, forth. for Kashaya, Pomoan;
Weber 2016 for Blackfoot, Plains Algonquian).

Some of the recent studies on highly synthetic languages have aimed to re-evaluate the
claims made in the earlier metrical phonology literature with the more refined methodologies
of empirical analysis of stress and with more representative datasets. An illustrative case comes
from the debate over stress and rhythm in Mapudungun (isolate; Chile, Argentina). In what
follows, I briefly summarize the issues with the analyses of this language rooted in the metrical
theory of phonology as they are presented in Molineaux (2018, forth.). As noted in Molineaux
(forth.), this language has long been analyzed as a *perfect grid* stress system of stressed and
unstressed syllables: an iterative, left-right, quantity-insensitive iamb. As such, it has
prominently figured in the literature on stress assignment. Under the name *Araucanian,*
Mapudungun is discussed, among others, by Hyman (1977: 41-2), Kager (1993: 409, 2007:
205-6), Hayes (1995: 266), Hyde (2002: 1055-65), McGarrity (2003: 59-6)1, Hermans (2011:
982-984), and Martıńez-Paricio and Kager (2015)[10]. Molineaux (forth.) identifies two major
problems with the earlier analyses of stress and rhythm in the language. Firstly, all of them are
based on a single unrepresentative set of data presented in Echeverrıá and Contreras (1965),
see also de Lacy (2014) for a detailed discussion of why that original data description is not
qualified to be used in prosodic research. The second problem identified in Molineaux (*ibid.*)
is the lack of consideration for the complex morphological patterns involved in stress
assignment in Mapudungun. The accounts of the stress system in terms of a metrical grid were

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[9] Culminativity of stress as applied to languages with complex morphology is the central topic of chapter **5**
of the current thesis.

[10] All citations are adopted from Molineaux (forth.).

based on the following rule (17) and the supporting examples (18) from Echeverría and Contreras (1965):

(17)   'a phonological word has main stress on the second syllable and, if applicable, secondary stresses on the fourth and sixth syllables' (134).

(18a)   [wu.ˈle]

        'tomorrow'

(18b)   [tri.ˈpan.to]

        'year'

(18c)   [e.ˈlu.-mu.-j-u]

        give-INV:2-IND:1-DU

        'You give us (both)…'

(18d)   [e.ˈlu.-a.-ˌe.-n-ew]

        give-FUT-INV-SP:1-3

        'S/he will give me x.'

(18e)   [ki.ˈmu.-fa.ˌlu.-wu.-ˌla-j]

        know-SIM-REFL-NEG-IND:3

        'S/he/they pretended not to know.'

The rule in (17) and the examples in (18) present the Mapudungun stress system as a syllable-counting, quantity-insensitive, and parsed from left-to-right. This is, however, not

representative of all the stress patterns found in the language: counter-examples are abundant in both simplex and morphologically complex forms. Molineaux (*ibid.*) proposes an analysis which crucially includes two separate mechanisms of stress assignment for two different domains within a complex morphological word – the domain of the phonological stem and the domain of the phonological word. Stress in both domains is aligned to the right edge of the domain. At the word level it is trochaic and weight-sensitive, while at the stem level it is stem-final. Crucially in stark contrast with the previous analyses, stress is seen as non-iterative, although a rhythm-like pattern may arise due to accidental placement of the stresses in two domains on alternating syllables, or due to clash-avoidance. Similarly, depending on the syllabic make-up of a complex wordform, the application of the two stress-placement mechanisms might result in a pattern stated in the rule (17) from Echeverría and Contreras (1965), cf. example (19a) below. However, it may also result in a different pattern in words such as (19b) where the word-initial stem is trisyllabic, and thus, by Molineaux's analyses, the stem-level stress is predicted to fall on the third syllable, and this prediction is borne out. Note also that following Molineaux (forth.), the hierarchical organization of the stresses is not marked: in the following examples both stresses are marked as primary since no clear phonetic distinctions between the two have been identified.

(19a) [[[pe]$_R$-ɲ.ˈma.]s-la.-ˈfi-j]$_\omega$

see-APPL-NEG-DIR:3SP-IND:3

'S/he did not see her/him/it (for the benefit of someone).'

(19b) [[[tu.ku.]$_R$-ˈɲe.]s-la.-ˈfu-j]$_\omega$

place-PASS-NEG-BI-IND:3

'S/he/it did not used to be placed.'   (Molineaux, forth.:18)

I refer the reader to Molineaux (2014, 2018, forth.) for a comprehensive analysis of the Mapudungun stress patterns. Importantly, the research on this language has revealed the complexities that might be involved in analyzing rhythm and its relation to stress. I return to the issues with defining rhythm in chapter **6**, where I propose to treat rhythm and secondary stress as separate phenomena based on the patterns observed in multiple languages with complex morphology.

Another area where research on prosodic features of highly synthetic languages has brought about new insights concerns *phonetic cues of prominence* in different prosodic domains as well as the refinement of methodologies in disentangling phonetic properties of word-level stress and phrasal accent, intonation, and tonal phenomena. Recent literature on word prominence has demonstrated that prosodic analyses based on impressionistic observations are prone to inaccuracies which become obvious upon instrumental studies (see Gordon 2014, Roettger and Gordon 2017). The need for phonetic verification is particularly acute for highly synthetic languages which provide pivotal evidence for many elements of prosodic structure, including rhythmic stress, footing asymmetries, and the differentiation of stress levels. For example, rhythmic structure and primary stress patterns reported in earlier impressionistic studies of several languages has not been instrumentally confirmed (e.g. Arnhold et al. forth. on Inuktitut; Bowern et al. 2013 on Yidiny; Jacobsen 2000 on West Greenlandic; Piggott 2013 and Rose et al. 2012 on Labrador Inuttut; Tabain et al. 2014 on Pitjantjatjara). Another reported characteristic of several languages with complex morphology, e.g. Yidiny, Tübatulabal, Central Alaskan Yup'ik (see Hayes 1995:25) is the occurrence of multiple stresses none of which is perceivably stronger than others, i.e. impressionistically non-culminative stress (see chapter **5**). On the other hand, some languages with a highly synthetic morphological profile have been described as having content words without stress, e.g. Cayuga, and Seneca (Hayes 1995:25), i.e. non-obligatory stress. Without instrumental studies it is

difficult to evaluate such reports, as these characteristics may be attributed to interactions between word stress and phrasal intonation. For example, intonational pitch accents conditioned by phrasal context may increase the prominence of certain stresses in a word, thereby obscuring true word level prosody. Additionally, instrumental analyses on genetically unrelated languages with highly complex morphologies show a similar trend for phonetic marking of the boundaries of prosodic constituents together with or instead of phonetically-signaled stress (and pitch movements associated with such marking at or near phrase boundaries may be mistaken for stress, e.g. Indonesian Goedemans and van Zanten 2007). For instance, careful instrumental analyses of the prosodic system of several Inuit varieties have shown regular marking of the boundaries of prosodic domains, while no acoustic evidence for stress has been found (Arnhold et al. forth.; Arnhold et al. 2018). Phonetic analysis is thus essential for establishing the distribution and phonetic exponents of stress and their relation to other word- and phrase-level prosodic properties in languages with complex morphological profiles. In the case studies in this dissertation, phonetic characteristics of stress are reported whenever available, while for Arapaho I present original (albeit preliminary) findings on acoustics of stress.

CHAPTER 2. DIRECTIONAL ACCENT

2.1 Directional lexical stress systems

The typology of lexical stress systems proposed in this dissertation answers the central question in any investigation of such systems:

(1) How is the surface primary stress calculated when there are multiple morphemes with a lexical accent within a word?

The main research object of this dissertation – languages with highly synthetic morphologies – present an ideal testing ground for answering the question in (1) due to their complex morphology. The first, and the simplest, type of lexical stress systems, however, does not involve any reference to morphological information in the resolution of accent competition. In *Directional* lexical stress languages, in a competition situation, the *rightmost* or the *leftmost* of multiple underlying accents within the domain of Culminativity (in most cases – within a morphological word, but see chapter **5** for a discussion) is realized as primary stress while all the other accents are either deleted or realized as secondary stresses. This chapter presents an example of a highly synthetic language with a *Directional Accent* system – Arapaho (Hinónoʔeitíít).

2.2 Case study: Stress in Arapaho

Arapaho is a Plains Algonquian language which, like other Algonquian languages, has a characteristically complex morphological system and has been described as polysynthetic implying that these languages exhibit a cluster of characteristic properties such as head-marking (Baker 1996; Nichols 1986) and free word order. Head-marking describes the extensive use of agreement to mark grammatical relations, accompanied by a tendency to either drop or incorporate constituents into the heavily inflected verb. As a result of this, an entire clause may correspond to a single long and morphologically complex verb form, and overt

nominals are optional. As an illustration of the possible morphological complexity of both nominal and verbal words in Arapaho consider the following (simplified) templates (based on Cowell and Moss 2011):

-1	0	+1	+2	+3	+4
Person (possessor)	Root	Incorporated Root*	Possession Theme	Inflection (PL/LOC/VOC / OBV)	Possessor PL
*optional and iterable					

Figure 1. Nominal template (head root in grey, slot 0)

-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4
Clause Type/Mood	Person	Aspect	Tense	Negation	Adverbials*	Root	Incorporated Root*	Agreement Inflection	Agreement Inflection	Mood
*optional and iterable										

Figure 2. Verbal template (head root in grey, slot 0)

If overt nominals occur, their order is largely governed by pragmatic and discourse factors (for recent formal accounts of Algonquian morpho-syntax see Bliss, Dechaine, & Hirose 2013; Bogomolets, Fenger & Stegovec 2018; Déchaine 1999; Déchaine & Wiltschko 2010; Junker and MacKenzie 2004; LeSourd 2006; Oxford 2014 among many others). Data from a number of Algonquian languages have informed theoretical literature on stress/accent/prominence: Halle and Vergnaud (1987); Hayes (1995); Kaye (1973); Stowell (1979); Valentine (1994). Most of the Algonquian languages that received attention in theoretical accounts have been analyzed as having iambic stress systems (see Rice 2010 and *forth.* for an overview).

I first briefly introduce the basics of the phonological system of Arapaho (§**2.2.1**). I then present the acoustic side of Arapaho prominence in §**2.3.1**, where I propose a relativized version of the *Functional Load Hypothesis* (Berinstein 1979). I argue that a weaker version of the *Functional Load Hypothesis* is motivated by the fact that Arapaho seems to be utilizing the same acoustic cues (vowel duration and modulations of F0) in both cuing stress and in cuing other contrasts in the language (phonemic vowel length and marking lexical tone respectively).

The central empirical generalizations regarding the distribution of stress in Arapaho are presented in §**2.3.2**-§**2.3.4**. An examination of these generalizations leads to the conclusion that although the position of stress in a given morpheme is unpredictable (i.e. Arapaho is a *lexical stress* language), the distribution of stresses within a morphological word can be explained with a highly constrained *Directional Accent* account, comprising of (i) a three-syllable window at the right edge of a morphological word, (ii) underlying accent specification for each of the morphemes within a wordform, (iii) default penultimate accent, and (iv) a *Directional* accent competition resolution whereby the right-most lexical accent wins. All the empirical observations in this chapter are formally accounted for with the following settings of six stress parameters which are explained in detail in the following sections:

(2) Arapaho stress parameter settings

Accent Domain	BOUNDED (R)
	SATELLITE (R)
Accent Placement	SELECT (R)
	DEFAULT (R)
	CULMINATIVITY (Y)
	OBLIGATORINESS (Y)

The formalizing of the stress parameters throughout this dissertation is based on van der Hulst (2012), with amendments to be discussed in the following sections. The Accent Domain parameters ensure that a tri-syllabic *Obligatory Stress Domain* is formed at the right edge of the word in Arapaho. These parameters are defined as follows and are motivated in detail in **2.3.2.1**:

(3a) BOUNDED

form a *disyllabic domain (DD)* at the edge of a word   L/**R**

(3b) SATELLITE

adjoin a syllable at the edge of the *DD*

to form *Obligatory Stress Domain* (OSD)   L/**R**

The second group of accent parameters – the Accent Placement parameters, firstly, makes sure that stress in Arapaho is Obligatory and Culminative. It will be demonstrated in this chapter that multiple morphemes within a complex word can realize their underlying accent as stress in Arapaho, and no resolution is enforced. However, I argue that Culminativity of stress in Arapaho is manifested through the ban on stress clashes (see section **2.3.2.5** for a discussion). Secondly, the Accent Placement parameters govern stress placement in the cases of stress competition (4a) or in the cases where lexical marking is absent (4b):

(4a)   SELECT   L/**R**

select the leftmost or the rightmost accent in the domain

(4b)   DEFAULT   L/**R**

assign accent to the leftmost or the rightmost syllable in *disyllabic domain*

if no accent mark is present in OSD

The Select parameter is the defining parameter for the *Directional Accent* systems as it determines the stress behavior when a stress competition arises, and thus effectively provides an answer to the question in (1) for the *Directional Accent* systems. Throughout this

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dissertation, accents, both lexical and produced by the Default rule, are formally represented as grid marks ('x') on the stress grid over the accented syllables (recall from **1.2**).

2.2.1 Phonemic inventory, syllable structure

Arapaho has twelve consonants, three vowels with contrastive length, and three diphthongs. The inventory of consonants with the standard orthographic form in parenthesis is given in Table 1 (adapted from Cowell & Moss 2011: 14).

Table 1: Phonemic Inventory of Arapaho Consonants

	Labial	Dental	Alveolar	Palatal	Velar	Glottal
Plosive	b (b)		t (t)		k (k)	ʔ (')
Fricative		θ (3)	s (s)		x (x)	h (h)
Affricate				t͡ʃ (c)		
Nasal			n (n)			
Glide	w (w)			j (y)		

Arapaho has only three phonemic vowels (standard orthographic form in parentheses):

Table 2. Phonemic inventory of Arapaho vowels

	Front	Back
High	i (i)	
Low	ɛ (e)	ɔ (o)

The high front vowel /i/ has a high back allophone which is orthographically represented as *u* in Arapaho. Cowell & Moss (2011:15) state that '/u/ is minimally a phoneme'. Synchronically, all occurrences of this allophone, with just a few exceptions of unknown origin, can be explained as an outcome of the backness vowel harmony process (Cowell & Moss 2011, 15-16). The phonetic quality of the high back vowel has been defined in Goddard (1990) as "high

back unrounded" [ɯ], which is consistent with my auditory impression and with the results of an instrumental analysis conducted in Bogomolets (2014). There are no minimal pairs based on the [i]-[ɯ] contrast in the language. Moreover, the distribution of [ɯ] is restricted with respect to the consonantal environment: /b/, /t͡ʃ/, /n/, /s/, /t/, /θ/, and /j/ never occur before [ɯ][11]. Goddard (1974) posits a three-vowel system for Proto-Arapahoan consisting of /i/, /e/, /o/, and I analyze the modern Arapaho system as containing these three vowel phonemes as well (see also Picard 1994 for a diachronic account of the development of the Arapaho vowel system). The non-phonemic status of [ɯ] is somewhat obscured by the orthographic tradition where it has an independent status (being written as *u*), which is unusual for non-phonemic elements in orthographic systems.

Although three-vowel systems are not uncommon cross-linguistically, the distribution of vowel qualities in the vowel space found in Arapaho is typologically highly unusual if not unique (cf. Maddieson & Precoda 1989; Ladefoged & Maddieson 1990; Schwartz et al. 1997). The UCLA Phonological Segment Inventory Database (UPSID, Maddieson 1984) includes 23 languages with three-vowel systems (about 5% of all languages in UPSID), but none of them has an Arapaho-like vowel distribution[12].

All vowels in the language can occur in two contrastive lengths, short and long; vowel length is conventionally shown with vowel doubling in the orthography[13]:

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[11] This can be explained by the fact that virtually all instances of the high back allophone of /i/ are a result of the backness vowel harmony process with the [+anterior] consonants blocking the backness harmony. In Arapaho, backness vowel harmony which can be seen as the acquisition of [+back] feature, is blocked by all elements with the conflicting [+front] or [+anterior] feature.

[12] The other two Plains Algonquian languages have small vowel inventories as well. Different dialects of Blackfoot have been reported to have the systems: /i o a/ (Elfner 2006: 141), /i u a/ (Kaneko 2000: 12-16) with contrastive lengths. Cheyenne has the vowel system: /e o a/ (Leman 1981). There are other examples of identical systems in UPSID: Alabama (Muskogean) and Amuesha (Arawakan) have been reported to have /e o a/, and Pirahã has been reported to have the /i o a/ vowels (based on UPSID, Maddieson 1984). Such vowel inventories are also very unusual. /i u a/, on the other hand, is typologically unmarked.

[13] Traditionally stresses are marked with acute accents in the dictionaries, grammars, and sketches of Arapaho (e.g. Cowell & Moss 2011; Goddard 1979, 2015; Salzmann 1983). I use the IPA stress diacritics throughout this dissertation for marking stress, thus for the sake of consistency the acute accents have been substituted with the stress diacritics in the Arapaho data as well.

(5)   ˈhisiʔ 'tick'   ˈhiisiʔ 'day'

          ˈhocoo 'steak   ˈhoocoo 'devil'

          heces- 'small'   heeces- 'before'

Arapaho allows for sequences of up to three vowel morae of the same or of different quality. In the traditional orthography each mora is written separately as *i*, *e*, *o*, or *u*:

(6a)   ˈbo.oo   'road'

(6b)   ˈhi.ii   'snow'

(6c)   ˈhoo.o   'bed'

(6d)   hiˈhei.o   'his aunt'

Even though the three vowel sequences are represented orthographically as an unparsed string of vowels, a nucleus of a syllable never consists of more than two vowel morae. Consequently, there are no stressed tri-moraic, or 'extra-long', sequences in the language:

(7)   *ˈ[VVV]$_\sigma$

The orthographic tradition exemplified in (6) is not reflecting the phonetic reality in another important aspect: there is a clear phonetic marking of the syllable boundaries in sequences of three vowels: speakers epenthesize an audible consonantal element at the syllable break. Impressionistically, the quality of the epenthetic consonant varies between a voiced glottal fricative, a voiced velar fricative, and a glottal stop. The epenthetic consonant can be observed in the spectrograms, consider for instance Figures 3-4 below:
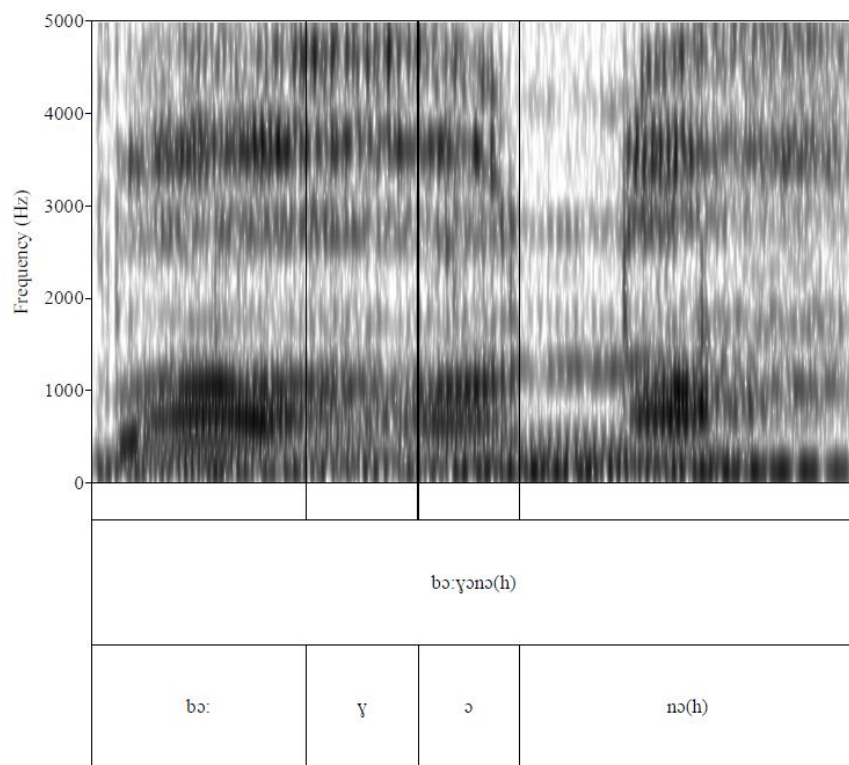
Figure 3. Spectrogram and waveform of *booono* 'roads'
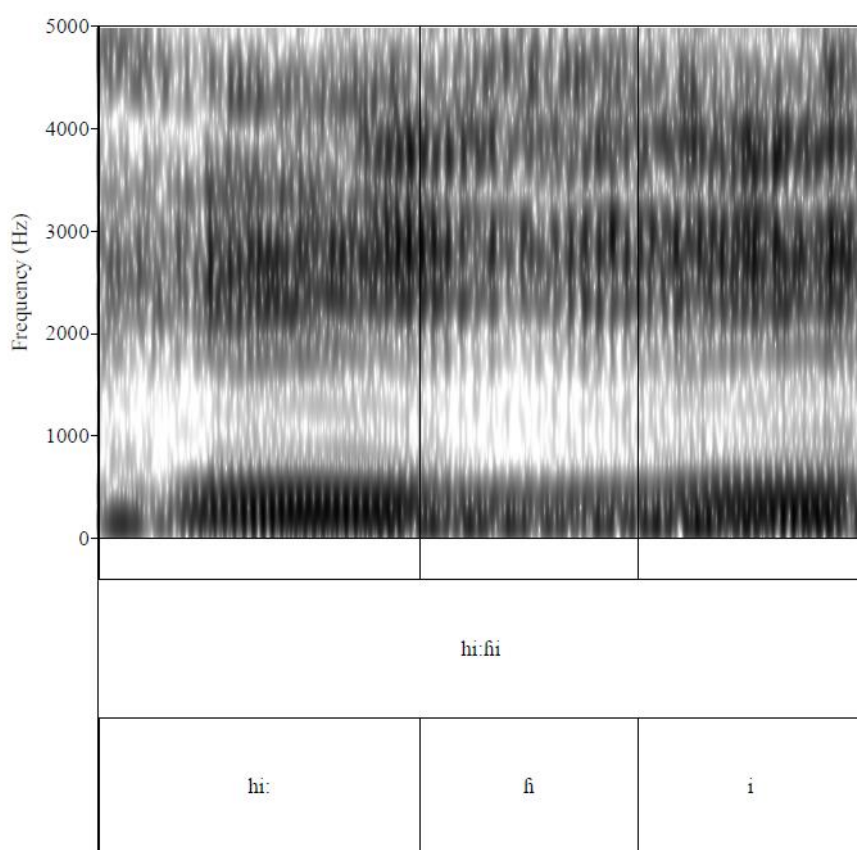
Figure 4. Spectrogram and waveform of *hiii* 'snow'

The observation of the maximally bimoraic accented nucleus, based on impressionistic reports, has been included in some of the existing sources on the phonology of Arapaho (Cowell &

Moss 2011; Goddard 1979), while Cowell & Moss (2011: 41-42) also note in passing that an epenthetic glottal stop tends to be inserted at the syllable boundaries in the three-vowel sequences. However, due to the potential difficulty with locating stress in such sequences reliably, in this chapter, I focus on stress patterns in short and long vowels which are not part of the (orthographic) tri-moraic sequences.

Arapaho has three diphthongs - /ei/, /ou/, /oe/:

(8a) ˈhi.sei   'woman'

(8b) ˈcei.too   'earring'

(8c) wo.ˈsouh.ʔun   'sock'

(8d) xonou-   'immediately, right away'

(8e) nei.ˈθon   'my tongue'

Long diphthongs are disallowed in the language since tautosyllabic tri-moraic sequences are not permitted. Cowell (2018) notes, amending Cowell & Moss (2011), that tri-moraic sequences which potentially could be analyzed as 'long diphthongs' historically all in fact originate from the loss of intervocalic *k in bi-syllabic sequences, and they retain their bi-syllabicity in the modern language:

(9)   Proto-Algonquian origins of the Arapaho diphthongs

(9a) *saaki- > no.uu[14]-   'out(side)'

(9b) *akoocin-wa > ho.uuθine[15]- 'to hang'

Just like with the three-moraic sequences above, the bi-syllabic status of the tri-moraic sequences involving a diphthong is often evidenced by epenthetic consonants.

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[14] Word-initially, Proto-Algonquian *s becomes /n/ in Arapaho as a regular (albeit surprising) historical correspondence (rule 10a in Goddard 1974:107).

[15] The asterisk sign (*) is used in the Proto-Algonquian (PA) examples with the meaning 'reconstructed' rather than 'ungrammatical'.

Permissible syllable shape differs between word-internal syllables and word-final syllables on one hand, and word-initial syllables on the other hand. Canonical word-internal (and word-final) syllables in Arapaho have the structure in (10):

(10)   Word-internal and word-final syllable structure

   (C$_{ons}$)V(C$_{coda}$)

In (10), V can be short, long, or a diphthong, and (C$_{coda}$) may be either a single consonant or /hC/, the parentheses indicate optionality. Consonant clusters are prohibited in the onsets – (C$_{ons}$). A word-initial syllable has the structure in (11) below:

(11)   Word-initial syllable structure

   C$_{ons}$V(C$_{coda}$)

Unlike word-internal syllables, word-initial syllables must have an onset, as schematized in (11) above. In the word-initial syllable, all morphemes which underlyingly begin with a vowel get epenthesized with an /h/. Contrast the form of the future tense prefix in examples in (12a) and (12b) below:

(12a)   ˌne**et**.cii.bi.θi.ˈhi.noʔ   FUT prefix word-internally

   ne-**et**-cii-biθihi-noʔ

   1-FUT-NEG-eat-12

   'We're not going to eat.'

(12b)   ˈ**heet**.bii.θi.ˈhi.noo   FUT prefix word-initially

   h<e>et-biiθihi-noo

   <IC>FUT-eat-1SG

   'I will eat.'

While in (12a) the future prefix /et-/ has its underlying vowel-initial form, in (12b), where the prefix is word-initial, it has the epenthesized form due to the constraint on the onsetless syllables. This process of /h/-epenthesis applies across the board whenever a word begins with

a vowel-initial morpheme. Consonant clusters are prohibited in the onsets, and (C_coda) may be either a single consonant or /hC/ (see Salzmann 1956, 1961 for examples, and Picard 1994 for the historical development of the Arapaho clusters). Although consonant clusters are common within morphemes (13a-b), and as the product of inter-morphemic combinations (13c) in non-initial and non-final positions, these clusters are always syllabified onto separate syllables (cf. Denzer-King 2012 for an analysis of consonant clusters in Blackfoot):

(13a) hi.ˈto**x.k**o.ˈʔoʔ

hi-toxkoʔo-ʔ

3-chin-SG

'his chin'

(13b) ˈbe**t.s**on

'elbow'

(13c) ˈhee**t.b**ii.ˈne.θen

h<e>et-biin-eθen

<IC>FUT-give-1SG>2SG

'I will give it to you.'

2.3 Prosodic system

The central object of this chapter is the prosodic system of Arapaho. A number of traits of the system appear to be typologically unusual. Firstly, it shows traits of both an accent system and a restricted lexical tone system (Goddard 2015; Cowell & Moss 2011; Bogomolets 2014b). Secondly, stress in the language is non-culminative within a morphological word, i.e. morphological words often bear more than one stress. At the same time, Arapaho exhibits some typical stress-like properties such as obligatoriness of stress in the morphological word domain, edge-orientation, and default penultimate stress.

I argue in this chapter that all of the stress patterns in both nominal and verbal forms in Arapaho can be explained with a combination of (i) a three-syllable window rule, (ii) underlying stress specification for each of the morphemes within a wordform, (iii) default penultimate stress, and (iv) a rule that makes sure that in a clash situation the right-most lexical stress wins. It will be thus shown that Arapaho has a *Directional lexical accent* system. Phonetics and phonology of stress in Arapaho are discussed in **2.3.1-2.3.4**, and **2.3.5** provides a brief discussion of the synchronically unpredictable falling tone which Arapaho developed on phonemically long vowels.

2.3.1 Lexical stress: Acoustic correlates

I begin the discussion of Arapaho stress with presenting the acoustic cues. The acoustic correlates cross-linguistically associated with stress most often include four broad categories: duration, fundamental frequency, spectral qualities, and intensity (see Roettger and Gordon 2017 for a cross-linguistic overview). Each of these categories includes various possible cues. For instance, many languages have been found to use vowel duration to signal stress, others lengthen the entire syllable under stress (e.g. Meadow Mari, Lehiste et al. 2005), while yet others use consonant duration to cue stress (e.g. Estonian, Gordon 1995, Lehiste 1966; Warlpiri, Pentland 2004; Welsh, Williams 1999). The relative robustness of the stress cues varies from language to language.

Arapaho makes use of all four groups of acoustic cues involved cross-linguistically in signaling stress: duration, fundamental frequency, spectral qualities, and amplitude (Bogomolets 2014a,b). It, however, appears to be quite unique in using different cues for phonemically long vs. phonemically short vowels. Stress on phonemically long vowels in Arapaho produces extra length, while stress on phonemically short vowels is manifested through significantly higher mean F0 throughout the stressed vowel. Higher pitch on stressed short vowels is also correlated with significantly higher mean amplitude throughout the

stressed vowel and significantly higher mean amplitude peak (see Bogomolets 2014 for details; see Lehiste 1970; Titze 1989 for a discussion of the correlation between pitch and intensity). Additionally, a comparison of spectral qualities of stressed vs. unstressed vowels has revealed that values of the first two formants differ for low vowels (both phonemically long and phonemically short) - /ɛ/ and /ɔ/. When unstressed, /ɔ/ gets fronted and is shifted toward [ə], /e/ gets fronted and raised toward [ɪ]. Unstressed /i/ and [ɯ] do not show any changes in quality when compared with their stressed counterparts, which seems to be cross-linguistically a common quality-reduction pattern (see Crosswhite 2001 for a detailed discussion of comparable patterns in Russian). Interestingly, phonemically short high vowels when unstressed 'compensate' for the lack of quality reduction with extensive quantity reduction. Cowell & Moss (2011: 47) observe that in their database short unstressed /i/ and [ɯ] are syncopated two-thirds of the time, while short unstressed low vowels are only syncopated less than 5% of the time. Quality and quantity vowel reduction can thus be considered an additional cue of stress in Arapaho.

The resulting system of acoustic contrasts in Arapaho presents an interesting picture from the point of view of the *Functional Load Hypothesis (FLH)* which postulates that acoustic parameters involved in segmental contrasts in a language will be dispreferred as cues of stress in that language (Berinstein 1979). For instance, a language with phonemic vowel length contrast is predicted to avoid cueing stress with vowel duration. As already mentioned, Arapaho contrastively uses duration (as vowel length) and pitch modulations (as restricted lexical tone, see section **2.3.5** for details). Thus, an interesting question is in what way stress can exist and be phonetically manifested in a language which uses the primary acoustic correlates of stress (pitch and duration) for other purposes. FLH was first introduced in Berinstein (1979), and later supported in Hayes (1995), Potisuk et al. (1996), and Vogel et al. (2016) among others. The Functional Load Hypothesis has been a source of debate ever since

its first formulation with some studies finding strong supporting data for it (e.g. Creek, Martin 2011; Fijian, Dixon 1988; Hungarian, Vogel et al. 2016), and others pointing out languages which seem to go against the predicted patterns (Aleut, Rozelle 1997, Taff et al. 2001; Chickasaw, Gordon 2004; see also Lunden et al. 2017 for an overview of the reported correlates of stress for 140 languages in the relation to the use of contrastive duration). In a recent overview, van Heuven (2019) proposes that FLH might only be valid within the domain of prosodic contrasts and not in the interactions between segmental distinctions and prosodic properties. As a clear example of the application of FLH within the prosodic domain, van Heuven presents Samate Ma'ya (Austronesian) patterns from Remijsen (2002). The language has both lexical tone and stress, but vowel length is not contrastive. The effect of four micro-cues on signaling stress and lexical tone has been assessed: pitch contour, intensity, loudness (i.e. intensity in selected frequency bands), vowel quality (expansion/reduction) and duration. Figure 5 below shows a perfect inverse relationship between the relative importance of cues in signaling stress (left-hand graph) vs. high and low lexical tone (right-hand graph):
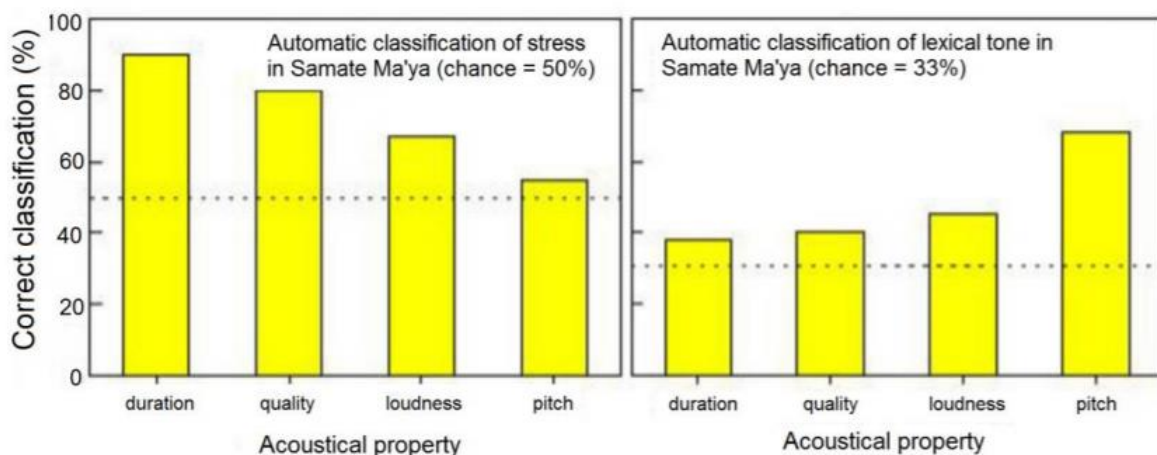
Figure 5. Percent correct automatic classification of stress (left-hand panel) and lexical tone (righthand panel) in Samate Ma'ya on the basis of the same four acoustic parameters (adopted from van Heuven 2019, 50, Figure 13).

The Arapaho stress however appears to be sensitive to both – segmental and prosodic contrasts. Phonemically short vowels are not lengthened when stressed since it would obscure the phonemic vowel length contrast; the lengthening of phonemically long vowels however does not introduce such ambiguity. Thus, phonemically long vowels are lengthened when stressed. On the other hand, lexical tone in Arapaho is only ever found on phonemically long vowels (see section **2.3.5** for details) and using pitch modulation to cue stress on phonemically long vowels could be ambiguous. However, lexical tone can never surface on phonemically short vowels which makes higher F0 an available (and unambiguous) cue of stress for phonemically short vowels. To my knowledge, a system of this kind has not been reported before. To account for this pattern, I propose the following formulation of FLH:

(14) Relativized Functional Load Hypothesis (RFLH)

A language with a contrast *C* will not use cues associated with *C* in signaling stress *in as much as using them has a potential for creating an ambiguity.*

(where *C* is either segmental or prosodic)

The Relativized FLH (14) is a weaker form of the original FLH: it states that acoustic properties involved in segmental contrasts, prosodic contrasts (outside of stress), or both will be avoided as correlates of stress but only to the extent necessary to avoid systematic ambiguity. In other words, a language might use vowel length as a segmental contrast *and* as an acoustic cue of stress *iff* ambiguity does not arise. Compare a sample prediction made by the original FLH and by RFLH below:

Hypothesis	Contrastive acoustic property	Prediction
FLH		Vowel duration will not be used as a correlate of stress.
RFLH	Vowel length /V/ vs /V:/	Vowel duration will not be used as a correlate of stress for phonemically short vowels.

Table 3. A sample prediction of FLH and RFLH regarding vowel length

Note in Table 3, RFLH does not make any predictions regarding the use of vowel duration as a correlate of stress in phonemically long vowels which means vowel duration might be used to cue stress in long vowels in some languages, but it is not required to be.

Arapaho shows one possible strategy of avoiding the stress correlates ambiguity. English shows a different way of unambiguously involving vowel duration in both stress and segmental contrasts. Van Heuven (2019, 51) notes that English contradicts the predictions of the (original) FLH since English speakers rely on vowel duration in recognizing stressed syllables despite the presence of the segmental contrast of tense versus lax vowels which correlates with vowel length[16]. Although this reasoning might put the predictions of the strong version of FLH into question, crucially for RFLH, the ambiguity of the phonemic vowel length vs. stress-induced vowel lengthening is not likely to arise in a language with lax-tense contrast unlike in a language with a clear vowel length contrast s.a. Arapaho (see discussion above), Finnish, or Czech (e.g. Lehiste 1970) since the lax-tense contrast is primarily a vowel quality contrast (see e.g. Halle 1977). Aleut is another language often cited as a counter example to

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[16] Note that in Berinstein (1979) English was used as an example of a language with *no* vowel length contrast, contrary to van Heuven (2019).

Berinstein's FLH (Rozelle 1997, Taff et al. 2001). Aleut uses vowel length contrastively, and thus, by the original version of FHL, is predicted to avoid vowel duration as a cue of stress. Taff et al. (2001), however, show that stressed vowels, both phonemically short and phonemically long, are significantly longer than their unstressed counterparts. Unstressed short vowels are on average 64 ms long while unstressed long vowels are 130 ms long. Short vowels bearing stress are 78 ms long on average, while long vowels when stressed average 151 ms. Through a series of statistical tests, the authors show that, firstly, vowel duration is a correlate of stress in Aleut, and, secondly, that the average durations of a short *stressed* vowel (78 ms), and a long *unstressed* vowel (130 ms) are significantly different. Thus, crucially, although stress affects duration in both long and short vowels, the contrast between phonemically short and phonemically long vowels is preserved, and the ambiguity of the phonemic vowel length vs. stress-induced vowel lengthening is not likely to arise. The Aleut case is then compatible with RFLH. There are thus various strategies to ensure that both prosodic and segmental contrasts are preserved and it appears to be not possible to *a priori* rule out the possibility of a particular acoustic cue for a particular language on the basis of structural properties.

2.3.2 Phonology of stress in Arapaho: Stress in nominals

This section begins the discussion of phonology of lexical stress in Arapaho. I first discuss stress in nominal forms for two main reasons: nominal forms tend to be less morphologically complex than verbal forms, and the stress rules found in nominal forms also hold for verbs. The position of the Arapaho stress cannot be predicted from phonological properties, i.e. stress in the language is *lexical*. Potentially heavy syllables CVV or CVC, and even super-heavy syllables such as CVVC do not behave differently from potentially light syllables – CV. Importantly, heavy syllables are not required to be stressed, cf. the stress patterns possible in

disyllables in (15a) and in longer nouns in (15b). We can thus conclude that accent is part of the underlying form of the morphemes, manifesting phonetically as stress[17]:

(15)   Weight-insensitive stress

(15a)   ho.ˈtii   'wheel, car'

          ˈko.soo   'scrotum'

          wo.ˈteʔ   'hat'

          ˈho.kok   'soup'

          bii.ˈciis   'leaf'

          ˈhii.teen   'village'

(15b)   bii.ˈne.ʔeek   'gravy, sauce'

          hoh.ʔo.ˈyoox 'cactus'

          ˈhi.co.ʔok   'waist'

          ni.ˈsi.ko.coo   'cake'

Stress in Arapaho is marginally contrastive: *minimal pairs* are infrequent, but they do occur with both verbs and nouns (stressed syllables are bold-faced). Note that at least one form in every pair in (16) below is morphologically complex (I have not been able to find simplex minimal pairs in the data available to me):

(16a)   teˈ**ce**noo 'door'   vs.   ˈ**te**cenoo 'roll it out!'

(16b)   ˈwoteiˈ**kuu**θoo 'doorbell'   vs.   woteikuuˈ**θoo** 'telephone ring'

2.3.2.1 Right edge three-syllable window

Stress in Arapaho (in both nominal and verbal forms) must surface in the *three-syllable window* at the right edge of a morphological word. Window stress systems have obligatory stress within

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[17] Examples throughout this section are from Cowell & Moss (2011) and Cowell (2018) unless stated differently.

a disyllabic or trisyllabic sequence of syllables from the edge of the domain (Kager 2012; van der Hulst 2012, 2014). Stress within the window can either be unpredictable/lexically specified, or it can be predictable based on the phonological properties of the syllables in question. The latter has been reported, for instance, for Pirahã, where stress is assigned to the heaviest syllable within the last three syllables of the word (Everett 1988). Some of the recent accounts of the Blackfoot stress have also claimed that the language has a weight-sensitive default accent in the three-syllable window at the left edge of the word (Weber 2016).

Although short words in Arapaho (up to three syllables) might be ambiguous between stress being, for instance, penultimate vs. penitial in a three-syllable long word, in longer forms, it is evident that stress is obligatory in the three-syllable window at the right edge of any morphological word. In other words, there are no forms which would not have a stress in the last three syllables of any morphological word, while it is quite common for such lapses to occur elsewhere within a morphological word, including at the left edge of a word, cf. below (lapses are bold-faced):

(17a)   wo.**θo.no.**ˈhoe   'book'   (17b)   **no.wo.θo.no.**ˈhoe   'my book'

I resort to the idea of a ternary constituent to formalize the three-syllable stress window pattern. More specifically, I adopt the formal representation proposed in van der Hulst (2012) where a three-syllable window at the right edge of a word is a result of the appropriate setting of two domain-related parameters. The Arapaho-specific settings are bold-faced and are further explained below:

(18a)   BOUNDED

        form a *disyllabic domain (DD)* at the edge of a word   L/**R**[18]

---

[18] As noted in Rice (2014), both right-edge oriented and left-edge oriented stress systems are found among Algonquian languages. Some examples of the former are Western Abenaki, Montagnais, Menominee, and Plains Cree; some examples of the latter are Blackfoot, Ojibwa, Delaware, Maleseet-Passamaquoddy.

(18b)   SATELLITE

adjoin a syllable at the edge of the *DD*

to form *Obligatory Stress Domain* (OSD)   L/**R**

A bounded *disyllabic domain* in this approach is similar to a non-iterative foot in the Metrical

Theory. However, it is not associated with rhythm or with headedness in the way the term *foot*

normally is. This makes it a preferable term for capturing the Arapaho stress facts. As is

apparent from lapses such as in the examples in (17) above, Arapaho lacks rhythm which in

turn suggests that there is no evidence for foot structure[19]. Additional evidence for this will be

presented throughout this chapter (for traditional metrical accounts of three-syllable stress

windows in terms of feet see for example Blevins & Harrison 1999). The notion of *satellite* in

van der Hulst (2012) captures the notion of Extrametricality in the Metrical Theory, which

involves an extension of the accentual domain at the word periphery (such satellite is called

external), but it also includes an extension of the accent domain with an internal syllable. The

advantage of the notion of *satellite* for the present analysis of Arapaho is that satellite, unlike

an extrametrical syllable, can be accented either regularly or in a limited set of language-

specific circumstances (see van der Hulst *ibid.,* 1502-1504 for some examples). I depart slightly

from van der Hulst (2012) and propose that not only internal satellites but external satellites as

well can bear accent. The representation in (19) below crucially groups the three syllables at

the right edge of a word into a constituent where the binary stress domain is within the

parentheses and the binary stress domain with the adjunct of an external satellite is in curly

brackets; the square bracket represents the word boundary:

---

[19] A potential counterargument is that Arapaho apparently enforces the word minimality constraint: every
content word must contain at least a light-light sequence of syllables or it may consist of just a heavy syllable
with CVC counting as heavy (Goddard 2015). The word minimality conditions have traditionally been viewed as
a result of the application of the Foot Binarity constraint (McCarthy & Prince 1999). I, however, follow the line
of work which views word minimality as autonomous from foot structure (Garrett 1999; Gordon 2007; Piggott
2008).

(19)   Stress domain in Arapaho

BOUNDED(R)   SATELLITE(R)

…σ {(σ σ $_{DD}$)+ σ $_{OSD}$}]

I will be referring to the ternary constituent in curly brackets in (19) as the *Obligatory Stress Domain (OSD)* throughout this dissertation. *OSD* in all cases is a constituent comparable to a foot but devoid of the metrical nature of the foot. In other words, OSD is a non-metrical (non-iterative, non-rhythmical) constituent. It can also be characterized as a *lexical* counterpart of a *metrical* stress window (Kager 2012). It is subject to identical well-formedness and alignment constraints: e.g. in both metrical and lexical stress windows, the stress window must be two or three syllables long and must be aligned with either the right or the left edge of words.

2.3.2.2 Default stress pattern

Both roots and affixes (prefixes and suffixes) can be underlyingly accented or unaccented in Arapaho; affixes can also be pre-accenting, while it is unclear at the moment whether roots can also be pre-accenting (see discussion below). In the absence of lexical marking within the *Obligatory Stress Domain*, a default stress surfaces on the penultimate syllable in both nominals and verbs. Consider, for instance, the noun ˈ*bee.θei* 'owl'. This noun is underlyingly accented on the penultimate syllable of the root:

(20)   ˈbee.θei   'owl'

When this root is affixed with a non-vocalic possessive suffix (i.e. with a suffix which cannot bear stress and is underlyingly unaccented), the root retains the stress:

(21)   he.ˈbee.θeib

he-ˈbeeθei-b

2-owl-POSS

'your (Sg.) owl'

The same is true for when the root is affixed with an underlyingly unaccented agreement suffix in (22) below since the root's stress remains within the three-syllable OSD:

(22) he.ˈbee.θei.bin

he-ˈbeeθei-b-in

2-owl-POSS-AGR

'our (incl.) owl'

However, with the addition of another unaccented suffix to the form in (22) above, the root's stress falls outside of the three-syllable OSD. In this case, the penultimate default stress is assigned:

(23a) he. ˈbee.θei.ˈ**bi.**noo

he-ˈbeeθei-b-in-oo

2-owl-POSS-AGR-PL

'your (Pl.) owl'

(23b) * heˈbee.**θei.bi.noo**   'int.: your owl(s)'

Note that the root stress in (23) does not get deleted (refer to **2.3.2.4-2.3.2.5** for a more detailed discussion of this).

Recall the definition of the relevant domains from (19), schematically repeated in (24) below:

(24) Stress domains in Arapaho

BOUNDED(R)   SATELLITE(R)

…σ {(σ σ DD)+ σ OSD}]

Following van der Hulst (2012), the default pattern found in Arapaho can be formally represented via the setting of the Default accent parameter in (25) below; the Arapaho-specific setting is bold-faced:

(25)   DEFAULT   **L/R**

         assign accent to the leftmost or the rightmost syllable in *disyllabic domain*

         if no accent mark is present in OSD

The setting of the Default parameter in (25) produces default stress on the penultimate syllable of a morphological word in case there is no lexical accent within the OSD. It should be noted that the penultimate stress is the prevalent stress pattern in nouns (Cowell 2018) as well as in verbs (see the discussion in **2.3.3**), and that (fixed) penultimate stress has been reconstructed for Proto-Algonquian as well (see Goddard 2015).

2.3.2.3 Stress in morphologically complex nouns

The application of the penultimate default and its interaction with the lexically specified stress can be illustrated further with the stress patterns in SG vs. PL noun forms. It has been noted that in some cases PL suffix produces a "shift" of stress in nouns, compare (26a) and (26b) below (Cowell & Moss, 2011: 37-40):

(26a)   ˈnee.cee   'chief'

(26b)   nee.ˈcee.noʔ   'chiefs'

(26c)   *ˈnee.cee.noʔ   int. 'chiefs'

In (26a), the noun 'chief' has a stress on the penultimate syllable of the root in SG, but the same noun "shifts" its stress to the final syllable of the root when affixed with the PL suffix (26b). In other nouns, however, the "shift" fails to occur:

(27a)   he.ˈnee.cee   'buffalo bull'

(27b)   he.ˈnee.cee.noʔ   'buffalo bulls'

(27c)   *he.nee.ˈcee.noʔ   int. 'buffalo bulls'

In (27a), the noun 'buffalo bull' has a stress on the penultimate syllable of the root in SG, just like the noun in (26a). In contrast to the example in (26), however, 'buffalo bull' retains the stress position when affixed with the PL suffix (27b). The behavior of these two kinds of nouns

can be explained if we assume that only roots of the 'buffalo' kind are underlyingly specified for stress, while roots of the 'chief' type are not. Thus, nouns like 'chief' in the absence of an underlying stress on the root receive the default penultimate stress in SG. When PL is added, the penultimate default rule reapplies to the whole wordform due to PL being underlyingly unstressed. This produces a stress on the penultimate syllable in the PL form in *nee.ˈcee.noʔ* 'chiefs'. In nouns of the 'buffalo' type, however, the lexically specified underlying stress on the penultimate syllable of the root surfaces in both SG and PL forms, which produces antepenultimate stress in the PL forms: *he.ˈnee.cee.noʔ* 'buffalo bulls'. The crucial point is that the surface penultimate stress on the root of nouns in SG can be of two kinds – lexically specified or default – which produces different patterns when a noun is affixed with underlyingly unstressed (PL) suffix.

In cases where SG form of the noun has stress on the final or on the antepenultimate syllable, stress must result from lexically specified accent, since there can only be a single default position for stress, which is penultimate in Arapaho. In these cases, the lexical stress on the root is always preserved. Consider the examples of PL adjoining to nouns with stem-final stress:

(28a)   bee.xoo.ˈkuθ   'molar'

(28b)   bee.xoo.ˈku.to   'molars'

(28c)   ho.ˈtii   'wheel, car'

(28d)   ho.ˈtii.woʔ   'wheels, cars'

In (28), we observe the underlyingly specified stress on the final syllable of the SG forms. There is no definitive way of establishing whether the penultimate stress in PL forms is the projection of the underlying accent of the root or whether the default penultimate stress surfaces when the PL morpheme is suffixed. However, there are noun stems in Arapaho with underlying accent on the final syllable of the stem in SG which suggest the former. In a number of nouns

in the language, the last syllable of the stem undergoes syncope in SG. In PL, however, the syncopated syllable has to surface. In these cases, the root-final stress surfaces producing antepenultimate stress in the PL forms which means that the default penultimate stress does not surface:

(29a) nii.ˈcii   'river'

(29b) nii.ˈcii.ho.h-o   'rivers'

(29c) hoo.ˈxeb   'spring'

(29d) hoo.ˈxe.bi.n-o   'springs'

In nouns with antepenultimate stress in SG, when PL is formed, the penultimate default must surface due to the requirement of there being a stress in the three-syllable window on the right edge of any given wordform in the language. Lexical stress on the root, however, is not deleted:

(30a) be.ˈce.ʔi.ʔoo   'cheek'

(30b) be.ˈce.ʔi.ˈʔoo.no   'cheeks'

(30c) ni.ˈsi.ko.coo   'cake'

(30d) ni.ˈsi.ko.ˈcoo.no   'cakes'

2.3.2.4 Rightmost accent wins

It can be observed from the examples presented so far that multiple stresses within a word are permitted in Arapaho (e.g. (30b, d) above). However, we can still observe the effects of accent competition and Culminativity in the language[20], and, crucially, accent competition is resolved with no reference to morphological information. This can be observed when two adjacent syllables carry an underlying accent as *clashes are banned* within morphological words in Arapaho. When two adjacent syllables carry a lexical accent, the right-hand lexical accent wins.

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[20] Refer to chapter **5** for a novel account of Culminativity as a macroparameter which includes an account of the resolution of accent clashes.

To formally capture this generalization, I adopt the Select parameter proposed in van der Hulst (2012); the Arapaho-specific setting of this parameter is bold-faced:

(31) SELECT   **L/R**

preserve the leftmost or the rightmost of the competing accents

By (31), the right-hand stress in a clash situation is selected, and the left-hand one gets deleted; this is schematically represented in (32) below:

(32)   x   x   x
       [σ   σ]   →   [σ   σ]

Note that (31)-(32) in Arapaho hold not only within the OSD: the domain for the application of (31)-(32) is the entire morphological word (see **7.2** for a brief discussion of mismatches in different stress-related domains). An alternative analysis is possible where one of the two competing stresses – the rightmost one in Arapaho – would receive extra prominence (an extra grid mark in a grid-based approach adopted here) with no deletion of the left-hand accent, cf. (33) below:

(33)   x

         x   x   x   x
       [σ   σ]   →   [σ   σ]

However, the accent deletion account proposed here is advantageous as it is further motivated by the fact that in a situation where there is no clash, both stresses are audible. Hence, there is no ban on multiple stresses in the language, and under the 'extra grid mark' analysis (33), we would expect both clashing stresses to be audible (albeit with a difference in the degree of

prominence), contrary to the empirical facts[21]. Crucially, since no morphological information is required for clash resolutions, Arapaho can be analyzed as a *Directional Accent* system.

I illustrate (31)-(32) and the *Directional* nature of the competition resolution in Arapaho with the so-called "locative shift" in Arapaho nouns. Cowell & Moss (2011: 32) observe that addition of the locative suffix (-*eʔ* or -*iʔ* depending on the noun class) to a noun root produces the same effects on the stress placement as the addition of the PL suffix: it tends to produce a stress on the penultimate syllable of the resulting wordform. Consider examples in (34) below:

(34a)   ˈ**no**ʔooθ   'my leg'

(34b)   noˈ**ʔoo**t-o   'my legs'   PL

(34c)   noˈ**ʔoo**t-e   'on my leg'   LOC

The noun in (34) is of the '*chief*' type (26): according to the analysis proposed above, it does not have an underlying accent on the root and gets the penultimate stress in SG (32a) via the application of the default stress rule. When PL is added, the default stress has to surface on the penultimate syllable of the newly formed word (34b). We observe in (34c) that when the LOC suffix is added, the stress pattern is identical to the PL form in (34b). However, the parallel between the effects of PL and LOC does not extend beyond examples of the '*chief*' type (26), (34). Recall the nouns of the '*buffalo bull*' type (27): these, according to my analysis, have an underlying stress on the penult in SG which is preserved when the PL suffix is adjoined thus producing the antepenultimate stress pattern in PL. However, nouns of this type undergo the "locative shift" just like the noun in (34):

(35a)   ˈ**ni**ʔec   'lake'

(35b)   ˈ**ni**ʔec-ii   'lakes'   PL

(35c)   niˈ**ʔec**-iʔ   'at the lake'   LOC

The same asymmetry between the stress realization of PL and LOC is observed in the nouns

with the stress on the surface final syllable of the root in SG in which the underlying final

syllable is syncopated in SG; recall examples in (29) and compare the following:

(36a) niiˈ**cii**   'river'

(36b) niiˈ**cii**hoh-o   'rivers'

(36c) niiciiˈ**he**h-eʔ   'at the river'

(36a) hooˈ**xeb**   'spring'

(36b) hooˈ**xe**bin-o   'springs'

(36c) hooxeˈ**bin**-eʔ   'in the spring'

The difference between the PL and the LOC pattern can easily be explained if we assume that

unlike PL, which does not carry underlying stress specification, the LOC suffix does.

Specifically, LOC suffix is pre-accenting, i.e. it requires a stress to be realized on the

immediately preceding syllable. In the framework adopted in this dissertation, the pre-

accenting is formalized as a type of underlying (*lexical*) grid marking, and as such it formally

has an equal status with other possible types of underlying grid marking – accenting and post-

accenting. To formally capture this, I adopt the representation from Revithiadou et al. (2006):

(37a) Pre-accenting grid marking

        x

        x   x

            σ

(37b) Post-accenting grid marking

            x

        x   x

        σ

(37c)   Accent grid marking

        x

        x   x

        σ   σ

Under this analysis, in forms such as (35-36) above, LOC suffix produces a stress clash with the underlying stress of the root:

(38)   *hooˈ**xe**ˈ**bin**-eʔ   int. 'in the spring'

The rightmost of the two lexical stresses wins and the root stress gets deleted producing the penultimate stress in the surface form in all cases. (31)-(32) applies regularly in a clash situation in Arapaho, and additional examples will be given throughout this chapter.

2.3.2.5 Non-Culminative stress or Secondary stress?

As noted earlier, multiple stresses within a morphological word are allowed in Arapaho. A clear reflection of this is seen in the existing sources on the Arapaho accent where all prominent peaks are marked with an acute accent. The question of whether there is a phonological and/or phonetic hierarchy of prominence in Arapaho is not a trivial one. There are two possible ways of interpreting the Arapaho data.

      Firstly, the stresses other than the rightmost stress within the morphological word could be analyzed as secondary on either phonological or phonetic grounds. Phonologically, the special status of the rightmost accent might be suggested by the accent clash cases, as discussed in the previous section: the appropriate setting of the Select parameter predicts the rightmost accent to be the winning accent in all cases of competition. However, the accent competition only seems to ever be observed in the situations of clashing accents.

      From the phonetic perspective, the motivation for analyzing all but the rightmost accent as (phonetically) 'secondary' is not straightforward: there appears to be no reliable way to determine the relative phonetic prominence of multiple stresses within a morphological word

in Arapaho. Firstly, since Arapaho uses different acoustic cues for stress in long vs. short vowels (recall section **2.3.1**), an acoustic comparison would have to include only the words with comparable stressed vowels within the OSD and outside of the OSD. However, it is unclear whether learners and speakers would be making such a phonetic comparison given that words with non-comparable stressed vowels within the OSD and outside of the OSD are frequent. Secondly, we can expect that other factors would interfere, most importantly – closeness to the edges of the word should be expected to influence the phonetic salience of stress (Gordon 2014). At the moment it is unclear how an experiment could be designed to eliminate these confounding factors.

Finally, the secondary stress analysis for the stresses other than the rightmost is questioned by the reported minimal or near-minimal pairs based on the position of these potentially secondary stresses, for instance:

(39)   ˈhonooˈsooʔ   vs.   honooˈsooʔ

         'It is fancy.'   'It is raining.'

If the initial stress in *ˈhonooˈsooʔ* 'it is fancy' were to be analyzed as a secondary stress, the minimal pair in (39) would be distinguished solely by the presence of a secondary stress. Due to perceptual and processing difficulties associated with contrastive secondary stress, such minimal pairs might be unexpected.

Based on the factors stated above, as well as on the fact that no consistent phonetic difference between multiple stresses within a morphological word has been reported for Arapaho, I argue that stress in Arapaho is non-culminative within the domain of morphological word. This puts Arapaho in line with a number of other highly synthetic languages where non-culminative stress or no clear phonetic differences between multiple stresses within synthetic words have been reported, for instance Mapudungun (Molineaux 2018, *forth.*), Blackfoot

(Stacy 2013)[22]. However, despite the seeming lack of Culminativity in the stress system of Arapaho, in chapter **5** of this thesis I will argue that stress in Arapaho should be analyzed as culminative because accent clashes are disallowed in the language. I propose to consider the ban on accent clashes as a possible instantiation of the Culminativity parameter (refer to **5.1.2** for a detailed discussion).

2.3.2.6 Summary of prosodic inventory of the morphemes in a noun

So far, we have observed that some **nominal suffixes** are accentless – for instance, all the allomorphs of the PL suffix in this chapter (26)-(30); or they can be pre-accenting – as the LOC suffix (34)-(38). The vocative suffix -ˈoo is an example of an underlyingly accented nominal suffix, cf. examples in (40) below (all nouns in (40) are obligatorily possessed, here given with the 1SG possessive prefix *ne-,* see discussion of the possessive prefixes below in this section):

(40) Nominative   Vocative

    ne-ˈhei   ne-hei-ˈhoo   'my aunt'

    ˈne-si   ˈne-si-ˈhoo   'my uncle'

    ne-eˈsebi   ne-esoˈb-oo   'my niece'

    ˈne-bi   ˈne-bi-ˈhoo   'my older sister'

We have also observed that **roots in nouns** can carry an underlying accent (26) or be accentless (27). Cowell & Moss (2011: 27) also report a small number of pre-accenting roots, for instance:

(41)   ˈσ-bex   'wood'

    ˈσ-nec   'water'

    ˈσ-wox   'bear'

    ˈσ-bee   'excrement'

---

[22] For a discussion of the considerable controversy surrounding the Blackfoot prominence system see Bogomolets (*forth.*).

However, Goddard (2015) does not mention or in any other way mark pre-accenting properties of these roots, but rather indicates that they carry an underlying accent themselves, e.g.: /ˈwoχ/ 'bear' (Goddard 2015:394). I should also note that multiple counter-examples can be found to the presumable pre-accenting properties reported for these roots in Cowell & Moss (2011: 27), consider, for instance, examples with the root *wox* 'bear' in (42) and with the root *bex* 'wood' in (43)-(45) below:

(42)   no-ˈwoχ-uuˈsoo-b-eʔ

          1-bear-cub-POSS-LOC

          'on my bear cub'

(43)   ˈheeθnee-bes

          real-wood

          'cottonwood' (lit.:'true wood')

(44)   seʔ-ˈbex-o

          flat-wood-PL

          'boards'

(45)   ceʔ-ˈbex-o

          round-wood-PL

          'logs'   (adapted from Cowell & Moss 2011: 101-108)

I have not been able to find a single unambiguous example of a pre-accenting root in either Arapaho recordings or Arapaho descriptions available to me.

    The only **prefix** found with nouns is the possessor marker (see Figure 1 in **2.3**). Most noun roots can be preceded by a possessive morpheme. The language also has a class of the so-called inalienable or obligatorily possessed nouns which must be prefixed with a possessive marker. The two sets of possessive prefixes behave differently with respect to stress. Stress

with alienable (non-obligatory) possessive prefixes is regular; they are underlyingly unaccented, consider an example below:

(46)   woθonoˈhoe   'book'

         no- woθonoˈhoe   'my book'

         ho- woθonoˈhoe   'your(S) book'

         hi- woθonoˈhoe   'his/her book'

Inalienable possessive prefixes, obligatory with the so-called 'dependent' nouns have idiosyncratic lexical accent, i.e. their stress varies from stem to stem, compare (47) and (48) below. The stress tends to be regular within the paradigm for a particular stem, cf. (48)[23].

(47)   ne-biiˈʔoʔoo   'my sweetheart'

(48)   ˈno-toˈnihiʔ   'my horse'

         ˈho-toˈnihiʔ   'your horse'

         ˈhi-toˈnihʔ-o   'his horse-OBV'

While the prefixes marking alienable possession ((46) above) are not only completely regular with respect to stress but are also highly regular in their segmental form, the inalienable possession prefixes show considerable amount of allomorphy. In addition to the morphemes *ne-, he-, hi-* (1st, 2nd, 3rd person respectively) exemplified above, which are homophonous with the alienable possession morphemes, these can have the forms *nei-, hei-, hinii-* or *nee-, hee-, hii-* for no obvious synchronic phonological reasons. This variability in both segmental and prosodic make-up of the inalienable possession morphemes is due to the historic sensitivity of the possession prefix to the phonological form of the noun root (Goddard, 2015). In addition to the examples in (47)-(48) above, consider for instance a noun for 'one's hand' in (49) below.

---

[23] The /e/-/o/ alternation in the prefixes is due to a regular process of vowel harmony (see Cowell & Moss 2011:20-22).

The obligatory possessive prefix with this noun has a long vowel in all forms which carries lexical falling tone (marked with the circumflex diacritic over the vowel), but is unstressed:

(49) nêe-ˈcet   'my hand'

      hêe-ˈcet   'your hand'

      hîi-ˈcet   'his/her hand'

      bêe-ˈcet   'one's hand'

Nouns like (49) historically had a root beginning with a cluster that became PAG * ʔC and lengthened the vowel of the prefix when the glottal stop was lost, which in turn produced the falling tone (see section **2.3.5** for a discussion). I refer the reader to Goddard (2015) for the historical origins of the allomorphy in inalienable possessive prefixes.

The prosodic inventory of the morphemes in the nominal complex illustrated in this section is summarized in Table 4 below:

	Roots	**Suffixes**	**Prefixes**
Accented	Y	Y	Y
Unaccented	Y	Y	Y
Pre-accenting	N?	Y	N

Table 4. Prosodic inventory of the morphemes in the nominal complex

2.3.3 Stress in verbs

The five stress parameters presented in the previous section for nominals hold identical settings for verbal words. A stress is required in the last three syllables of a morphological word, and its location is unpredictable on the phonological grounds. The penultimate default applies in the absence of a lexically specified accent in the three-syllable window at the right edge. Multiple stresses within a morphological word are allowed, but, crucially, in the cases of accent clash, the rightmost accent wins and no morphological information is needed in order to resolve the stress competition in these cases. In verbal words, Arapaho thus also shows the defining

property of a *Directional Accent* system. In the next two sections, I demonstrate this property first as it is manifested in the verbal suffixes (**2.3.3.1**), and after that – in the verbal prefixes (**2.3.3.2**).

2.3.3.1 Rightmost accent wins: verbal patterns

As previously mentioned, although Arapaho allows for multiple stresses within a wordform, stress clashes are banned and are resolved across the board with the following setting of the Select parameter (31) repeated below as (50):

(50)   SELECT   **L/R**

preserve the leftmost or the rightmost accent of the competing accents

Below I will demonstrate that the setting of the Select parameter in (50) accounts for the accentual patterns in verbal complexes that have previously appeared to be "exceptional" and appeared to require some special idiosyncratic rules (Cowell 2018, Cowell & Moss 2011). I consider two verbal paradigms to illustrate this: (i) the "stress shift" in verbal stems in the transitive animate (TA) paradigm vs. in the transitive inanimate (TI) paradigm; and (ii) the "stress shift" in verbal stems in reflexive/reciprocal forms. I will show that no special rules are necessary in addition to the ones stated in the previous section for nominals.

Consider the forms of two verb stems: ˈ*noohow-* 'to see someone' (TA) and ˈ*niʔeeneb-* 'to like someone' (TA)[24].

(51a) no.ˈ**noo**.ho.ˈ**be**.θen   (51b) no.ˈ**noo**.ho.ˈ**bei**.noo

n<oˈn>oohoˈb-eθen   n<oˈn>oohoˈb-einoo

<IC>see-1>2   <IC>see-3>1

'I see you.'   'S/he sees me.'

---

[24] The comparison of the accentual behavior of these two verb stems was first presented in Cowell (2018).

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(52a) ˈ**nii.**ʔee.ne.ˈ**be.**θen   (52b) ˈ**nii.**ʔee.ne.ˈ**bei.**noo

ˈn<i>iʔeeneˈb-eθen   ˈn<i>iʔeeneˈb-einoo

<IC>like-1>2   <IC>like-3>1

'I like you.'   'S/he likes me.'

For the sake of space, I only provide a limited number of forms in (51)-(52), but note that stress falls on the penultimate syllable of the root in ˈ*noohow-* 'to see someone' and on the antepenultimate syllable in ˈ*niʔeeneb-* 'to like someone' throughout the paradigms. Suffixes, additionally, also bear stress either specified underlyingly or assigned by default; in the cases of penultimate stress, it is not always possible to determine whether that stress is lexical or assigned by default based solely on these data, but it is not important at this point. Cowell (2018) observes that verbs with lexical stress on the penultimate syllable of the root (such as ˈ*noohow-* 'to see someone') "shift" their stress one syllable to the right when suffixed with the reflexive/reciprocal morpheme *-eti*, compare the forms below to (51) above:

(53)   no.noo.ˈ**ho.**be.ˈti**.**θiʔ

n<on>ooˈ**ho**b-eˈti-θiʔ

<IC>see-REFL-3PL

'They see themselves.'

(54)   no.noo.ˈ**ho.**be.ˈti.noo

n<on>ooˈhob-eˈti-noo

<IC>see-REFL-1SG

'I see myself.'

The alternation in the position of the stress in the verb stem observed between (51) and (53)-(54) can be explained if we analyze the reflexive/reciprocal morpheme *-eti* as pre-accenting[25].

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[25] Note that there is no data available to determine whether the stress on the penultimate syllable in verb forms with *-eti* comes from an underlying accent on this suffix or is assigned by default, i.e. there is no way to discriminate between two possible underlying forms of this suffix: /ˈσ-eˈti/ vs. /ˈσ-eti/.

Under this analysis, whenever this morpheme is suffixed to a root stressed on the penultimate syllable, a clash results:

(55)   x   x

σ. ˈσ. ˈσ. σ. σ. σ.

*noˈ**noo**ˈ**hob**-eti-θiʔ   Int.: 'They see themselves'

The clash is resolved as predicted by the setting of the Select parameter stated in (50) above: the right stress wins, i.e. the lexical stress on the penultimate syllable of the root gets deleted. This account is further supported by the pattern found in verb roots with lexical stress on the antepenultimate syllable, such as *ˈniʔeeneb-* 'to like someone' (52). This analysis predicts that the suffixation of *-eti* to such verb roots would not affect the lexical stress of the root but would produce an additional stress on the final syllable of the stem. This prediction is borne out, compare the forms below to the ones in (52) above:

(56)   ˈ**nii**.ʔee.ˈ**ne.**beˈti.θiʔ

ˈn<i>iʔeeˈneb-eˈti-θiʔ

<IC>like-REFL-3PL

'They like themselves.'

(57)   ˈ**nii**.ʔee.ˈ**ne.**beˈti.noo

ˈn<i>iʔeeˈneb-eˈti-noo

<IC>like-REFL-1SG

'I like myself.'

As expected, lexical stress on the initial syllable of the root *ˈniʔeeneb-* 'to like someone' is preserved in (56)-(57) and is unaffected, i.e. no "stress shift" occurs in these cases. Thus, the patterns of "stress shift" in reflexive/reciprocal forms are in fact patterns produced by pre-

accenting and regular stress clash resolution, and no additional stipulations or idiosyncratic "stress shift" rules are necessary.

The same setting of the Select parameter accounts for the "stress shift" that Cowell & Moss (2011) and Cowell (2018) observe in transitive animate (TA) versus transitive inanimate (TI) verb forms. Compare the position of stress in the verb roots between the TA and the TI columns in table 5 below. The verb roots in the TA column are suffixed with an underlyingly accented 1>3 inflection - ˈoʔ ('I do something to him/her'), while the roots in the TI column are suffixed with the transitivity suffix -ow and 1SG -oo. The relevant "shifting" stress is bold-faced in the corresponding TA and TI forms:

Transitive Animate (TA)	Transitive Inanimate (TI)	Translation
ne.ˈnii.θi.ˈn-oʔ	ne.nii.ˈθi.n-o.w-oo	possess
ˈko.θe.ˈn-oʔ	ko.ˈθe.n-o.w-oo	miss, not hit
ˈsee.you.ˈn-oʔ	see.ˈyou.n-o.w-oo	crush
ˈcih.ʔo.ˈh-oʔ	cih.ˈʔo.h-o.w-oo	chop to bits

Table 5. Stress patterns in TA vs. TI verbs

Dozens of such examples can be found in Arapaho (see Cowell 2018 for a list of comparable verb forms), and all of them can be accounted for if we assume that the TI suffix -ow is pre-accenting, and in the clash situations, the right stress wins. This analysis also correctly predicts that no changes to the root stress will occur with the addition of the ˈσ-ow suffix if the root is underlyingly accented on the antepenultimate syllable:

(58)   ˈko.uu.te.ˈn-oʔ   ˈko.uu.ˈte.n-o.w-oo   'dismiss'

The data and analysis presented thus far are to illustrate the following claim: all of the stress patterns in the root+suffixes portion of morphological words in Arapaho can be accounted for with only four parameter settings. This yields a rather simple and learnable pattern. In the next

subsection, I address stress in the pre-root portion of verbal words, and I show that it has the same stress patterns as the morphological environments discussed so far.

2.3.3.2 Stress in the pre-stem part in a verbal word

Verbal morphology in Arapaho includes a wide array of pre-stem morphemes. These include a polar question particle and *wh*-particles, Tense/Aspect/Mood prefixes[26], negation, and morphemes with various adverbial, quantificational and aspectual meanings (traditionally know as 'preverbs' in the Algonquianist literature, see Cowell & Moss 2011: 205-234). A simplified template of the morphemes in a verb is repeated from the introduction in Figure 6 below:

-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4
Clause Type/Mood	Person	Aspect	Tense	Negation	Adverbials*	Root	Incorporated Root*	Agreement	Agreement	Mood
*optional and iterable										

Figure 6. Verbal template (head root in grey, slot 0)

Most of the inflectional prefixes are underlyingly unaccented. In what follows, I will consider the stress behavior of the future tense prefix (slot -3 in Figure 6) and person prefixes (slot -5). The future tense prefix and the person prefixes are monosyllabic and underlyingly accented which allows us to observe stress interactions with the following root when the root carries an underlying accent on the initial syllable. I will show throughout this section that Select (R) is active in resolving stress clashes in the prefix-root part of the morphological word as well.

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[26] Note, this is in contrast to the rest of the Algonquian family where TAM is marked via suffixation, see for example Oxford (2014) for the general Algonquian pattern.

Firstly, consider examples in (59)-(60) showing that the future tense prefix *'et-* carries an underlying accent[27]:

(59)   koo-ˈ**het**-ceˈnis

          Q-FUT-fall

          'Will it fall?'

(60)   ˈ**h\<o>ot**-biiˈn-ein

          \<IC>FUT-give-3SG>2SG

          'He will give it to you.'   (adapted from Goddard 2015: 376)

Examples in (59)-(60) above show the future tense prefix realizing its accent as stress on the antepenultimate syllable. The stress on the antepenultimate syllable in both (59) and (60) is due to the underlying accentual marking of the future tense prefix since it cannot be explained by default (i.e. it is not penultimate). Importantly, the future tense prefix is part of the stress domain of the stem which can be concluded from the data showing that stress on the FUT counts toward satisfying the three-syllable window requirement:

(61)   ˈh\<e>et-coo-noo

          \<IC>FUT-come-1SG

          'I will come.'

In (61) above, the underlyingly accented future tense prefix is followed by two underlyingly unaccented morphemes. We can observe that penultimate default stress is not assigned which indicates that the stress on the antepenultimate syllable in the future prefix satisfies the requirement of OSD.

---

[27] The future tense prefix has a few allomorphs: the *'et-* prefix is epenthesized with an /h/ when word-initial and following the 'clause type' morphemes (slot -6 in Figure 6). I refer the reader to Bogomolets, Fenger & Stegovec (2018) for a brief discussion of the /h/-inducing prosodic boundary following the 'clause type' morphemes in Arapaho. Note also that when preceding a vowel-initial morpheme, the future tense prefix has the form *'(h)etn-.* Finally, this prefix can also be realized as *'(h)ot-/'(h)otn-.* These variants are used by the older speakers, i.e. the variation appears to be generational, see Goddard (2015: 377).

When the future tense prefix is followed by a morpheme stressed on the first syllable, the clash is resolved via the same setting of the Select parameter as in all the clash cases seen so far: the right-hand accent wins, and the future tense prefix loses its accent. Consider the position of stress in the verb *'iisisee-* 'to walk' in (62)-(63) which has an underlying accent on the initial syllable:

(62)　　ni.ˈ**hii**.si.seet

　　　　niˈh-iisisee-t

　　　　PST-walk-3SG

　　　　'He went.'[28]

(63)　　h<e>etˈ**nii**siseet

　　　　h<e>etˈn-iisisee-t

　　　　<IC>FUT-walk-3SG

　　　　'He is going to go.'

Example (62) illustrates that the verb root has a lexical accent on the first syllable. The past tense prefix is underlyingly unaccented, and in (62) the root realizes its underlying accent as stress. In (63), however the underlying accent of the future tense prefix clashes with the underlying accent on the initial syllable of the root producing an illicit form *ˈ***heet*ˈ*nii***siseet*. We observe that accent on the FUT tense prefix gets deleted, and the rightmost of the two accents is realized as stress. These examples demonstrate that the accentual behavior of the tense prefixes is parallel to the accentual behavior of the morphemes at the right edge of

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[28] Note that the relevant forms of the verb *'iisisee-* 'to walk' discussed here come from larger phrases, (62) comes from (i) below, and (63) comes from (ii):

(i)　　hee.ˈʔi.no.woo　　　　ni.ˈhii.si.seet
　　　heeˈʔin-ow-oo　　　　niˈh-iisisee-t
　　　know-TR-1SG　　　　PST-walk-3SG
　　　'I know where he went.'

(ii)　　heeˈʔinowoo　　　　h<e>etˈniisiseet
　　　heeˈʔin-ow-oo　　　　h<e>etˈn-iisisee-t
　　　know-TR-1SG　　　　<IC>FUT-walk-3SG
　　　'I know where he's going to go.'

morphological words: they count as part of the OSD, accent clashes between the prefixes and the following morphemes are not tolerated and are resolved via Select (R).

The 1st and 2nd person prefixes – *ne-* and *he-* show the same pattern. They are underlyingly accented and are part of the same stress domain as the following stem which is evidenced by the fact that they undergo the same stress clash resolution when followed by a lexical stress on the verb root:

(64)   ˈ**he-i**hoow-ˈkoon-ooˈku-n

    2-NEG-open-eye-12

    'We are not opening our eyes.'

(65)   koo-**ho-**ˈkoon-ook

    Q-2-open-eye

    'Are you opening your eye?'

In (64), the 2nd person morpheme realizes its stress before the NEG morpheme which is underlyingly unaccented. In (65), the stress on the 2nd person prefix is deleted as it is followed by a stressed verb root.

The discussion above demonstrates that prefixes in Arapaho, just like roots and suffixes, can be underlyingly unaccented or underlyingly accented, and that even the outermost left edge prefixes take part in the regular stress assignment. Recall from the previous section that both nominal and verbal suffixes can be underlyingly marked to be pre-accenting while I have not been able to find clear examples of pre-accenting roots in nouns. Cowell & Moss (2011) report a number of verbal roots (66a-b) and prefixes (66d-e) which appear to be pre-accenting:

(66a)   ˈσ-nihii   'to say'

(66b)   ˈσ-niibei   'to sing'

(66d)   ˈσ-θoʔ-   'never do s.t.'

(66e) ˈσ-niʔ-   'able to do s.t.'

There is however not enough data to evaluate the accentual behaviour of these morphemes in full. The prosodic inventory of the morphemes in the verbal complex illustrated in this section is summarized in Table 6 below:

	Roots	Suffixes	Prefixes
Accented	Y	Y	Y
Unaccented	Y	Y	Y
Pre-accenting	Y?	Y	Y?

Table 6. Prosodic inventory of the morphemes in verbs

2.3.4 Arapaho as a *Directional Accent* system: Summary

In this chapter, I proposed an analysis of Arapaho as a *Directional Accent* system, i.e. I demonstrated that in an accent competition situation, the winning accent is determined by referring solely to the 'right-most' vs. 'left-most' grid mark on the stress plane. More specifically, the competition resolution in Arapaho is based on the *directionality* or *edge-orientation*: in a competition between multiple underlyingly accented syllables, the right-most always wins. This means that even though the language has a characteristically complex morphological system, the stress placement mechanism does not reference it. The following generalizations regarding the phonological behavior of the Arapaho accent have been made in this chapter:

(67) Arapaho accent generalizations

   i.   Stress must be present in the three-syllable window at the right edge of a morphological word (OSD).

   ii. In words with no underlying accents in the OSD, default assigns accent to the penultimate syllable, i.e. stress is Obligatory.

iii. Multiple underlying accents can be realized as stress in a morphological word, but not in adjacent syllables.

iv. When two underlying accents are adjacent, the rightmost one is realized as stress and the left one is deleted.

Following van der Hulst (2012), I proposed to formally capture the generalizations in (67) through the appropriate settings of the four parameters in (68) below:

(68) Arapaho stress parameter settings

Accent Domain	BOUNDED(R)
	SATELLITE(R)
Accent Placement	SELECT(R)
	DEFAULT(R)

Recall that the Accent Domain parameters ensure that a tri-syllabic *Obligatory Stress Domain* is formed at the right edge of the word in Arapaho, while the Accent Placement parameters govern stress placement in the cases of stress competition (SELECT (R)) or in the cases where lexical marking is absent (DEFAULT (R)). The Select parameter is central in analyzing a language as a *Directional Accent* system. Languages like Arapaho crucially do not require any morphological information in order to resolve competition between multiple underlying accents. The mechanism of accent assignment in such languages is thus independent of morphology.

The final section of this chapter presents a brief overview of the lexical falling tone in Arapaho. Although important for the overall characteristic of the prosodic system of Arapaho, the tonal system is not directly involved in phonology of stress. Some readers thus might choose to skip the following section and proceed directly to Chapter **3** where *Cyclic Accent* systems are addressed.

2.3.5 Lexical tone in Arapaho

This chapter is mainly focused on the phonological properties of stress. However, a brief note on lexical tone in the language is in order. Arapaho has historically developed a falling tone through a process of glottalization – the loss of glottal stop before a consonant and compensatory lengthening of the preceding vowel. Upon deletion of the glottal stop, HL tone surfaced on the newly formed long vowel. In Arapaho, falling tone is synchronically unpredictable (Goddard 1974, 2015). Consider the following example:

 (69) AR θô:xoˈhohoʔ < PA *θaʔθehsa　　　'mitten, glove'　　　(Goddard 2015: 356)
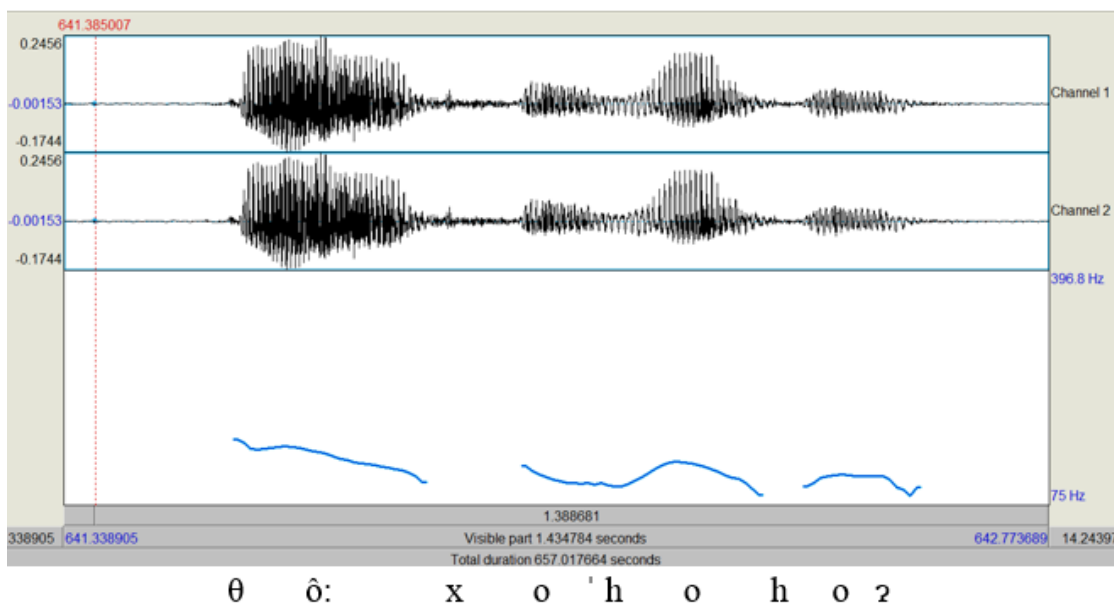
Figure 7. Waveform and pitch contour for *θôoxoˈhohoh* [θô:xoˈhohoʔ] 'mitten'.

The figure above shows a pitch fall over the long vowel in the first syllable in place of the PA short vowel followed by the *ʔθ* cluster. The falling tone formation in this environment is not an Arapaho-specific phenomenon. Goddard (1974: 110) notes that Gros Ventre shows a falling tone in this environment as well. Blackfoot has a synchronically predictable falling tone conditioned by the same environment (see Stacy 2004; Frantz 2009). The falling tone in Blackfoot arises through a process which is virtually identical to the glottalization process in

Arapaho. The only difference between the HL tone in Blackfoot and the HL tone in Arapaho is in the historical timing: in Blackfoot the glottalization process is ongoing and thus is predictable from the synchronic phonological form of the morphemes in a word, while in Arapaho falling tone is synchronically unpredictable as it has developed through a diachronic loss of glottal stops in the earlier stages of the language history (Goddard 1974, 2015). Consider the following Blackfoot example:

(70)   'a:xkio**ksâ:ts**˳is

       aah.kio.**ksaʔ.ts**is

       'boat'   (Stacy 2004: 119)
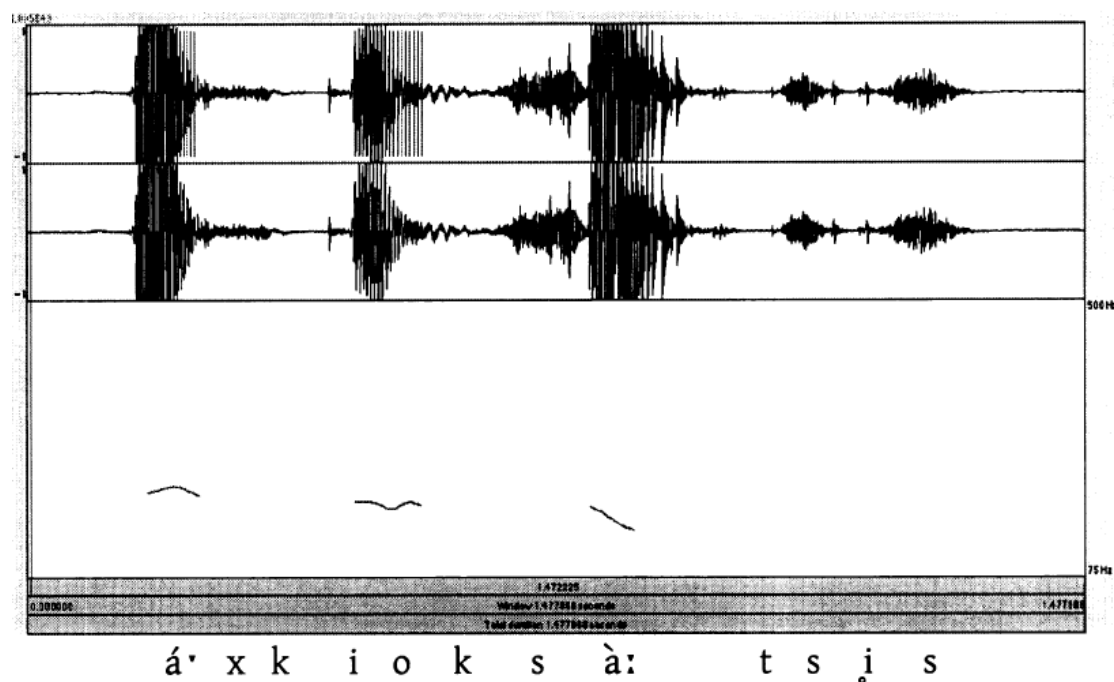
Figure 8. Waveform and pitch contour of *aah.kio.ksaʔ.tsis* ['a:xkio**ksâ:ts**˳is] 'boat', adopted from Stacy (2004: 120, Figure 10)

In (70), the fall in the pitch contour is evident in the place of the glottal stop deletion in the penultimate syllable (Figure 8).

Falling tone in Arapaho is part of the underlying shape of a morpheme and as such can surface anywhere in a wordform, i.e. there are no restrictions on its distribution, except that it only occurs on long vowels and diphthongs. Tonal minimal pairs are infrequent but possible:

(71a) Proto Arapaho-Atsina *oiθine- > Arapaho houˈθine- 'to hang'   vs.

(71b) Proto Arapaho-Atsina *oiʔθine- > Arapaho hôuˈθine- 'to float'

(Goddard 1974: 110-111)

Stress and tone on the adjacent syllables are allowed (72a-b):

(72a) hê:ˈtec   'ocean'

(72b) sîˈsi:c   'duck'   (Goddard 2015: 356)

Examples such as (72) above also illustrate that a single morpheme can carry both accent and tone, while it is not usual for a single morpheme to have multiple underlying accents. Moreover, a syllable carrying falling tone can bear stress. The example in (73) below has falling tone on both the penultimate and the final syllable. The penultimate syllable additionally bears stress – the vowel in the penultimate syllable is lengthened (which is the main acoustic cue of stress for phonemically long vowels in Arapaho, see discussion in section **2.3.1**):

(73) neˈ**bî:**xû:t   'my shirt, my dress'

Falling tone has no involvement in the morphological system of the language. The tonal system of Arapaho is best described as (i) metrically-independent: tone is not conditioned by stress; (ii) restricted: there is a single toneme; and (iii) it is a low-density tone system, i.e. one in which many syllables do not bear tone (the term borrowed from Michael 2011).

CHAPTER 3. CYCLIC ACCENT

3.1 Cyclic Lexical Accent in Sahaptian languages

This chapter develops a novel analysis of lexical accent in two Sahaptian languages – Ichishkiin Sɨnwit and Nez Perce. Ichishkiin has been previously analyzed as an Affix Controlled Accent language (Hargus and Beavert 2002, 2006, 2016). For Nez Perce, an analysis in terms of positional faithfulness constraints privileging the realization of accents that are furthest away from the root towards the word edges has been proposed (Bjorkman 2010). Both analyses propose idiosyncratic constraints (or constraint rankings) to account for the observed stress patterns in the two Sahaptian languages, which is undesirable if we aim to develop a cross-linguistically representative theory of lexical accent languages. These languages are particularly interesting for the current study because they have been claimed to exhibit a sensitivity to the identity of morphemes in their accent competition: i.e. affixes versus roots. Recall from **1.3.1,** the theory of lexical accent proposed in this dissertation predicts such sensitivity to be impossible. In what follows, I review the existing analyses of lexical accent in Ichishkiin Sɨnwit and Nez Perce, and I argue that these languages do not warrant positing language-specific accent mechanisms. Instead I propose to treat these systems as examples of lexical accent being assigned *cyclically*. More specifically, I argue that Nez Perce and Ichishkiin Sɨnwit fall in the (b) type of lexical accent systems, cf. the typology in **1.3.1**, repeated below as (1):

(1) Typology of lexical stress systems

      (a)   *Directional Accent.* In an accent competition, either the right-most or the left-most accent wins, i.e. competition is resolved *directionally.*

      (b)   *Cyclic Accent.* In an accent competition, accent in the outermost derivational layer within the relevant morpho-prosodic domain wins, i.e. competition is resolved *cyclically*.

Additionally, I propose that Sahaptian accent is sensitive to cross-linguistically motivated differences between three prosodic domains: PRoot, PStem, and PWord, which on the surface presents as a prefix-suffix asymmetry in stress assignment. The analysis proposed below naturally captures two insights about Sahaptian accent which in fact have been noted by both Hargus and Beavert (2006) and Bjorkman (2010), namely that stress in these languages (i) is strongly tied to the edges of the morphological word, and (ii) is right-edge oriented. Moreover, postulating that the phonological systems of Ichishkiin Sɨnwit and Nez Perce are affected by the reference to three prosodic constituents – PRoot, PStem, and PWord provides an explanation for the properties of the phonological systems of the two languages other than stress. Specifically, the proposed prosodic structure and the prefix-suffix asymmetry effects are also observed in the hiatus resolution patterns in Ichishkiin Sɨnwit and in the vowel harmony patterns in Nez Perce. The important analytical contribution of the proposed account is that it captures all the stress generalizations in these languages without invoking rules or constraints (and constraint rankings) which otherwise appear to be uniquely needed for the Sahaptian patterns. An important typological implication of this chapter is this: if a reanalysis of the Sahaptian accent without invoking Affix Controlled Accent (Hargus and Beavert 2002, 2006) is possible, affix faithfulness is unattested as a property of lexical accent systems.

3.2 Case study: Stress in Ichishkiin Sɨnwit

In this section, I take a closer look at the stress system of Ichishkiin (or Ichishkiin Sɨnwit), also known as Yakima Sahaptin[29]. I will propose that stress in Ichishkiin is assigned cyclically, and thus, falls into the second type of the typology proposed in this dissertation (see (1b) above). I begin this case study by presenting all the relevant stress patterns in **3.2.1** and the previous

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[29] Sahaptin (Penutian, Plateau Penutian, Sahaptian) is generally described as having three groups of dialects, following Jacobs (1931), Rigsby (1965), and Rigsby & Rude (1999): River, Northeast, and Northwest. Yakima (or Yakama), the focus of this analysis, belongs to the Northwest dialect. Beavert & Hargus (2009) report that the traditional native name *Ichishkiin (Sɨnwit)* is preferred by the community over the Salish term *Sahaptin*, therefore *Ichishkiin* is used throughout this dissertation.

analysis of these patterns in **3.2.2.** I then argue in **3.2.3** that the observed stress patterns can be reanalyzed in a more economical and typologically less marked way with a cyclic accent account. Finally, I propose an account of the outstanding patterns in **3.2.5** before moving on to the case study of accent in a related language – Nez Perce.

A few background notes on the language are in order. As all languages discussed in this dissertation, Ichishkiin Sɨnwit (IS) has a complex morphological structure with verbs exhibiting the highest degree of complexity. The structure of the verb in the language is the following (based on Jansen 2010; Rigsby & Rude 1996). The pre-root part of a verb can contain the morphemes in (2), where (2a) is the outermost prefix and (2d) is the prefix closest to the root:

(2) Ichishkiin verb prefixes

(2a)   Person agreement

(2b)   Preverbs with modal or adverbial meanings

(2c)   Causative prefix

(2d)   "Lexical prefix": body parts, instruments or motions

The prefixes in (2) can be followed either by a single root or by two roots. I refer the reader to Jansen (2010: 215-217) for more details on the combinatorics of the morphemes in (2). Verbal suffixes and their relative linear positions are listed in (3), with (3a) being the closest to the root and (3g) being the outermost:

(3) Ichishkiin verb suffixes

(3a)   Applicative

(3b)   Inchoative

(3c)   Desiderative/Purpose

(3d)   Aspect (Continuous/Imprerfective, Perfective, Habitual)

(3e)   Direction/location of motion

(3f)   Tense/Imperative/Conditional

(3g)   Person+Number enclitic

Stress in IS is culminative and obligatory, and is phonetically cued by raised pitch and greater intensity in the stressed syllable (Hargus & Beavert 2005). Both roots and affixes (prefixes and suffixes) can be underlyingly accented. Hargus and Beavert (2001, 2006, 2016) claim that all roots in Ichishkiin are underlyingly accented, i.e. there are no words in the language which would not have an underlying accent. At the same time, they term some roots "strong" accented roots – these are the roots which combined with an underlyingly accented prefix retain their underlying accent (while the accent on the prefix deletes). The rest of the roots, termed "weak" accented roots in Hargus and Beavert (2006), do not retain their accent in this case and the prefix surfaces with the primary stress. This also means that no default stress rule has been proposed for the language since it has been assumed that all words in the language have at least one underlying accent. In contrast, I propose that the "weak" accented roots are in fact underlyingly unaccented while the "strong" roots carry an underlying accent. Data presented in Hargus and Beavert (2001, 2006, 2016) as well as generalizations in Jansen (2010) also suggest that penultimate stress can be analyzed as default in Ichishkiin. I base this proposal on the observation that all "weak" accented roots of two or more syllables given in Hargus and Beavert (2006) carry stress on the penultimate syllable and lose their stress in the presence of an underlyingly accented affix while the "strong" accented roots may carry stress on any syllable and they retain their stress in the presence of an underlyingly accented prefix (see section **3.2.1** for details on accent competition patterns). Thus, the roots which I term *unaccented* ("weak" accented in the terminology of Hargus and Beavert 2006 and Jansen 2010)

only carry stress if combined with unaccented affixes, consider for example an unaccented root *tkʷata* 'to eat':

(4a)	ˈtkʷata-t	(4b)	ˈmaj-tkʷata-t	(4c)	maj-tkʷata-ˈɬa
	tkʷata-t		ˈmaj-tkʷata-t		ˈmaj-tkʷata-ˈɬa
	eat-NMLZ		morning-eat-NMLZ		morning-eat-AGT
	'eating'		'eating breakfast'		'breakfast eater'

(adapted from Hargus & Beavert 2016, eg. (2))

In (4a), stress surfaces on the penultimate syllable (i.e. penultimate default), however, when combined with an accented prefix, the root loses its stress, and the underlying accent of the prefix surfaces as stress (4b). In (4c) we observe that in the presence of both – an underlyingly accented prefix and an underlyingly accented suffix, the underlying accent of the suffix is realized as primary stress. In what follows, I address such cases of stress competition in detail while the default stress pattern is discussed in more detail in **3.2.4.**

3.2.1 Relevant data

The stress generalizations are as follows. When a word contains only one underlying accent, that accent is realized as stress:

(5a)	ˈpaʔatɬ'awiʃa	(5b)	wanˈpawaas
	ˈpa-ʔatɬ'awi-ʃa		wanp-ˈawaas
	INV-beg-IPFV		sing.medicine.song-INSTR
	'S/he's begging her/him.'		'musical instrument'

(adapted from Hargus & Beavert 2006: 180-1)[30]

In (5a), only the inverse prefix *ˈpa-* carries an underlying accent while the suffix is underlyingly unaccented, and the root, in the terms proposed in the current discussion, is underlyingly

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[30] Note that all descriptions of the language distinguish between glottal stops, transcribed as /ʔ/ and glottalized consonants transcribed as a consonant followed by an apostrophe, e.g. /ɬ'/ (Hargus & Beavert 2006, Jansen 2010, Rigsby & Rude 1999).

unaccented as well. The prefix thus realizes its underlying accent as primary stress. Similarly, in (5b), only the instrumental suffix -ˈ*awaas* has an underlying accent on the first syllable, which is then realized as primary stress.

Data important for the present discussion comes from the morphologically complex words composed of more than one morpheme carrying an underlying accent. When multiple underlyingly accented prefixes are combined with an unaccented root, the leftmost (outermost) accented prefix realizes its accent as stress. Consider (6) where there are two prefixes marked for underlying accent, and the leftmost one is stressed:

(6)   Multiple accented prefixes

    ˈpaʃapawinata

    ˈpa-ʃaˈpa-wina-ta

    INV-CAUS-go-FUT

    'S/he will let her/him go.'   (adapted from Jansen 2010:54)

When multiple underlyingly accented suffixes are combined with an unaccented root, the rightmost (outermost) one realizes its accent as stress:

(7)   Multiple accented suffixes

    ʃjakɬaanˈmi

    ʃjak-ˈɬa-anˈmi

    scout-AGT-GEN

    'of a scout'   (adapted from Jansen 2010:55)

Finally, when an underlyingly unaccented root is combined with one or more underlyingly accented suffixes *and* one or more underlyingly accented prefixes, the rightmost underlyingly accented suffix is always stressed:

(8)   Accented suffixes and accented prefixes

(8a)   pinak'inuˈt'awaas

piˈna-k'inu-t'-ˈawaas

RFL-see-NMLZ-INSTR

'mirror, window'   (adapted from Jansen 2010:54)

(8b)   ʃapaʃukʷaaˈɬa

ʃaˈpa-ʃukʷaa-ˈɬa

CAUS-know-AGT

'prophet'   (adapted from Hargus & Beavert 2006: 181)

Both forms in (8) contain an underlyingly accented prefix and an underlyingly accented suffix, and the accent of the suffix is realized as stress.

Let us now consider wordforms with underlyingly accented roots with an example of the underlyingly accented root ʔiˈwaχi 'to wait'. In words containing an underlyingly accented root and one or more underlyingly accented prefixes, the root accent always wins:

(9) Accented root and accented prefix

(9a)   paʔiˈwaχim

ˈpa-ʔiˈwaχi-m

INV-wait-CISLOC

'Wait for me.'

(9b)   ʔaʃapaʔiˈwaχik

ˈʔa-ʃaˈpa-ʔiˈwaχi-k

ABS-CAUS-wait-2SG.IMP

'Make her wait for him.'   (adapted from Hargus & Beavert 2006: 180)

In (9a), the underlyingly accented root is prefixed with a single underlyingly accented prefix, while in (9b), the same underlyingly accented root is prefixed with two accented prefixes. In

both cases the root receives the primary stress, while accents in the prefixes are deleted. In contrast to (9), in words containing an underlyingly accented root and one or more underlyingly accented suffixes, the root does not win, rather the rightmost (outermost) underlyingly accented suffix realizes its accent as stress:

(10)   Accented root and accented suffix

(10a)   ʔiwaχiˈɬa

        ʔiˈwaχi-ˈɬa

        wait-AGT

        'one who waits'

(10b)   ʔiwaχitpaˈma

        ʔiˈwaχi-t-paˈma

        wait-NMLZ-THING.FOR

        'a place for waiting (waiting room, bus stop etc.)'

(10c)   ʔiwaχitpamaˈnmi

        ʔiˈwaχi-t-paˈma-ˈnmi

        wait- NMLZ-THING.FOR-GEN

        'of a waiting place'   (adapted from Hargus & Beavert 2006: 180)

In (10a-b), the underlyingly accented root is affixed with a single underlyingly accented suffix, while in (10c), the same underlyingly accented root is affixed with two underlyingly accented suffixes. In both cases the root loses its accent and the primary stress surfaces on the (outermost) accented suffix. The patterns of stress competition in IS are summarized below in (11). The following notation is used: P – prefix, R – root, S – suffix, ˈ - underlying accent; the winning morpheme which receives primary stress is bold-faced and underlined, e.g. **<u>S:</u>**

(11)　　P-P-**R**-S-S

　　　　P-P-ˈ**R**-S-S

　　　　ˈP-ˈP-ˈ**R-**S-S

　　　　ˈ**P-**ˈP-R-S-S

　　　　ˈP-ˈP-ˈR-ˈS-ˈ**S**

3.2.2 Previous analysis

Based on the data presented above, Hargus & Beavert (2005, 2006, 2016) and Jansen (2010)

come to the following descriptive hierarchy in stress assignment:

(12)　　accented suffixes > accented roots > accented prefixes > unaccented roots

In the only existing formal analysis of the Ichishkiin Sɨnwit stress system, Hargus and Beavert

(2006) propose to account for the stress patterns with the following set of constraints:

(13)　　Hargus and Beavert (2006:182): Set of constraints

　　　　FAITHSUFFIX

　　　　FAITHSTRONG = Preserve accent of strong roots

　　　　FAITHPREFIX

　　　　ALIGNEDGES = 'The edges of level 0 of a prosodic word, i.e., both the initial and the

　　　　　　　　　　　final syllable, be aligned with a level 1 grid mark. One violation is

　　　　　　　　　　　incurred if either the initial or the final syllable does not carry a level 1

　　　　　　　　　　　grid mark, and two violations are incurred if both the initial and the final

　　　　　　　　　　　syllables do not have a level 1 grid mark' (Hargus & Beavert 2006: 182,

　　　　　　　　　　　following Gordon 2002: 497).

　　　　RIGHTMOST = ALIGN (*, R, PWD, R), where * represents accent.

(14)   Hargus & Beavert (2006:183): OTSoft[31]-generated ranking in a Hasse diagram
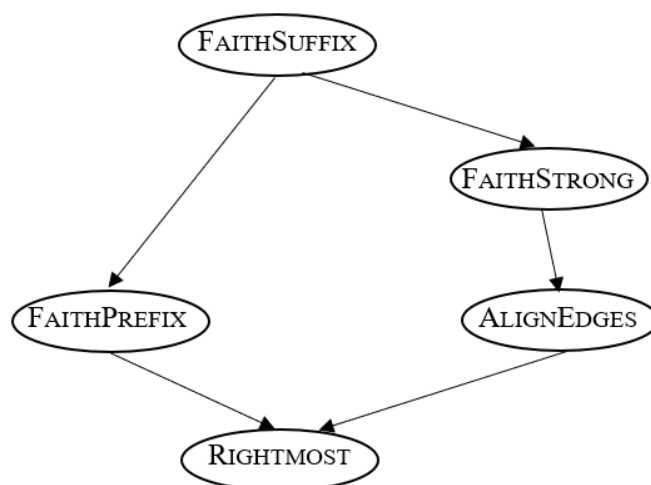
The ranking of the constraints in (14) and the Ichishkiin case in general became a unique example of a stress system that seemingly requires a high ranking of the Affix Faithfulness constraints over the Root Faithfulness constraints (it is cited as such, for instance, in Inkelas 2014, van Oostendorp & Rice 2011). I should note that although the respective ranking of FAITHSUFFIX >> FAITHSTRONG >> FAITHPREFIX derives some part of the accent competition patterns presented in **3.2.1**, it is not immediately clear what role ALIGNEDGES would play in resolving the competition between two accented affixes if neither of them aligns with the initial or the final syllable of a word. On the other hand, while the application of the RIGHTMOST constraint would favor the rightmost of the lexical accents within a prosodic word which would produce the correct winner of the competition between two accented suffixes, it would in fact produce an incorrect outcome in a competition between underlyingly accented prefixes. In cases of competition between underlyingly accented prefixes in the absence of other underlyingly accented morphemes in the word, ALIGNEDGES would be responsible for the leftmost prefix winning only if the accented syllable of the leftmost prefix aligns with the initial syllable of the prosodic word. However, if the accented syllable does not align with the initial

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31 Hayes, Tesar and Zuraw (2003)

syllable of a prosodic word, the application of the RIGHTMOST constraint will then favor the rightmost of the competing accents, contrary to the empirical facts, consider an example below:

(15)   piˈnat͡ʃaχɨlpanita   tpɨʃ

         piˈna-ˈt͡ʃa-χɨlp-ani-ta   tpɨʃ

         REFL.SG-CAUS-open-APPL-FUT   face

         'S/he will open up her/his face.'   (adapted from Jansen 2010:213)

In (15), two prefixes carry an underlying accent – the causative prefix *ˈt͡ʃa-* is underlyingly accented on the only syllable while the singular reflexive prefix *piˈna-* carries an underlying accent on the second syllable. In accordance with the generalizations summarized in (11), in a competition between two underlyingly accented prefixes, the underlying accent of the leftmost prefix wins, thus resulting in the primary stress on the second syllable in the verb in (15). Deletion of either of the two underlying accents will result in equal violations of the FAITHPREFIX constraint. Neither of the two accents align with the initial syllable of the word, thus ALIGNEDGES would not be helpful in resolving the competition, which means that the lowest ranked RIGHTMOST constraint should presumably produce the correct output. This is, however, clearly not the case since in all cases of competition between two underlyingly accented prefixes, the leftmost wins, as it does in (15). The ranking of the constraints in (14) thus produces an incorrect prediction for words with multiple accented prefixes and no underlying accent on other morphemes.

Hargus & Beavert (2006) directly link the Ichishkiin stress patterns to the sensitivity of the stress mechanism to the morpheme boundaries and to the distinction between morphological primitives – roots vs. prefixes vs. suffixes. The cross-linguistic validity of the constraints in (13) and their respective ranking in (14) is however not clear. In the next section, I argue that no idiosyncratic constraint ranking is necessary to account for the Ichishkiin Sɨnwit stress patterns. Instead, I will argue that stress in the language is assigned *cyclically*.

3.2.3 Cyclic stress assignment in Ichishkiin

The analysis of stress assignment in Ichishkiin below is threefold. Firstly and crucially, I propose that accent is assigned *cyclically,* i.e. accent in the outermost derivational layer within the relevant domain wins. Secondly, I propose that the stress algorithm in the language distinguishes between three cross-linguistically motivated morpho-prosodic constituents – the *PRoot (PR),* the *PStem (PS)* and the *PWord (PW).* The bracketing in a phonological form is schematically (16a), exemplified by an actual form in (16b):

(16a)   [prefixes [[Root]*PR* suffixes]*PS*]*PW*

(16b)   [ʃapa[[ʃukʷaa]*PR*ˈɬa]*PS*]*PW*

       ʃaˈpa-ʃukʷaa-ˈɬa

       CAUS-know-AGT

       'prophet'   (adapted from Hargus & Beavert 2006: 181)

Thirdly, I propose that stress assignment in IS first applies cyclically within the *PStem* constituent: [[Root]+suffixes]. However, if there is no lexical stress within the *PStem* constituent, the stress algorithm applies to the "outer", prefixal part [prefixes [[Root]+suffixes]], where it proceeds cyclically as well, resulting in the stress on the outermost underlyingly accented prefix in the absence of underlyingly accented roots and suffixes. Descriptively, what we observe then is that stress in the *PStem* is preferred over the stress outside of the *PStem*, i.e. in the prefixes. There is thus an asymmetry in stress placement preference between different kinds of domains in Ichishkiin Sinwit. Differences in phonological behavior between the *PStem* on one hand and prefixes on the other hand have been described and analyzed for multiple unrelated languages (see for example Bobaljik & Wurmbrand 2001 for Itelmen; Booij & Rubach 1984 for Polish; Hyman 2008 for Bantu languages; Kim 2014 for Huave; Rice 1989 for Slave; Vogel 1989 for Hungarian; Zuraw, Yu,

& Orfitelli 2014 for Samoan). Some examples of highly synthetic languages treating the PStem and the prefixes differently with respect to stress assignment include Tahltan (Athabaskan; Bob and Alderete 2005), Witsuwit'en (Athabaskan; Hargus 2005), Moses-Columbian (Salish; Czaykowska-Higgins 1993), Plains Cree (Algonquian; Russell 1999), see also section **5.1.3** of this dissertation for some additional examples. A number of prominent approaches to modelling the prefix-suffix (or prefix-stem) asymmetry exists. In terms of the theory of Prosodic Hierarchy (Selkirk 1978, Selkirk 1980, Nespor & Vogel 1986), the special phonological behavior of prefixes has been analyzed by postulating that prefixes form an independent prosodic domain, i.e. a prosodic boundary is inserted between prefixes and the stem (see Peperkamp 1997 for an account of such prosodic structures in the framework of Optimality Theory). In the framework of Lexical Phonology, the asymmetries in stress behavior between prefixes and suffixes could be derived through the appropriate ordering of suffixation, stress rules, and prefixation (Kiparsky 1983; see also Booij & Rubach 1984). Recent morpho-phonological accounts rely on the difference in the timing and nature of morphological mechanisms involved in prefixing vs. suffixing (e.g. Moskal 2015; Newell 2008). Regardless of the particular theoretical machinery employed in the existing analyses of the prefix-stem asymmetry, (at least some of the) prefixes in many languages have been shown to be in some ways more 'peripheral'. I thus propose that stress assignment Ichishkiin Sɨnwit falls within a widely attested pattern.

Let us begin our analysis of the Ichishkiin Sɨnwit stress patterns with an account of the stress assignment in words containing an underlyingly accented root and suffix(es), but no underlyingly accented prefixes. Recall from **3.2.1**, in all such cases, primary stress moves rightwards with the addition of each new underlyingly accented suffix, as exemplified by (7) in **3.2.1**. These data are straightforwardly accounted for if we assume that stress assignment is *cyclic* in Ichishkiin, i.e. that stress assignment must reapply iteratively from the most embedded

elements to the least embedded elements in the morpho-prosodic structure. I assume that phonological cyclicity is diacritical (see Schwayder 2015: Chapter 2 for a summary of alternatives). Morphemes which are marked as cyclic for the purpose of lexical accent assignment, which in this case is identical to saying *morphemes which are marked with underlying accent*, induce a new prosodic (*lexical accent*) cycle and a grid mark in that cycle. In the derivations throughout this chapter, the *lexical accent cycles* are marked with square brackets '[]', and an 'x' mark is used to designate on the grid the syllables carrying an underlying accent (see example (17a-d) below). Note, in this analysis, morphemes which do not carry an underlying accent are non-cyclic for the purpose of lexical accent assignment. The representation of stress assignment adopted here is largely inspired by numerous bracketed grid-based accounts of primary stress first developed in Halle & Vergnaud (1987) and Halle & Idsardi (1995). The contrast to the previous grid-based analyses, however, is in the nature of the constituents projected onto the grid. I use square brackets in the derivations to project prosodic cycles (or, more precisely, *accent cycles*) which are (a) *idiosyncratic*, as determined by the *lexical*, i.e. diacritical nature of accent in the languages in question; (b) *non-metrical*, i.e. the derivation is not foot-based[32]; c) *morpho-phonological* in that they are sensitive to at least some morphological information, and such information is necessary to determine the phonological shape of the output.

I assume that morphemes which are not marked as cyclic are inactive but visible to the cyclic phonology (Halle & Nevins 2009), unless evidence to the contrary can be found in the language[33]. The visibility of the phonological (segmental) shape of these morphemes to the

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[32] This property of the morpho-phonological constituents designated by the square brackets in my analysis also eliminates the majority of the complex rules governing the metrical behavior of feet in Halle & Idsardi (1995).

[33] See, however, **4.3-4.4** for a discussion of the behavior of non-cyclic morphemes in Choguita Rarámuri, where underlyingly unaccented affixes are not only inactive in the accent assignment mechanism, but are also invisible to it.

stress mechanism ensures that they potentially can bear stress assigned by the neighboring cyclic morphemes: for instance, if a lexical accent language has pre-accenting morphemes. Their inactive status with respect to the cyclic accent assignment, on the other hand, means that they do not induce a new phonological cycle, nor can they project a grid mark that can be interpreted as stress. Consider the derivation in (17a-b) below where an underlyingly accented root is in competition with an underlyingly accented suffix in a complex verb, and the derivation in (17c-d) where the same root is in competition with two underlyingly accented suffixes in a deverbal noun:

(17a)   ʔiwaχiˈjat'aʃa

        ʔiˈwaχi-ˈat'a-ʃa

        wait-DESID-IPFV

        'S/he wants to wait.'   (adapted from Hargus & Beavert 2006: 181)

(17b)   x

      [ʔiwaχi]   Cycle 1

          x

       x   x

      [[ʔiwaχi]at'a]-ʃa   Cycle 2

      ʔiwaχiˈjat'aʃa   surface stress

(17c)   ʔiwaχitpamaˈnmi

        ʔiˈwaχi-t-paˈma-ˈnmi

        wait-NMLZ-THING.FOR-GEN

        'of a waiting place'   (adapted from Hargus & Beavert 2006: 180)

(17d)   x

[ʔiwaχi-t]   Cycle 1

                    x

        x   x

[[ʔiwaχi-t] pama]   Cycle 2

                      x

              x   x

          x   x   x

[[[ʔiwaχi-t] pama] nmi]   Cycle 3

ʔiwaχitpamaˈnmi   surface stress

In Ichishkíin Sɨnwit, in words where there is a competition between an underlying accent in the root and underlying accents in the suffixes, the cyclic application of accent assignment thus produces the primary stress in the outermost derivational layer, as shown in (17), i.e. the outermost suffix always wins.

3.2.4 Default stress pattern

Recall that in the current analysis, departing from the previous accounts of the language, I assume that only roots which win in the stress competition with underlyingly accented prefixes carry an underlying accent themselves. In what follows I briefly discuss words which lack an underlying accent and thus receive default stress.

In the combination of unaccented affixes with an unaccented root, stress surfaces on the penultimate syllable of the root if the root has two or three syllables. Interestingly, it is not on the penultimate syllable of the whole word, consider examples below:

(18a) ʔi-ʔatˈɫʼawi-ʃa

ʔi-ʔatɫʼawi-ʃa

3SG-beg-IPFV

'S/he is begging him/her.'

(18b) ʔi-ˈkʼinu-ʃa=aʃ

ʔi-kʼinu-ʃa=aʃ

3SG-see-IPFV=1SG

'S/he is seeing me.'   (adapted from Hargus & Beavert 2006)

The roots 'beg' and 'see' have the penultimate stress which only surfaces if these roots are combined with unaccented affixes.

If the unaccented root is monosyllabic and it combines with unaccented affixes, then stress is on the only syllable of the root:

(19) ʔi-ˈpxwi-ʃa

ʔi-pxwi-ʃa

3SG-think-IPFV

'S/he is thinking.'

Ichishkiin thus appears to have a default rule that operates only over the root. Unlike the true lexical accent in the language, the default root accent seems to be predictable – it is always on the penultimate syllable of the root if there is one. The underlying lexical accent, in contrast, is unpredictable – it can fall on any syllable of the root. I propose to account for this unusual default assignment pattern by assuming that all roots are cyclic, i.e. all roots induce a phonological cycle. Crucially, however, only underlyingly accented roots induce a gridmark in the projected cycle. Consider for example a stress derivation of a word with an unaccented root, an unaccented prefix and an unaccented suffix in (20a-b). Since affixes do not carry an

underlying accent, the root is the only cycle-inducing morpheme in this form; note however that it induces a cycle but not a grid mark:

(20a)   ʔi-ʔatˈɬʼawi-ʃa

       ʔi-ʔatɬʼawi-ʃa

       3SG-beg-IPFV

       'S/he is begging him/her.'

(20b) [ʔatɬʼawi]　　　　Cycle 1

      [ʔatɬʼawi] -ʃa

      ʔi-[ʔatɬʼawi] -ʃa

In the cases where by the end of the word derivation no underlying accent has been projected, as in (20b), the default rule operates over the only domain that has been projected onto the grid, namely the only cycle projected – the root. The default penultimate accent in the root domain is then assigned by the following settings of the two relevant parameters:

(21a)   BOUNDED   L/**R**

      form a *disyllabic domain* at the edge of a string

(21b)   DEFAULT   **L**/R

      assign accent within *disyllabic domain*

The assumption that all roots must induce a cycle is parallel to the proposals in the early days of Lexical Phonology where roots would always project a cycle (if they belonged to a lexical category – N, V, or A; cf. Booij & Rubach 1984, Kiparsky 1982). Consider, for instance, a derivation of the Polish verb *grozić* [groʑitɕ] 'to threaten' proposed in Booij & Rubach (1984:10); square brackets indicate a cycle:

(22)   Root cycle in Polish

Cycle 1:   [groz]$_N$

            No rule applies

Cycle 2:   [[groz]$_N$ i]$_V$ WFR: Verbalization

               ʑ   Coronal Palatalization

Cycle 3:   [[[groʑ]$_N$ i]$_V$ tɕ]$_V$ WFR: Infinitive

            No rule applies

The verb *grozić* 'to threaten' as analyzed in Booij & Rubach (1984:10) is derived from a nominal root by adding the verbalizing suffix *-i* and the infinitive morpheme *-tɕ* (22). Importantly, the root morpheme induces a cycle even if no cyclic phonological rules apply at that cycle – this being markedly different from affixes which can only project a cycle if cyclic phonological rules refer to them.

The assumption that the root always projects a cycle does not alter the analysis for the words where there are underlyingly accented affixes, since the cyclic stress algorithm proposed here will always result in the outermost affixes being stressed by the definition of the *Cyclic* lexical accent, cf. (1b). The current proposal also naturally captures some of the prefix-root stress interactions. In cases where the root is underlyingly unaccented, it induces a cycle, as all roots do (cf. 20), but not an accent grid mark since it is not underlyingly marked with accent. Thus, if a prefix is underlyingly accented, it will "see" that there is no grid mark in the material integrated in the previous cycle, and it will project its accent. However, an additional explanation is required for the competition between underlying accent in the root and underlying accent in the prefixes. Recall from (11), in case of such a competition, the root accent wins in Ichishkiin. The next section addresses this pattern in detail.

3.2.5 Prosodic domains in accent assignment

In this section, I address the patterns of accent competition involving underlying accent in the prefixes. Recall from **3.2.1,** if there is no accent in the *PStem*, but multiple prefixes carry an underlying accent, the outermost (the leftmost) of the underlying accents is realized as primary stress. This pattern, similarly to the 'outermost accent in the suffixes wins' pattern, is straightforwardly accounted for with the *Cyclic Accent* analysis: I propose that the accent assignment mechanism applies iteratively in the pre-stem portion of the word as well. Consider the form below with two underlyingly accented prefixes but no underlying accent in the *PStem* constituent:

(23a)   ˈpaʃapawinata

    ˈpa-ʃaˈpa-wina-ta

    INV-CAUS-go-FUT

    'S/he will let her/him go.'   (adapted from Jansen 2010:54)

(23b)   [wina]-ta   Cycle 1

      x

    [ʃapa[wina]]-ta   Cycle 2

     x

     x   x

    [pa[ʃapa[wina]]]-ta   Cycle 3

    ˈpaʃapawinata   surface stress

As predicted by the *Cyclic Accent* analysis, primary stress in forms like (23) is assigned in the outermost derivational layer.

However, recall the pattern of competition which arises if both underlying accents in the prefixes and underlying accents in the *PStem* are found within a single word. In these cases, the underlying accents in the prefixes never win in Ichishkiin Sɨnwit, thus resulting in an

unexpected pattern with respect to the predictions of the *Cyclic Accent* analysis, consider a

schematic representation of these in (24):

(24)   Cyclic Accent: predictions for prefix-suffix accent competition

(24a)   x   Cycle 3

        x   x   Cycle 2

        x   x   Cycle 1

        [A-[[Root]-B]]

        ˈ**A**-Root-B   Surface stress

(24b)   x   Cycle 3

        x   x   Cycle 2

        x   x   Cycle 1

        [[A-[Root]]-B]

        A-Root-ˈ**B**   Surface stress

The predictions of the *Cyclic Accent* analysis schematized in (24) are in fact borne out in the

'canonical' *Cyclic Accent* systems such as Chamorro (Chung 1983); consider examples in (25)-

(26) repeated from **1.3.1.2:** (7)-(8):

(25a)   ˈ**kwen**tus   (25b)   kwenˈ**tus**-i   (25c)   ˈ**a-k**wentus-i

        speak   speak-to   RECP-speak-to

        'to speak'   'to speak to'   'to speak to one another'

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(26a) manˈtika   (26b) ˈmi-mantika   (26c) mi-mantika-ˈŋa

fat   abounding.in-fat   abounding.in-fat-COMPR

'fat'   'abounding in fat'   'more abounding in fat'

(Chung 1983: 41)

I propose that the difference in the results of stress competition between Ichishkiin Sɨnwit and Chamorro is due to an independent difference between the two languages: while in both Chamorro and Ichishkiin accent is *cyclic*, Chamorro stress assignment (or, more specifically – the interpretation of underlying accents as stress) applies once at the *PWord* level while in Ichishkiin it cares about smaller prosodic constituents as well: *PRoot* and *PStem*[34]. Thus, although the accent mechanism is the same in Chamorro and in the Sahaptian languages – i.e. *cyclic*, the surface effects differ because of the difference in the prosodic constituents relevant for stress assignment. Specifically, in Ichishkiin, stress in the prefixes can only be assigned if no stress has been assigned within the *PStem*.

In contrast to suffixes, prefixes are not part of the same stress domain as the root. As noted in **3.2.3,** a number of competing approaches exist to model the phonological effects of the prefix-suffix, or prefix-stem, asymmetry (these approaches are, however, not necessarily conflicting, see, for instance, Inkelas 1989). The asymmetry between the *PStem* and the prefixes in Ichishkiin stress assignment can be explained by the order in which morphemes become available for the stress computation whereby the accent properties of the root and the suffixes are processed first, and prefixes are processed after the *PStem*. A number of theoretically possible explanations for this exists. Firstly, this could possibly be due to all the pre-root morphemes being generated above the verbal complex. Prefixes can be analyzed as

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[34] This is in line with the recent proposals in the Prosodic Hierarchy studies regarding an 'emergent' rather than 'universal' status of prosodic constituents (e.g. Sheer 2008; Shiering, Bickel & Hildebrandt 2010).

functional heads generated above the verbal complex head, or as adverbs adjoined to the syntactic structure above the verbal complex. The leftmost pronominal prefix (cf. (2)) can be analyzed as a morpheme in CP[35]. In this case, it could be proposed that root does not undergo head movement up to these heads, and prefixes can be seen as merged *after* the root has collected all the suffixes via head movement. However, the morpho-syntactic motivation for the assumption that all the morphemes which surface as prefixes in IS are higher than the verbal complex might be questionable. Recall from (2): at least some prefixes – the causative and the so-called Lexical Prefixes might be syntactically low.

An alternative explanation of the asymmetry in the phonological behavior of prefixes vs. suffixes is theoretically possible, namely that all prefixes are non-cyclic (e.g. Halle & Nevins 2009). This, however, would not be plausible for the Ichishkiin data because stress assignment in the pre-root part of a word iterates outwards, just like it does in the post-root part of the word (cf. (23)), suggesting that stress assignment in the prefixes is cyclic.

Finally, an assumption can be made on the general mechanism of the morpho-phonological processing: it is possible that languages can vary in the order of processing of their exponents. Booij and Rubach (1984), for example, propose that cyclic prefixes in Polish are always processed phonologically as the last cycle of the derivation, i.e. after all the cyclic suffixes, whereas from the morpho-syntactic point of view they belong to earlier cyclic domains. Descriptively, this is identical to the pattern in question in Ichishkiin. In order to unify the idea that at least some prefixes appear to be low in the morpho-syntactic structure (i.e. are structurally "internal" to suffixes), while all prefixes appear to be processed with respect to stress assignment after the root and the suffixes, one can assume that while suffixes occupy head positions in the structure, and thus are collected by the root via head-movement, prefixes

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[35] For an account of the prefix-stem asymmetry in Cree along these lines see Schwayder (2015).

are either high in the morpho-syntactic structure (e.g. adverbial and modal prefixes, and the outermost person agreement prefix, see (2)), or are in the specifier positions and thus are not collected by the root via head-movement (the low causative prefix and the Lexical Prefixes would fall in this category). In this case, it can be stipulated that there is an ordered relation between different morpho-phonological operations whereby the head-movement which results in the root collecting suffixes necessarily precedes the morpho-phonological operation which merges the prefixes with the root or the stem. Prefixes thus are able to 'see' the phonological properties of the *PStem* (cf. Moskal 2015). A prefix will then only project its underlying accent as stress if no stress has been assigned in the *PStem.* Assuming that prefixes are either 'late' in the morpho-syntactic structure, or are 'late' in the phonological processing, the following question arises: If phonological properties of the prefixes are processed after the phonological properties of the *PStem,* why are the underlyingly accented prefixes unable to alter the stress placement derived in the *PStem?*

The answer to this question can be found in a proposal put forward in Moskal (2015). Moskal proposes that a prosodic boundary is induced by the left edge of the *Spell-Out Domain* defined by a category-defining node in the morphological structure. This boundary is argued to be present between the prefixes and the root in words of lexical categories. Note that Moskal (2015) associates the relevant prosodic boundary with a *Prosodic Word* boundary (*w*) rather than a *PStem* boundary, but this terminological difference is not important for the current discussion:

(27)   Prosodic boundary between root and prefixes   Moskal (2015:260)

The left edge of prosodic words aligns with the left edge of the Spell-Out Domain:

(*w* **root**

The No Dominant Prefix Hypothesis proposed by Moskal (2015) makes specific predictions in the area of lexical accent:

(28a) No Dominant Prefix Hypothesis (NDPH): In lexical material, a (dominant) prefix

cannot alter the accentual landscape of its root (and suffixes).

(28b) In a configuration **x (**_w_ **y**

x cannot alter (properties of) y, but

y can alter (properties of) x.   (Moskal 2015:263)

Crucially, Moskal notes that NDPH applies only to languages with the _deletive accent resolution_ while it is not applicable to the languages with the _additive accent resolution_. In a deletive resolution, in a competition of two lexical accents, one accent is demoted (deleted), consider (29):

(29)   x   x   x

[σ   σ]   →   [σ   σ]

In (29), the deletive resolution is exemplified – when two accents are present in a domain, the resolution may be to delete the rightmost of the two accents thus resulting in the leftmost accent carrying primary stress.

In an additive resolution, in a configuration of two competing lexical accents, one of the two accents may be promoted, for example by adding a grid mark to the leftmost syllable, again resulting in primary accent falling on the leftmost syllable:

(30)   x

x   x   x   x

[σ   σ]   →   [σ   σ]

We can illustrate the two strategies as applying to competing accents in prefixes and the root:

(31a) Deletive resolution

   x   x   x

[prefix [root]] →   [prefix [root]]

(31b) Additive resolution

                    x

  x   x   x   x

[prefix [root]] →   [prefix [root]]

Moskal (2015) notes that both strategies alter the representations as a whole, but only the deletive resolution (31a) alters the existing material in the root by removing a grid mark. Thus, NDPH applies to languages with the deletive resolution, but not to languages with the additive resolution. Ichishkiin Sɨnwit does not exhibit any evidence of being an additive system. On the contrary, it can be argued that it employs the deletive strategy which is evidenced by the fact that it has no secondary stress (Hargus & Beavert 2016), suggesting that underlying accents which do not receive the primary stress get deleted. It is thus expected that predictions of NDPH (28b) hold for the Ichishkiin Sɨnwit data, i.e. the accent competition between prefixes and the *PStem* can never result in a deletion of the accent belonging to the *PStem*.

Predictions made by NDPH can also account for the micro-variation found in the accent patterns within the Sahaptian family. In the next section, I will show that while Ichishkiin Sɨnwit employs the deletive resolution strategy and is thus correctly predicted to disallow for prefixes winning in an accent competition with either the *PRoot* or the *PStem,* its sister-language Nez Perce (also discussed in Moskal 2015) is an additive accent resolution system and consequently allows for prefixes to win in an accent competition with the root (but not with the *PStem)*. Building on this idea, I will however show that an additional qualification on

the prosodic structure is required in order to account for all the stress competition patterns in Nez Perce and in Ichishkiin. Specifically, I will propose that in both languages the end of the *PStem* derivation induces an interpretation of the grid marks if any have been projected (i.e. stress assignment). The sensitivity of phonology to the *PStem* constituent in the Sahaptian languages will also be shown to play a role in other phonological processes – hiatus resolution in Ichishkiin and vowel harmony in Nez Perce (see **3.3.5**).

3.3 Case study: Stress in Nez Perce

Nez Perce (or Nimipuutímt) has an accent system that is highly comparable to the Ichishkiin system. I will argue that it should be analyzed as a *cyclic* system as well. Two important differences can be observed between Ichishkiin Sɨnwit and Nez Perce. Firstly, while Ichishkiin does not have secondary stress, Nez Perce does. Secondly, the underlyingly accented prefixes in Nez Perce win in a competition with the underlyingly accented roots, in the absence of underlyingly accented suffixes. Recall from the previous section, prefixes in Ichishkiin Sɨnwit in such cases never realize their underlying accent as stress.

3.3.1 Relevant data

Before presenting the important differences between Ichishkiin and Nez Perce in more detail, I outline some basic Nez Perce stress generalizations below (based on Bjorkman 2010; Crook 1999).

Nez Perce can be characterized as a lexical accent language as multiple morphemes in the language are marked with unpredictable underlying accent[36]. **The default pattern** of stress in Nez Perce is penultimate within the morphological word (Crook 1999: 296)[37]:

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[36] It is, however, noted in Crook (1999) that syllable weight plays a role in secondary stress assignment, refer to the discussion of examples in (37) below and see Crook (1999: 350-386) for a detailed discussion.
[37] Note that there is a contrast between long and short vowels in the language which is neutralized in unstressed syllables, cf. (32b) vs. (32d).

(32a)   ˈpis.kis   (32b) ˈweep.tes

        piskis   weeptees

        door   eagle

        'door (Nom.)'   'eagle (Nom.)'

(32c)   pis.ˈkis.ne   (32d) wep.ˈtees.ne

        piskis-ne   weeptees-ne

        door-OBJ   eagle-OBJ

        'door (Obj.)'   'eagle (Obj.)'

In (32), the default penultimate stress is assigned in the underlyingly unaccented bare root form
(32a-b); when suffixed with an underlyingly unaccented morpheme, stress shifts one syllable
rightwards to remain penultimate (32c-d). Most nouns in the language exhibit the stress pattern
exemplified in (32). The same pattern of penultimate stress is observed for adjectives:

(33a)   hi.ˈmee.qʔis   (33b) hi.mee.ˈqʔis.ne

        himeeqʔis   hi.mee.qʔis-ne

        big   big-OBJ

        'big (Nom.)'   'big (Obj.)'

(33c)   ˈcʔel.cʔel   (33d) cʔel.ˈcʔel.ne

        cʔelcʔel   cʔelcʔel-ne

        awkward   awkward- OBJ

        'awkward (Nom.)'   'awkward (Obj.)'

The penultimate default stress pattern is also observed with underlyingly unaccented roots in
verbs when suffixed with underlyingly unaccented tense and aspect suffixes:

(34a) ha.ˈnii.sa   (34b) ha.ni.ˈsaa.qa

hanii-see   hanii-see-qa

make-INC   make-INC-REC

'I am making.'   'I was making.'

(34c) ha.ˈnii.na

hanii-ne

make-PFV

'I made.'

Both roots and affixes can bear **underlying accent** (thus not exhibiting the default penultimate stress pattern). In words that have exactly one underlying accent, it is realized as stress, consider nouns with an underlying accent in the roots affixed with unaccented case suffixes in (35) below:

(35a) wi.ˈwi.ceʔ   (35b) wi.ˈwi.ceʔ.ne

wiˈwiceʔ   wiˈwiceʔ-ne

log   log- OBJ

'log (Nom.)'   'log (Obj.)'

(35c) ˈʔa.lok.ʔat   (35d) ˈʔa.lok.ʔat.pa

ˈʔalokʔat   ˈʔalokʔat-pa

bighorn.ram   bighorn.ram-LOC

'bighorn ram (Nom.)'   'bighorn ram (Loc.)'

In (35), stress does not shift rightward with suffixation, but remains fixed in contrast to (32) above. The same pattern can be observed in verbal words with underlyingly accented roots and underlyingly unaccented tense and aspect suffixes; consider (36) below:

(36a) kʔi.ˈlil.ce   (36b) hi.kʔi.ˈlil.ca.qa

       kʔiˈlil-cee   hii-kʔiˈlil-cee-qa

       be.unable.pass-INC   3-be.unable.pass-INC-REC

       'I am unable to pass.'   'He was unable to pass.'

Stress is culminative within a morphological word, thus, if a word contains multiple underlying accents, they are in competition. Consider examples of morphological words with multiple underlying accents in (37):

(37a) payˈnoosaqa

       ˈpaay-ˈnuu-saaqa

       arrive-toward-REC

       'I recently arrived towards.'

(37b) kʔomayˈnaapiiksa

       ˈkʔomay-ˈnaapii-k-see

       sick-away-SF-INC

       'I, being sick, am kept away.'

                    (Crook, 1999: 352, 456, 458, as cited in Bjorkman, 2010, ex. (14))

In (37a-b), the underlying accent on the suffix is realized as primary stress over the underlying accent in the root. This pattern of competition resolution is identical to the one found in Ichishkiin: underlying accent in suffixes wins over underlying accent in the root (cf. (10)-(11)).

In parallel with Ichishkiin, if there are multiple accented prefixes (but no accented suffixes), stress is attracted iteratively leftwards and the leftmost accented prefix realizes its accent as primary stress. Crucially, in a competition between accented prefixes and an underlyingly accented root, the accent in the prefix is realized as primary stress – note, this pattern is in contrast to the pattern found in the same environments in Ichishkiin (11). Consider examples below:

(38a) ˈcuukwe-ce   (38b) siˈleew-cuukwe-ce

       ˈcuukwe-cee   siˈleew-ˈcuukwe-cee

       know-INC   by.seeing-know-INC

       'I know.'   'I know by seeing.'

(38c) seˈpee-sileew-cuukwe-ce   (38d) ˈnee- sepee-sileew-cuukwe-ce

       seˈpee-siˈleew-ˈcuukwe-cee   ˈnees-seˈpee-siˈleew-ˈcuukwe-cee

       CAUS-by.seeing-know-INC   PL.OBJ-CAUS-by.seeing-know-INC

       'I make you(sg) know by seeing.'   'I make you(pl) know by seeing.'

(Crook, 1999: 462, as cited in Bjorkman 2010, ex. (20))

Finally, in parallel to the Ichishkiin patterns, if the word contains an accented suffix, its accent wins over the accents in the root and in the prefixes:

(39a) hi-ˈnees-weyik-se   (39b) hi-nes-weyiˈk-uu-se

       hii- ˈnees-ˈweeyik-see   hii-ˈnees-ˈweeyik-ˈuu-see

       3-PL.OBJ-cross-INC   3-PL.OBJ-cross-toward-INC

       'He is crossing them.'   'He is crossing toward them.'

(Crook, 1999: 480, as cited in Bjorkman 2010, ex. 21)

Secondary stress in Nez Perce, according to Crook (1999) is assigned based on a number of metrical factors as well as based on the underlying specification for accent. Firstly, Crook reports that all initial syllables receive secondary stress (40a). Secondly, super-heavy syllables – CVV and CVVC always receive secondary stress (40b-c), while heavy syllables CVC receive secondary stress unless they are word-final. Super-heavy and heavy syllables receive secondary stress even if it produces a clash with the primary stress, consider (40c-d) below:

(41a) ˌceˈmiitx   'huckleberries'

(41b) ˈc'iɬiˌɬee   'weasel'

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(41c)   ˈhiˌmiin   'wolf'

(41d)   ˈmimˌqas-pa   'orange (Loc.)'   (Crook 1999: 357-359)

Underlyingly accented syllables which do not receive primary stress carry secondary stress:

(41a)   hi-ˈpaay-ca

       hii-ˈpaay-cee

       3-arrive-INC

       'He is arriving.'

(41b)   hi-saˈpaa-ˌpay-ca

       hii-seˈpee-ˈpaay-cee

       3-CAUS-arrive-INC

       'He makes arrive (someone).'   (Crook 1999: 481)

In (41a-b), the root ˈpaay- 'arrive' is underlyingly accented on the initial syllable which carries primary stress in the absence of underlyingly accented affixes (41a), but receives a secondary stress when an underlyingly accented suffix follows (41b)[38].

3.3.2 Previous analysis

In this section I briefly summarize the most recent analysis of the Nez Perce stress – Bjorkman (2010), while I refer the reader to Crook (1999) for the most detailed study of the Nez Perce stress system.

Bjorkman's account for the Nez Perce stress competition is twofold: it involves an account for the *rightward* stress pattern (which is considered to be the 'regular' pattern by Bjorkman) and an account for the alignment reversal triggered by the presence of accented prefixes. The rightward orientation of stress is accounted for with the constraint ranking in (42):

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[38] It should be noted that secondary (as well as primary) stress placement in Crook (1999) was determined impressionistically. To my knowledge, no acoustic or other experimental data is available regarding the secondary stress placement in the language.

(42)   MAX (x_1) >> CULMINATIVITY>>MAX (x_2)>>NON-FINALITY>>ALIGN (x_2, R)>> ALIGN

(x_2, L)

The faithfulness constraints MAX (x_1) and MAX (x_2) penalize the deletion of level 1 and level 2 gridmarks respectively. The high ranking of MAX (x_1) ensures that all underlying accents are realized with secondary stress. CULMINATIVITY requires that all words contain one and only one syllable with primary stress, thus requiring that MAX (x_2) be violated at least once in any word with more than one underlying accent. Note that the ranking in (42) includes the NON-FINALITY constraint which requires that primary stress be assigned to a non-final accent. This constraint was first introduced in Crook (1999) to account for a number of examples where the word-final stress appears to be dispreferred. The non-finality of stress in Nez Perce is however not an across the board phenomenon, as Crook himself shows (see Crook 1999: 317-326). The deciding factors in whether stress can be assigned to the word-final position seem to be the word class (e.g. some functional words require stress on the final syllable, Crook 1999: 323-327) and the presence of lexical accent: lexical accent on the final syllable is always realized as primary stress unless there is another, non-final, syllable marked with lexical accent in the word, in which case that syllable receives primary stress instead, and the final syllable receives secondary stress. The full extent of the distribution of the morphological and phonological contexts where the word-final stress is indeed dispreferred is unclear at the moment. The ranking of NON-FINALITY>>ALIGN (x_2, R)>> ALIGN (x_2, L) in (42) ensures that in such cases the rightmost non-final accent is realized as primary stress. In the following discussion I will ignore the non-final stress pattern for clarity of exposition. The relevant constraint ranking based on Bjorkman's analysis can then also be restated as (43) leaving out the marked cases where word-final stress is dispreferred:

(43)   MAX (x_1) >> CULMINATIVITY>>MAX (x_2)>> ALIGN (x_2, R)>> ALIGN (x_2, L)

In addition to (42)-(43), Bjorkman (2010) introduces a constraint privileging the preservation of accent on morphemes furthest toward each word edge in order to account for the alignment reversal triggered by accented prefixes (in the absence of accented suffixes). The proposed constraint is the following:

(44)   PRESERVE EDGEMOST (X_2) [PRES-EDGES]

Assign a violation if a level-2 gridmark that is outermost from the root on one edge in the input is not present in the output.

(Bjorkman 2010, ex. 26)

PRESERVE EDGEMOST preserves (non-root) accents that are located furthest towards the word edges. The ranking of the stress constraints including PRESERVE EDGEMOST is given in (45):

(45)   MAX (X_1)>>CULMINATIVITY>>PRESERVE EDGEMOST (X_2)>>MAX (X_2)>>NON-FINALITY>>ALIGN (X_2, R)>> ALIGN (X_2, L)

PRESERVE EDGEMOST (X_2) is ranked below CULMINATIVITY, ensuring that only one edge-most accent is ever preserved. It must also outrank ALIGN (X_2, R) in order to force leftward stress assignment in words where all underlying accents are either on the root and on prefixes, or on multiple prefixes, producing stress on the leftmost accent. When an accented suffix is present, the same ranking predicts the reassertion of right-aligned primary stress since the prefix-stressing and suffix-stressing candidates incur equal violations of PRESERVE EDGEMOST (X_2), but only the prefix-stressing incurs the violation of ALIGN (X_2, R).

A number of problems can be identified in Bjorkman's analysis. Firstly, it misses an important language-internal and cross-linguistic generalization, namely that prefixes are treated in a markedly different way when compared to suffixes (cf. **3.2.3-3.2.5** and see **3.3.5** for further language-internal evidence suggesting a 'peripheral' status of prefixes). Secondly, it is not readily clear at which point of the morpho-phonological derivation the resolution of the accent competition proposed by Bjorkman would apply since it has to be sensitive to both

the linear position of all the phonological exponents of the morphemes in the morphological word, and to their affiliation with the *root* vs. *affixes* class of morphemes. Finally, the idiosyncratic nature of the proposed constraints (specifically the formulation of PRESERVE EDGEMOST (X_2)) is theoretically undesirable.

3.3.3 Cyclic stress assignment in Nez Perce

I propose that the stress patterns in Nez Perce can be analyzed as *cyclic* and largely parallel to Ichishkiin. Nez Perce stress algorithm also distinguishes between three kinds of morpho-phonological constituents in the language – the *PRoot* (PR), the *PStem* (PS), and the *PWord* (PW), and it applies cyclically within the *PStem* constituent first: [[Root] suffixes]. If there is no lexical accent within the *PStem* constituent, the accent algorithm applies to the "outer", prefixal part [prefixes [[Root] suffixes]], where it proceeds cyclically as well, resulting in the stress on the outermost underlyingly accented prefix in the absence of underlyingly accented suffixes. Compare the patterns of accent competition in Ichishkiin and in Nez Perce schematically summarized in Table 1 below: the differing pattern is shaded:

Ichishkiin	**Nez Perce**
P-P-ˈR-ˈS-ˈ**S**	Same
ˈ**P-**ˈP-R-S-S	Same
ˈP-ˈP-ˈR-ˈS-ˈ**S**	Same
ˈP-ˈP-ˈ**R-**S-S	ˈ**P-**ˈP-ˈR-S-S
P – prefix, R – root, S – suffix, ˈ - underlying accent; winning morpheme is bold-faced and underlined, e.g. **S.**	

Table 1. Summary of accent competition patterns in Ichishkiin vs. Nez Perce

The important differences between Ichishkiin and Nez Perce are thus the following[39]:

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[39] Another difference between the two systems is in the domain of the default application: recall, in Ichishkiin the penultimate default must be assigned within the root, while in Nez Perce default is post-cyclic, i.e. applies to the full morphological word.

(46a) Ichishkiin does not have secondary stress, while Nez Perce does[40].

(46b) Underlyingly accented prefixes in Nez Perce win in a competition with the underlyingly accented roots. In Ichishkiin, underlyingly accented prefixes lose to underlyingly accented roots (cf. (11)).

Recall from **3.2.5**, NDPH (Moskal 2015) predicts (46b) on the basis of (46a). It can be argued that Nez Perce has an additive resolution system, which is evidenced by the fact that underlying lexical accents get preserved as secondary stresses (in contrast to Ichishkiin). By NDPH, we can thus expect to observe the winning prefixes in the competition with the root accent.

However, NDPH makes an incorrect prediction for the competition between accent in the prefixes and accent in the suffixes in Nez Perce as it predicts that no distinction should be observed in the prefix-root interactions vs. the prefix-suffixes interactions, contrary to the Nez Perce facts, schematized in (47) below:

(47) Competition between prefix, root, and suffix accents not predicted by NDPH

(47a)   ✓   Prefix accent wins over root accent

       [prefix [root]]

(47b)   ✖   Prefix accent loses to suffix accent

       [prefix [[root] suffix]]

I argue that the differential treatment of roots vs. suffixes in Nez Perce (47) lands additional support to the proposal that three morpho-prosodic constituents must be active in the Sahaptian languages. I propose that the pattern in (47) arises in Nez Perce because accent is specified to get interpreted in the Sahaptian languages first at the PStem level. The stress derivation in a morphologically complex word with underlying accents in both the PStem and in the prefixal

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[40] Hargus & Beavert (2016) explicitly state that IS lacks secondary stress except in reduplicated forms.

domain (which is outside of the PStem) would involve two passes of accent interpretation: once at the end of the PStem derivation, and once at the end of the PWord derivation, i.e. at the end of the derivation of the prefixal domain:

(48)   [prefixes [[Root]$_{PR}$ suffixes]$_{PS}$]$_{PW}$
                                              | |
                    accent interpretation 1
                                         accent interpretation 2

Crucially, as is evident from the difference between (47a) and (47b), there is a difference in the accentual behavior between the PRoot and the PStem constituents: the PRoot constituent does not induce an interpretation of the underlying accent as stress in Sahaptian (cf. (48)). Thus, if an accent is present in the suffixes, it will be interpreted as stress at the end of the PStem derivation, but if an accent has been assigned only in the root, an interpretation of accents as stress will not be triggered. Underlying accents in the prefixes will then be processed in the second pass of the accent interpretation. Thus, only a non-vacuous PStem domain, i.e. a PStem domain where an accent has been assigned in the suffixes, will trigger the interpretation of the accents as stress. The PRoot domain (or a vacuous PStem domain with no accented suffixes), on the other hand, will not trigger an interpretation of the accents. In other words, as is somewhat to be expected, the prefix-suffix asymmetry in accent assignment derived from the sensitivity of the phonological system to the prosodic domains can only be observed if there are suffixes and prefixes which potentially can be in competition.

Before moving on to the examples of stress derivation in Nez Perce in the next section, it is worth noting that this proposal has an important implication that languages may vary in the kinds of prosodic domains which are relevant for the interpretation of accent as stress. This implication makes a prediction that we should be able to observe this variation: for instance, we should expect to find languages where the PRoot (and not the PStem) constituent would be the domain of accent interpretation in addition to the PWord constituent, which universally

appears to be the maximal domain of stress assignment (see Kaisse 2017 and chapter **5** of this dissertation). We might also expect that languages with complex morphology would be the most likely candidates for showing this pattern under the hypothesis that there would be a higher pressure in such languages to demarcate word-internal domains (see chapter **5** of this dissertation for a discussion of this hypothesis). At least two unrelated languages where this prediction appears to be borne out are discussed in chapter **5:** Mapudungun (isolate, Chile, Argentina; see Molineaux 2018, *forth.;* Pache 2014) and Tahltan (Athabaskan; Bob and Alderete 2005), which exhibit a double-accent interpretation as well, but, in contrast to Nez Perce, the first accent interpretation in these languages is enforced at the PRoot-level.

3.3.4 Stress derivations

At the end of the *PStem* derivation, stress is computed from the abstract accent. Thus, by the time prefixes have access to the stress algorithm, primary stress has already been assigned, and the primary stress assigned within the constituent is visible but is not alterable. Assuming that Nez Perce is an additive system, prefixes still project their underlying accents as gridmarks, which at the end of the derivation must be phonetically interpreted as secondary stresses preserving the primary stress in the *PStem*. The proposed account of the Nez Perce stress system thus includes the following assumptions:

(49a)   Assume the distinction between additive and deletive resolution systems.

(49b)   Assume that NDPH applies to deletive but not to additive systems (Moskal 2015).

(49c)   Assume underlying accents in the *PStem* constituent are available to the stress algorithm prior to the prefixes.

In addition to (49), I proposed that underlying accents projected in the *PStem* get interpreted as stress at the end of the PStem derivation. Unembedded *PRoot* by itself does not induce an interpretation of accents as stress in Sahaptian. Note that this latter point can only be illustrated

in an additive system (s.a. Nez Perce), and would be impossible to demonstrate in a deletive system (s.a. Ichishkiin), since in a deletive system the dominant status of the root is ensured independently by NDHP.

Taking into consideration the assumptions and the proposals outlined above, the proposed step-by-step stress derivation in a complex word in Nez Perce is the following:

(50) Cyclic stress derivation in Nez Perce

1. **[Root]**

1a. Project a root cycle onto the grid

1b. Project a tier-1 gridmark on accented syllable

2. **[[Root] Stem]**

2a. Project a suffix^{+acc} cycle onto the grid   [iterative]

2b. Project a tier-1+n gridmark on accented syllable   [iterative]

3. **Interpretation of accents**

3a. Assign primary stress to the accented syllable marked with highest gridmark

3b. Assign secondary stresses to the remaining accented syllables

4. **[prefixes [Stem]]**

4a. Project a Stem cycle onto the grid

4b. Project a prefix^{+acc} cycle onto the grid   [iterative]

4c. Project a tier-1+n gridmark on accented syllable   [iterative]

5. **Interpretation of accents**

5a. Assign secondary stresses to the remaining accented syllables

5b. Produce output

Consider a sample derivation of the verb below:

(51)   ˌhi-ˌnes-ˌweyiˈk-uu-se

hii-ˈnees-ˈweeyik-ˈuu-see

3-PL.OB-cross-toward-INC

'He is crossing toward them.'

(52)   Sample stress derivation in a Nez Perce verb with Stem-prefix competition

1.   [Root]

1a. Project a root cycle onto the grid   [weeyik]

1b. Project a tier-1 gridmark on accented syllable   x

[weeyik]

2.   [[Root] Stem]   x

2a. Project a suffix^{+acc} cycle onto the grid   [[weeyik]uu]

x

x   x

2b. Project a tier-1+n gridmark on accented syllable   [[weeyik]uu]

3. Interpretation of accents

3a. Assign primary stress to the accented syllable   x

marked with highest gridmark   [[weeyik] ˈuu]

3b. Assign secondary stresses to the remaining

accented syllables   [[ˌweeyik] ˈuu]

4. [prefixes [Stem]]

4a. Project a Stem cycle onto the grid   [[ˌweeyik] ˈuu]

4b. Project a prefix⁺ᵃᶜᶜ cycle onto the grid   [nees [[ˌweeyik] ˈuu]]

                                                             x

4c. Project a tier-1+n gridmark on accented syllable   [nees [[ˌweeyik] ˈuu]]

5. Interpretation of accents

5a. Assign secondary stresses to the remaining

 accented syllables   [ˌnees [[ˌweeyik] ˈuu]]

5b. Produce output   ˌnesˌweyiˈkuu

The mechanism in (50) integrates cyclic morphemes in a strict order whereby the integration of the PStem morphemes precedes the integration of the prefixes[41]. Crucially, the gridmarks in the PStem can be interpreted as stress in the first pass of the accent computation. Thus, after the step 3 in (52), there are no gridmarks within the PStem constituent, but instead stress is assigned. If primary stress is assigned within the PStem constituent, no primary stress can then be assigned in the subsequent steps of the derivation due to the requirement of stress Culminativity in Nez Perce. The output of step 5 in (52) would be the input to the post-cyclic prosodic processes. For instance, once integrated with the phonological exponents of the non-cyclic affixes, it will serve as an input to the non-cyclic secondary stress algorithm which will

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[41] For clarity of exposition, the mechanism in (50) integrates only the morphemes which carry an underlying accent, the non-cyclic morphemes can be included in the derivation, but, as stated before, they would be inactive for the purposes of stress assignment.

assign a secondary stress on the initial syllable in the full verb form in (53) below (for the

details of non-cyclic secondary stress assignmnet see Crook 1999: 359-363):

(53)   ˌhi-ˌnes-ˌweyiˈk-uu-se

hii-ˈnees-ˈweeyik-ˈuu-see

3-PL.OBJ-cross-toward-INC

'He is crossing toward them.'

Consider now a sample derivation of stress in a verb with no underlyingly accented suffixes,

but with an accent competition between a root and a prefix:

(54)   ˌhi-ˈnees-ˌweyik-se

hii- ˈnees-ˈweeyik-see

3-PL.OBJ-cross-INC

'He is crossing them.'

(55)   Sample stress derivation in a Nez Perce verb with Root-prefix competition

    1.   [Root]

1a. Project a root cycle onto the grid   [weeyik]

                                                  x

1b. Project a tier-1 gridmark on accented syllable   [weeyik]

    2.   [[Root] Stem]

2a. Project a suffix^{+acc} cycle onto the grid

                                  Does not apply

2b. Project a tier-1+n gridmark on accented syllable

    3.   Interpretation of accents

3a. Assign primary stress to the accented syllable

marked with highest gridmark	*Does not apply*
3b. Assign secondary stresses to the remaining	
accented syllables	

4. [prefixes [Root]]

4a. Project the Root cycle onto the grid	x
	[weeyik]
	x
4b. Project a prefix^{+acc} cycle onto the grid	[nees [weeyik]]
	x
	x x
4c. Project a tier-1+n gridmark on accented syllable	[nees [weeyik]]

5. Interpretation of accents

5a. Assign primary stress to the accented syllable	x
marked with highest gridmark	[ˈnees [weeyik]]
5b. Assign secondary stresses to the remaining	[ˈnees [ˌweyik]]
accented syllables	
5b. Produce output	ˈneesˌweyik

The derivation in (55) presents a stress derivation in wordforms with competing accents in prefixes vs. the root (i.e. when no underlyingly accented suffixes are present in a word). I

assume that no PStem constituent for the purposes of accent assignment is formed in these cases since no accent cycles except for the root cycle get projected onto the grid if no suffixes are marked with an undedrlying accent[42]. Thus, for the purposes of stress assignment, no PStem material is projected onto the stress grid. The PRoot constituent in Nez Perce is not specified to trigger ans accent interpretation, and thus the stress derivation proceeds cyclically from the root outwards to the prefixes, and the accent in the outermost derivational layer (i.e. the outermost accented prefix) is interpreted as primary stress at the end of the PWord derivation.

3.3.5 PStem vs. PWord in other phonological processes

The analysis of the accent competition patterns in the Sahaptian languages proposed in this dissertation accounts for the accent patterns, which on the surface appear to require idyosyncratic prosodic mechanisms, with a set of phonological devices with a demonstrated cross-linguistic validity. The two most crucial of these are the cyclic mechanism of accent assignment and the word-internal prosodic constitunecy. As demonstrated in this chapter, a major part of the stress patterns in the Sahaptian languages is straightforwardly analyzed as *Cyclic Accent* resulting in the accent in the outermost derivational layer within a relevant domain receiving primary stress. The analysis of the lexical accent systems of Ichishkiin and Nez Perce developed in this chapter also crucially relies on the proposal that both languages refer to the PStem constituent in their prosodic structure. If this constituent is active in the language, we might expect to see its effects on other phonological phenomena as well. This is exactly what we find in both Ichishkiin and Nez Perce.

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[42] An alternative to this would be to assume that prosodic units are organized according to the principles of the Strict Layer Hypothesis (Selkirk 1996), and thus 'a constituent of layer n must be exhaustively contained within a constituent of the immediately higher layer n+1, and can only exhaustively contain constituents of the immediately lower layer n-1' (Scheer 2010: 391). Thus, a vacuous *PStem* constituent would still be formed even if no underlyingly accented suffixes are present. One would then ought to include an additional qualification on the stress mechanism to ensure that only non-vacuous constituents can induce an accent interpretation.

In Ichishkiin, the prefixes-stem boundary differs from the root-suffixes boundary in hiatus resolution strategies. In the case of the prefix-stem boundary, hiatus is resolved with an epenthetic glottal stop, while at the root-suffixes boundary, hiatus is resolved via glide insertion (Jansen 2010:58-59). Contrast examples in (56a-b) where the glottal stop in inserted between the vowel-final prefix and the vowel-initial root, and examples in (56c-d) where glide-insertion resolves the hiatus between the root and the suffix; epenthetic consonants are bold-faced:

(56a) i-ʃaˈpa-**ʔ**aʃ-ta

       i-ʃaˈpa-aʃ-ta

       3SG-CAUS-enter-FUT

       'S/he will let them in.'

(56b) i-**ʔ**aˈjik-ʃa

       i-ajik-ʃa

       3SG-sit-IMPF

       'S/he is sitting.'

(56c) ʔiwaχi-ˈ**j**at'a-ʃa

       wait-DESID-IPFV

       'S/he wants to wait.'

(56d) ˈtu-**w**in

       what-3>3.ERG

       'what'

(adapted from Jansen 2010: 58-62; Hargus & Beavert 2006:181)

In Ichishkiin, hiatus is resolved with the glottal stop insertion in the pre-root portion of the word (56a-b), and with a glide insertion in the post-root portion of a word (56c-d)[43]. The quality of the glide – /j/ or /w/ depends on the first vowel in the sequence of two vowels with /w/ epenthesized if the first vowel of the sequence is /u/, and /j/ being the elsewhere case (Jansen 2010: 60). The particular strategy of hiatus resolution in Ichishkiin thus has to refer to a particular prosodic constituent: to the PStem constituent in the case of glide epenthesis, and to the PWord constituent in the case of the glottal stop epenthesis.

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[43] The split between the hiatus resolution strategies found in Ichishkiin is strikingly similar to the one found in Algonquian languages and previously analyzed as evidence for a difference between morpho-phonological domains to which prefixes and suffixes belong (see Newell & Piggott 2014, Piggott & Newell 2006 for Ojibwa; see Schwayder 2015 for Plains Cree).

In Nez Perce, the difference between the prefixal domain and the PStem domain, in addition to stress patterns, is also evident in the vowel harmony process. Nez Perce vowels fall into the following dominant-recessive pairs:

Dominant	/a/	/o/
Recessive	/æ/ (orthographically: e)	/u/

Table 2. Dominant-Recessive vowel pairs in Nez Perce

The vowel /i/ behaves as either dominant or recessive depending on the morpheme (Crook 1999: 245)[44].

Hall & Hall (1980: 227, f.n. 2) note that Nez Perce has no prefixes which would trigger vowel harmony. Crook (1999) agrees, stating that 'there are no prefixes that currently trigger harmony, and there is scant evidence that there were dominant prefixes in recent times' (Crook 1999: 247-248). Roots and suffixes, in contrast, regularly trigger vowel harmony. Consider, for instance, examples in (57)-(58) below. In (57), a dominant root spreads harmony bidirectionally, resulting in the /æ/ - /a/ alternation in both prefixes and the suffix. In (58), vowel harmony triggered by the dominant suffix *-qa* spreads iteratively to the preceding suffix *-see* and to the root resulting in the /æ/ - /a/ alternation in the suffix and in the /u/ - /o/ alternation in the root; dominant morphemes are bold-faced:

(57)   ʔaˈnaas**lawyala**ca

        ʔe-ˈnees-**lawyala**-cee

        3OBJ-PL.OBJ-gaff-INC

        'I am gaffing them.'

---

[44] The particular dominant feature spreading in the Nez Perce vowel harmony system is not entirely clear: while Hall & Hall (1980) proposed to interpret it as tongue root harmony, Crook (1999: 252) argues against such analysis.

(58)   koˈsaa**qa**

kuu-see-**qa**

go-INC-REC

'I just went.'   (Crook 1999: 247-248)

Prefixes in Nez Perce clearly behave in contrast to the roots and the suffixes in that they never trigger vowel harmony (see also Moskal 2015: 256-258 for a discussion of this pattern as derived from a prosodic boundary between the prefixes and the stem). As expected under the analysis of the prosodic systems of Nez Perce and Ichishkiin comprising of three prosodic constituents – PRoot, PStem, and PWord with prefixes being peripheral, we thus find additional effects of the word-internal prosodic constituency in the phonological system of these languages.

3.4 Summary of the chapter

In this chapter, I have argued that the sensitivity of stress assignment to the types of morphemes previously analyzed as Affix Controlled Accent in the Sahaptian languages can in fact be seen as a case of cyclically assigned accent. The proposed analysis captures naturally the pattern of the 'outermost' winning accents in the two languages. I show that the Ichishkiin and the Nez Perce stress patterns are sensitive to three morpho-prosodic domains: the PRoot, the PStem, and the PWord, which have been shown to be cross-linguistically valid, thus eliminating the need for the constraints which otherwise appear to be typologically unwarranted. Importantly, I argue that sensitivity of these languages to the differences between prosodic domains is observed not only in the stress patterns but in other phonological processes in these languages as well.

I follow Moskal (2015) who shows on the basis of multiple unrelated languages that the presence of a prosodic boundary at the left edge of a root has observable effects on stress assignment. In addition to the No Dominant Prefix Hypothesis (NDPH) proposed by Moskal,

I proposed that languages may differ in the timing of the interpretation of accents as stresses to account for the asymmetries between the PRoot and the PStem domains observed in Nez Perce but not predicted by NDPH. This chapter demonstrated that a typologically unusual stress pattern does not necessarily require any morpho-phonological mechanisms that are not already needed independently to account for superficially different patterns within the language or in other languages. Another conclusion which this chapter suggests is that the cyclic type of accent can be difficult to recognize due to the interactions with prosodic domains and to the associated cross-linguistically attested asymmetries, such as the prefix-suffix asymmetry. Finally, if the analysis proposed in this chapter for the Sahaptian languages is on the right track, the Affix-Controlled Accent appears to be epiphenomenal, as predicted by the typology of lexical accent systems proposed in this dissertation. In the next chapter, I turn to testing this prediction against the accent systems previously analyzed as Root-Controlled Accent languages.

CHAPTER 4. RE-EVALUATING ROOT-CONTROLLED ACCENT

4.1 Root-controlled lexical accent

One of the predictions made by the theory of lexical accent proposed in this dissertation eliminates the possibility for the accent competition mechanism to be sensitive to the differences in the identities of morphemes – roots, prefixes, suffixes. In this light, this chapter reviews evidence for positing Root-Controlled Accent as a distinct type of lexical stress systems. As mentioned in **1.3**, the discussion of such languages first originated from Alderete (1999, 2001) where it was proposed that some lexical stress languages exhibit a clear preference for either root-controlled stress. In such languages, underlying affix accent only surfaces in words which contain unaccented roots, otherwise, underlying root accent always wins.

Alderete (1999) points out that considering Root-Controlled Accent systems as a separate type of lexical accent systems is supported by evidence from a variety of sources which indicate a preferential treatment of roots in languages. Such sources include psycholinguistic evidence (e.g. from word recognition studies by, among others, Kempley and Morton 1982; Fowler, Napps, and Feldman 1985) as well as evidence from segment inventories (see, for instance, Beckman 1998) and from phonological alternations (McCarthy and Prince 1995; Selkirk 1995). Such evidence has been taken to suggest that lexical items are stored and accessed in the mental lexicon on the basis of roots rather than affixes, that roots typically allow for a wider variety of phonemic contrasts than affixes, and that phonological features are more likely to be realized in roots than in affixes. However, the Root-Controlled Accent (RCA) systems appear to be extremely rare. To my knowledge, the only two highly synthetic languages that have ever been analyzed as RCA systems are Cupeño, originally analyzed as such by Alderete (1999, 2001), and a related Uto-Aztecan language Choguita Rarámuri, an analysis of which presented in Caballero (2008) is highly influenced by Alderete's work on

Cupeño. Taking into consideration the diverse evidence in support of the privileged status of Roots in languages, the question arises as to why RCA systems would be so exceptionally rare.

The theory of lexical accent proposed in this dissertation answers this question in a principled way: RCA is not only typologically rare, but it in fact does not exist altogether, and this is due to the way in which stress competition mechanism accesses the information about competing accents. Let us review the proposal one more time. I propose that (i) accent competition in lexical accent languages can be resolved either *cyclically,* or *directionally* (post-cyclically), and (ii) following van der Hulst (1996, 2012, 2014), lexical accents as a property of morphemes project a grid mark onto the accent grid where the computation of accent occurs. Consider once again the schematic representations of accent derivation in both types of systems repeated from the introduction as (1) and (2) below:

(1)   Directional Accent systems

(1a)   Rightmost 'x' wins

		x		Line 2: Promote Rightmost 'x'
x	x	x		Line 1: Project LA

ˈσ σ - σ σ ˈσ σ- σ ˈσ σ

Surface form   Assign primary stress to the promoted 'x'

σ σ - σ σ σ σ- σ ˈ**σ** σ

(1b)   Leftmost 'x' wins

x			Line 2: Promote Leftmost 'x'
x	x	x	Line 1: Project LA

ˈσ σ - σ σ ˈσ σ- σ ˈσ σ

Surface form   Assign primary stress to the promoted 'x'

ˈ**σ** σ - σ σ σ σ- σ σ σ

Importantly, the accent competition mechanism in *Directional Accent* systems (1) operates over the grid marks projected by the inherent lexical prominence of some syllables in some morphemes within the wordform. In *Cyclic Accent* systems, the accent assigning mechanism is formally similar: lexically accented syllables project a mark ('x') onto the accent grid, and the grid marks are in competition for being realized as primary stress. The difference is in the presence of a hierarchy between grid marks created by the cyclic application of the accent assignment algorithm. Consider the hypothetical derivation in (2); lexical accent cycles are represented with square brackets:

(2)   Cyclic Accent systems

      x   Line 1

[σ σ ˈσ σ]   Cycle 1: Project LA on Line 1

   x   Line 2

   x   x   Line 1

[ˈσ σ -[σ σ ˈσ σ]]   Cycle 2: Project LA on Line 2

               x   Line 3

  x   x   Line 2

  x   x   x   Line 1

[[ˈσ σ- [σ σ ˈσ σ]]- ˈσ σ] Cycle 3: Project LA on Line 3

Surface form   Assign primary stress to the 'x' in the outermost derivational layer

σ σ-σ σ σ σ- ˈ**σ** σ

There is an important formal similarity in how accent competition is resolved in both types, namely, the only information available to the accent competition mechanism is the information supplied by the grid: the linear string of 'x' marks in the case of *Directional Accent* systems and the bracketed hierarchical structure of 'x' marks in the case of *Cyclic Accent* systems. It is

thus expected that Root-Controlled Accent systems should not arise. On one hand, there is no way to signal to the grid the privileged status of the root in *Directional Accent* systems because there is no hierarchy between the grid marks. On the other hand, in the *Cyclic Accent* systems, the root will always be the most embedded cycle. Thus, the root is not predicted to win the accent competition by the definition of the *Cyclic Accent* systems. In this chapter, I will argue that this prediction holds: I will show that the only two highly synthetic languages ever analyzed as having Root-Controlled Accent (Cupeño; Alderete 1999, 2001 and Choguita Rarámuri; Caballero 2008) can be reanalyzed as *Directional Accent* systems. I first review evidence from Cupeño in **4.2** in light of an alternative, non-RCA, analysis proposed in Yates (2017). It will be shown, following Yates (2017), that the stress facts point to Cupeño being a *Directional Accent* system, and they do not in fact require the stress competition mechanism to access any morphological information. In **4.4-4.5,** I propose a novel analysis of the accent system of Choguita Rarámuri as a *Directional Accent* system. I will show that a *Directional Accent* analysis in fact accounts for all the data including the data which was problematic for the Root-Controlled Accent analysis.

In the previous chapter, I provided a novel analysis of two languages which previously have been analyzed as having Affix-Controlled accent – Nez Perce and Ichishkiin. I argued that these languages should be analyzed as having *Cyclic accent.* I thus ultimately argue that Root-Controlled and Affix-Controlled accent systems are indeed epiphenomenal and can always be reanalyzed as either *Directional* or *Cyclic,* in line with the predictions made by the typology proposed in this dissertation.

4.2 Stress in Cupeño

Root-Controlled Accent has been exemplified in the literature with two genetically related highly synthetic languages – Cupeño and Choguita Rarámuri. Cupeño has a lexical accent system with roots, prefixes and suffixes underlyingly specified as accented, unaccented, and in

the case of suffixes – also preaccenting (Alderete 1999, 2001; Crowhurst 1994; Hill & Hill 1968; Newell 2008). In the presence of a single underlying accent in a complex wordform, that accent is realized as stress:

(3a)   nəˈŋu-wənə

          nəˈŋu-wənə

          have-CUST.PL

          '(We) have.'

(3b)   ˈʔamu-wənə

          ˈʔamu-wənə

          hunt-CUST.PL

          '(We) hunt.'

(3c)   ya-ˈqaʔ

          yax-ˈqa

          say-PRS.SG

          '(She) says.'   (Yates 2017:41)[45]

In the absence of underlyingly accented morphemes in a word, a word-initial default surfaces:

(4)   ˈyax-wənə

          yax-wənə

          say-CUST.PL

          '(They) say.'   (Yates 2017:41)

The most interesting cases for the typology of lexical stress systems proposed in this dissertation involve the presence of multiple underlying accents. Consider the examples below where both the root and the suffix are underlyingly accented:

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[45] Yates uses the acute accent diacritic to mark stress in his examples.

(5a)   nəˈŋu-qa

         nəˈŋu-ˈqa

         have- PRS.SG

         '(It) has.'

(5b)   ˈtul-qa

         ˈtul-ˈqa

         finish- PRS.SG

         '(She) finishes.'   (Yates 2017:49)

The accent in the roots in (5) wins over the accent in the singular present tense suffix -ˈqa.
Alderete (2001) argues that underlying accent in the affixes is only realized when the root is
underlyingly unaccented (as in (3c)). Alderete thus proposes to account for these patterns
through the RootFaith>>AffixFaith constraint ranking. This ranking formalizes the central
hypothesis of Alderete (1999, 2001):

(6)   Root Controlled Accent Hypothesis (RCAH)

         In lexical-to-surface mappings of a word with more than one inherent stress, if stress is

         deleted, stress in the root is realized over stress elsewhere in the word[46].

                                                                 (Alderete 2001:43)

The RCAH and the related ranking of the faithfulness constraints are claimed to be insensitive
to the hierarchical morphological structure, and are only sensitive to linear morphological
boundaries, being able to distinguish roots from affixes.

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[46] Note that the RCAH formulated in this way applies specifically to stress systems with culminative (primary)
stress.

4.2.1 Yates (2017): An alternative to the RCA analysis

Yates (2017) presents an alternative to the RCA account of the stress system of Cupeño in terms of the BASIC ACCENTUATION PRINCIPLE (BAP; Kiparsky and Halle 1977) stated in (7) below:

(7)   Basic Accentuation Principle

If a word has more than one accented vowel, the leftmost of these receives word stress.

If a word has no accented vowel, the leftmost syllable receives word stress.

(Yates 2017, 55)

Consider again the relevant Cupeño patterns presented above: underlyingly accented suffixes are stressed when combined with underlyingly unaccented roots, but are unstressed when combined with underlyingly accented roots (5), which are stressed on their accented syllable. Consider again the pair of examples in (3c) and (5a) repeated below as (8):

(8a)   ya-ˈqaʔ

        yax-ˈqa

        say-PRS.SG

        '(She) says.'

(8b)   nəˈŋu-qa

        nəˈŋu-ˈqa

        have- PRS.SG

        '(It) has.'

Yates (2017) notes that examples like (8a-b) are compatible not only with the idyosyncratic ranking of the faithfulness constraints proposed by Alderete, but also with the BAP analysis: in words like (8b) where there is more than one accented vowel, the leftmost of these receives word stress. In the terms proposed in this dissertation, examples like (8a-b) are compatible with analyzing Cupeño as a *Directional* lexical accent language with the SELECT parameter setting in (9):

(9)   SELECT   **L**/R

        preserve the leftmost or the rightmost of the competing accents

The two analyses do equally well in accounting for the stress competition between roots and suffixes. They however make different predictions with respect to the competition between prefixes and roots: while the RCA analysis predicts roots to win, the BAP analysis predicts that the leftmost, i.e. the prefixal accent would win. Yates (2017) makes a crucially different assumption regarding the accentual specification of pronominal prefixes: while Alderete argues that pronominal prefixes in Cupeño are underlyingly accented, and thus examples like (10) below present crucial evidence for the RCA hypothesis (6), Yates argues that those prefixes are underlyingly unaccented. In the examples (10a-b), I underline the pronominal prefix to indicate its ambiguous status with respect to lexical accent specification.

(10a) nə-ˈtul

       n̲ə̲-ˈtul

       1SG-finish

       'I finish.'   (Yates 2017, 48)

(10b) ˈpə-yax

pə̱-yax

3SG-say

'S/he says'   (Alderete 2001: 456)

Under the analysis proposed by Yates, when combined with an accented root (10a), the pronominal prefixes are predictably unaccented (see also Newell 2008 who also analyzes these prefixes as underlyingly unaccented). However, when these prefixes combine with an unaccented root (10b), they are predicted to bear the default stress by BAP since they align with the left edge of the word. When these prefixes occur in wordforms with underlyingly accented suffixes, the pattern illustrated in (8) above surfaces: underlyingly accented suffixes are stressed when combined with an underlyingly unaccented root (8a), but are unstressed when combined with an underlyingly accented root (8b), which is stressed on its accented syllable. Consider examples with the pronominal prefixes and the imperfective singular suffix *-qal* which is underlyingly accented:

(11a) pə-ya-ˈqal

pə̱-yax-ˈqal

3SG-say-IPFV.SG

'S/he says.'

(11b) pə-ˈtul-qal

pə̱-ˈtul-ˈqal

3SG-finish-IPFV.SG

'S/he finishes.'   (Yates 2017, 58)

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The pronominal prefixes thus do not participate in the stress competition, which is expected if they are underlyingly unaccented. In examples like (11), as predicted by BAP, the accented suffix attracts stress when it is the only accented morpheme, but an accented root is stressed in preference to the suffix because it is the leftmost underlying accent assuming the agreement prefixes are unaccented. BAP also predicts that stress would fall on the agreement prefix in words where the root and the suffixes are underlyingly unaccented. Yates shows that this prediction is born out:

(12)   ˈpəm-yax-wən

         p̲ə̲m̲-yax-wən

         3PL-say-PST.IPFV.PL

         'They said.'   (Yates 2017, 51)

Finally, Yates (2017) also provides supporting evidence for BAP from words with multiple accented affixes, where stress falls on the leftmost accented affix, as predicted by BAP (and not predicted by the RCA analysis). I refer the reader to Yates (2017: 60-70) for a detailed analysis of data with the stress competition between multiple accented affixes and data from reduplicated forms supporting the analysis of the Cupeño stress system in terms of the Basic Accentuation Principle. I thus follow Yates (2017) in rejecting the RCA analysis for Cupeño, and instead, based on the evidence provided in Yates (2017), I treat Cupeño as a *Directional Accent* system (much like Arapaho presented in chapter **2**), where the appropriate setting of the SELECT parameter (9) and not the affiliation with the 'roots' vs. 'affixes' classes of morphemes determines the winner in case of an accent competition. The remaining part of this chapter presents a detailed novel analysis of another Uto-Aztecan language previously analyzed as a Root-Controlled Accent system – Choguita Rarámuri. I will argue that Choguita Rarámuri

ought to be analyzed as a *Directional Accent* system as well, and that the setting of the SELECT parameter (9) identical to its sister-language Cupeño is active in Choguita Rarámuri.

4.3 Case study: Stress in Choguita Rarámuri

The main focus of this chapter is the stress system of another Uto-Aztecan language of the Taracahitan branch – Choguita Rarámuri (also known as Tarahumara). I first introduce the basic properties of the stress system in Choguita Rarámuri (CR) based on the discussion and data from Caballero (2008) and Caballero and Carroll (2015). The position of stress in a given morpheme in Choguita Rarámuri is unpredictable (i.e. it is a *lexical stress* language). I present a novel analysis of the stress system of in Choguita Rarámuri and I will argue that the distribution of stresses within a morphological word can, however, be explained with the combination of (i) a three-syllable window rule, (ii) underlying stress specification for every morpheme within a wordform, (iii) default second-syllable stress, and (iv) a stress competition resolution whereby the leftmost lexical accent wins. The empirical observations in this case study are formally accounted for with the six accent parameters previously introduced in chapter **2** for Arapaho; the Choguita Rarámuri settings are below:

(13) Choguita Rarámuri stress parameter settings

Accent Domain	BOUNDED (L)
	SATELLITE (L)
Accent Placement	CULMINATIVITY (Y)
	OBLIGATORINESS (Y)
	SELECT (L)
	DEFAULT (L)

I propose an account of stress patterns in CR as a *Directional Accent* system as a simpler alternative to the *Root-Controlled Accent* analysis (proposed in Caballero 2008), or to an analysis involving morphological conditioning (Caballero 2011).

4.3.1 Relevant data

The basic properties of Choguita Rarámuri stress, as described in Caballero (2008, 2011) and Caballero and Carroll (2015), are the following. Stress in the language displays phonological and phonetic properties characteristic of "prototypical" stress systems: (i) stress is culminative and obligatory within the morphological word domain; (ii) unstressed vowels undergo quality and quantity reduction; (iii) longer duration and higher overall intensity are phonetic correlates of stress[47]. It has also been reported that there is no secondary stress in the language.

Stress in Choguita Rarámuri shows properties which are characteristic of *lexical accent languages*. Stress is phonologically unpredictable and lexically contrastive, cf. minimal pairs in (14) below:

(14a)　ˈsawa　　　'smell'　　　　　saˈwa　　　'leaf'

(14b)　ˈkot͡ʃi　　　'pig'　　　　　koˈt͡ʃi　　　'dog'

(14c)　ˈkori　　　'visit'　　　　　koˈri　　　'chile pepper'

(2d)　ˈnowi　　　'have son'　　　noˈwi　　　'maggot'

(Caballero & Carroll 2015: 461)

Choguita Rarámuri has a left-aligned three-syllable window, meaning that stress must be present in one of the first three syllables in every morphological word. I formalize it in

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[47] Choguita Rarámuri has also been reported to have a tone system which is dependent on stress: each word obligatorily has a stressed syllable which contrasts an /H/, /L/ or /Ø/ tone (Caballero 2011; Caballero and Carroll 2015). Given that stress assignment is not dependent on tone, tone will not be considered here (see also Spahr 2016 for an analysis of stress-tone interactions in the language).

parallel to the formalization of the *OSD* in Arapaho given in **2.3.2.1**, with the appropriate change of the edge-orientation:

(15a)   BOUNDED   **L**/R

form a *disyllabic domain (DD)* at the edge of a word

(15b)   SATELLITE   **L**/R

adjoin a syllable at the edge of the *DD* to form

Obligatory Stress Domain (OSD)

Recall from **2.3.2.1,** *disyllabic domain* in this approach is similar to a non-iterative foot in the Metrical Theory. However, it is not associated with rhythm or with headedness in the way the term *foot* normally is. This makes it a preferable term for capturing stress facts in languages like Arapaho or Choguita Rarámuri which lack rhythm (for metrical accounts of three-syllable stress windows see for example Blevins & Harrison 1999; for a detailed typology of stress window systems see Kager 2012). The notion of *satellite* adopted from van der Hulst (2012) captures the notion of *extrametricality* in the classical Metrical Theory[48]. The advantage of the notion of *satellite* for the present analysis of Choguita Rarámuri is that satellite, unlike an extrametrical syllable, can be accented either regularly or in a limited set of language-specific circumstances (see van der Hulst *ibid.,* 1502-1504 for some examples). The representation in (16) below crucially groups the three syllables at the left edge of a word into a constituent where the disyllabic stress domain is within the parentheses and the disyllabic stress domain with the adjunct of an external satellite is in curly brackets; the square bracket represents the word boundary:

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[48] In metrical theories which allow for 'weakly layered feet' (Hewitt 1992; Kager 1994, 2012), the notion of an adjunct within a weakly layered foot corresponds to the notion of *satellite* adopted here. Such an adjunct, unlike an extrametrical syllable and just like a satellite, can be left- or right-adjoined to the 'head foot', i.e. for a language like CR with a word-initial stress window, such an adjunct can be either preceding the 'head foot' (external satellite) or following the 'head foot' (internal satellite).

(16) Obligatory Stress Domain in Choguita Rarámuri

BOUNDED(L)   SATELLITE(L)

$[\{_{\text{OSD}}\ \sigma + (_{\text{DD}}\ \sigma\ \sigma)\}\dots$

The three-syllable window at the left edge of a morphological word – or OSD – in (16) contains the external satellite and the disyllabic domain. Stress must be assigned within the OSD, and the second-syllable and the third-syllable stress are the common patterns in the language, while the initial-syllable stress can be regarded as exceptional. This suggests the 'adjunct' status of the syllable at the left periphery in a sequence of three syllables and motivates positing an external, and not an internal, satellite in Choguita Rarámuri. The trisyllabic *Obligatory Stress Domain* will play a prominent role in the analysis of stress patterns proposed in this chapter.

Caballero (2008, 2011) shows that, similarly to other lexical accent languages, both roots and suffixes can be underlyingly accented in Choguita Rarámuri. When only one morpheme in a word carries an underlying accent, that accent is realized as stress. Consider, for example, (17) where underlyingly accented roots are combined with an underlyingly unaccented past tense suffix *-ri/-li*[49]:

(17a) ˈsu-li

sew-PST

'S/he sewed'

(17b) ˈlani-li

bleed-PST

'S/he bled.'

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[49] The unaccented versus underlyingly accented sets of suffixes in the language are considere in more detail in **4.3.4.**

(17c)   buˈre-li

tie-PST

'S/he tied.'

(17d)   seˈbari-ri

complete-PST

'S/he completed.'

(17e)   baniˈhi-ri

accuse-PST

'S/he accused.'   (Caballero 2011: 753; Caballero and Carroll 2015: 463)

In examples in (17), underlyingly accented roots realize their accent as stress. Consider as well

examples in (18) below, where underlyingly unaccented roots combine with an underlyingly

accented conditional suffix *-sa:*

(18a)   ru-ˈsa

say-COND

'If s/he says.'

(18b)   t͡ʃapi-ˈsa

grab-COND

'If s/he grabs.'   (Caballero 2011: 753)

In (18), underlyingly unaccented mono- and disyllabic roots are suffixed with an underlyingly

accented conditional morpheme. In all such cases, the underlyingly accented suffix carries the

primary stress. However, the picture is different when an underlyingly unaccented trisyllabic root is combined with an accented suffix, consider (19) below:

(19)   raʔiˈt͡ʃa-sa

speak-COND

'If s/he speaks.'   (Caballero 2008: 183)

In (19), observe that stress is not on the underlyingly accented suffix as could be predicted from (18) above, but instead the third syllable of the underlyingly unaccented root is stressed. I propose a formal analysis of this pattern in **4.3.4.**

Importantly, if an underlyingly accented root is combined with an underlyingly accented suffix, the accent of the root is realized as primary stress and the accent of the suffix is deleted. Consider examples in (20) below where the underlyingly accented roots are combined with the suffix *-sa* or with the future singular suffix *-ma,* both of which are underlyingly accented:

(20a)   ˈsu-sa

sew-COND

'If s/he sews.'

(20b)   ˈlani-sa

bleed-COND

'If s/he bleeds.'

(20c)   buˈre-sa

tie-COND

'If s/he ties.'

(20d)   ˈhumisi-ma

take.off-FUT.SG

'S/he will take off.'

(20e)   naˈhata-ma

follow-FUT.SG

'S/he will follow.'

(20f)   biniˈhi-ma

accuse-FUT.SG

'S/he will accuse.'   (Caballero 2011: 753-757)

As illustrated in (20), roots which are underlyingly specified for accent, retain the unpredictable position of stress (first or second syllable in disyllabic roots, and any of the three syllables for trisyllabic roots) even when suffixed with underlyingly accented suffixes, while in words where roots are not underlyingly specified for accent, the stress is on the underlyingly accented suffix if one is present (18). Data such as (20a-f) led Caballero (2008) to analyze Choguita Rarámuri as a *Root-Controlled Accent* system. In the remaining of this chapter, I will argue that the Choguita Rarámuri stress competition data are equally compatible with a *Directional Accent* analysis where in a competition between lexical accents the leftmost accent always wins. Moreover, some data, which cannot be captured by the *Root-Controlled Accent* analysis,

namely stress in noun incorporation constructions, is straightforwardly captured by the *Directional Accent* analysis (see section **4.5**).

In addition to the regular patterns exemplified thus far, Caballero (2008: 186) reports that there is a set of exceptional unaccented disyllabic roots in the language which have a first syllable stress when affixed with the underlyingly unaccented suffixes such as the past tense suffix *-ri* in (21a, c), and second syllable stress when affixed with the underlyingly accented suffixes such as the future singular suffix *-ma* in (21b, d). Caballero (*ibid.*) reports that in her corpus of 680 verbal roots, eight roots exhibit this behavior. Consider examples in (21) below:

(21a) ˈpewa-ri

        smoke-PST

        'S/he smoked.'

(21c) ˈnata-ri

        think-PST

        'S/he thought.'

(21b) peˈwa-ma

        smoke-FUT.SG

        'S/he will smoke.'

(21d) naˈta-ma

        think-FUT.SG

        'S/he will think.'   (Caballero 2008:186)[50]

I will mostly focus my analysis on the regular stress patterns, but I am returning to the exceptional stress pattern exemplified by (21a-d) in the discussion of the accent domains in **4.4.1.**

Finally, Caballero (2008, 2011) and Caballero and Carroll (2015) also make the following generalization regarding the stress competition in the language:

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[50] Caballero (2011) suggests that these exceptional roots at some point in the history of the language were trisyllabic, i.e. that they diachronically lost a syllable (presumably, the initial one), which then led to the exceptional stress pattern which is strikingly parallel to the behavior of stress in regular unaccented trisyllabic roots.

(22)   In multiply affixed words, the stress properties of the word depend on the stress makeup of the morphemes of the Stem (root plus the suffix closest to the root).

<p align="right">(Caballero 2008:174)</p>

The generalization in (21) thus states that the domain of accent assignment in the language contains the root and the closest phonologically overt suffix. I will argue, however, that this generalization is false, and that the available data suggest that any underlyingly accented morpheme within a morphological word in CR may project its accent as stress.

The remaining part of this chapter is organized as follows. After discussing the default stress pattern in **4.3.2,** I propose a novel analysis of the stress system of CR which captures all the stress patterns in the language with a combination of a small number of analytical points: (i) there is a trisyllabic word-initial OSD in CR; (ii) roots and affixes can be underlyingly accented or unaccented; (iii) all accented affixes are associated with a single stress assignment pattern; (iv) unaccented affixes are invisible to the stress assignment mechanism; (v) accent competition is resolved directionally where the left-hand accent always wins. I will additionally show that CR shows two typologically interesting properties: (i) a mismatch between the domain of obligatory stress (the OSD), and the domain which can participate in stress assignment, and (ii) a possibility for segmentally null morphemes to be underlyingly accented. I will reject the following core claims made in the previous analyses of the CR stress system (Caballero 2008, 2011): (i) root accents are favored over suffix accents, (ii) only suffixes closest to the root can assign accent, and (iii) special accent assignment patterns are required in particular morphological environments, specifically in the noun-incorporation constructions. While features (i) and (iii) will be uniformly analyzed as consequences of a regular *Directional Accent* system, (ii) will be shown to be false.

4.3.2 Default stress pattern

In words which consist of only one overt morpheme – an underlyingly unaccented root (23a-c), and in words in which an underlyingly unaccented root is combined with an underlyingly unaccented suffix, stress regularly falls on the second syllable (23d-f):

(23a) t͡ʃaˈpi   (23d) t͡ʃaˈpi-li

      'grab.pres'   grab-PST

(23b) koˈt͡ʃi   (23e) koˈt͡ʃi-li

      'sleep.pres'   sleep-PST

(23c) ruˈruwa   (23f) ruˈruwa-li

      'throw liquid.pres'   throw.liquid-PST

                                                      (Caballero and Carroll 2015: 463)

In (23), disyllabic and trisyllabic unaccented roots are stressed on the second syllable when unaffixed (23a-c), as well as when they are combined with the underlyingly unaccented suffix (23d-f). I propose to treat the second-syllable stress pattern as default in Choguita Rarámuri. This can be formalized as (24)[51]:

(24)   DEFAULT   **L**/R

      assign accent within *disyllabic domain*

      if no accent mark is present in OSD

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[51] Caballero (2008, 2011) and Caballero and Carroll (2015) treat both of the common stress patterns in the language – the stress patterns produced by the underlyingly accented suffixes (third syllable) and the second syllable pattern as two "defaults" or "morphologically conditioned defaults".

The setting of the DEFAULT parameter in (24) ensures that the second syllable receives stress in case there is no lexical accent within the three-syllable window at the left edge of the word. This pattern is observed across the board for disyllabic and trisyllabic roots in the language.

4.3.3 Choguita Rarámuri as a Directional Accent system

I begin the analysis of the CR stress data with the analysis of the simplest part of the pattern, namely the generalization illustrated in (20) above: in a competition between an underlying accent in the root, and an underlying accent in the suffix, the accent of the root is realized as stress, and the accent of the suffix is deleted. Caballero (2008), based on this generalization, proposed a *Root-Controlled Accent* analysis for CR. More specifically, Caballero (2008) argues that this pattern is compatible with (25) below:

(25)   Root Controlled Accent Hypothesis

In lexical-to-surface mappings of a word with more than one inherent stress, if stress is deleted, stress in the root is realized over stress elsewhere in the word.

(Caballero 2008: 215, adopted from Alderete 2001: 43)

In application to the Choguita Rarámuri data, (25) means that in a morphologically complex word containing both an underlyingly accented root and an underlyingly accented suffix, the root accent is realized as primary stress while the suffix loses its accent. Choguita Rarámuri, thus, according to Caballero (2008), presents a second example of a *Root-Controlled Accent* system after Cupeño (as analyzed in Alderete 1999)[52]. I argue that the RCA analysis is not warranted since this pattern of accent competition can be analyzed as a typologically unmarked case of *Directional Accent*. Note that there is no productive prefixation in Choguita Rarámuri

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[52] It should be noted that although the RCA analysis was proposed in Caballero (2008), in the later research on the prosodic system of the language, the author proposes an alternative analysis within the Cophonology framework (see Caballero 2011) which introduces special accent assignment patterns in particular morphological environments. The analysis proposed here eliminates the need for multiple morphologically-conditioned patterns uniformly accounting for all the stress patterns in the language with a single mechanism.

(Caballero p.c.), thus root accent can only compete with and win over the underlying accent in suffixes[53]. I formally capture the proposed *Directional Accent* analysis with the following setting of the SELECT parameter:

(26)   SELECT   **L/R**

       preserve the leftmost or the rightmost of the competing accents

By (26), if a competition between lexically marked accents arises, the leftmost accent wins. Choguita Rarámuri thus uses the setting of the SELECT parameter which is identical to Cupeño, and the opposite of Arapaho – two other *Directional Accent* systems discussed in this dissertation. I thus propose that the main question of the lexical accent system typology, repeated below as (27), is thus answered in CR without any reference to the morphological structure:

(27)   How is the surface primary stress calculated when there are multiple morphemes with a lexical accent within a word?

The only seeming complication comes from the generalization in (22), repeated below as (28):

(28)   In multiply affixed words, the stress properties of the word depend on the stress makeup of the morphemes of the Stem (root plus the suffix closest to the root).

                                                        (Caballero 2008:174)

In **4.4,** I will argue, however, that data used in Caballero (2008, 2011) and Caballero and Carroll (2015) to support the generalization in (28) in fact are inadequate, and when tested against the appropriate data, the generalization in (28) does not hold.

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[53] I will, however, argue in **4.5** that there are constructions in the language where the accent supplied by a suffix wins in the root-suffix competition crucially providing evidence against the RCA analysis and in favor of the *Directional Accent* analysis.

4.3.4 Underlying accent in suffixes

Let us now consider the stress behavior of two sets of suffixes in the language, which I term *accented* vs. *unaccented.* A non-exhaustive list of underlyingly accented and underlyingly unaccented suffixes is presented below in Table 1 with an unaccented root *suku-* 'to scratch':

Underlyingly unaccented suffixes			Underlyingly accented suffixes		
Verb	**Suffix**	**Gloss**	**Verb**	**Suffix**	**Gloss**
suˈku-ti	-ti/-ri	Causative	suku-ˈnale	-nale	Desiderative
suˈku-ki	-ki	Applicative	suku-ˈsa	-sa	Conditional
suˈku-t͡ʃane	-t͡ʃane	Evidential	suku-ˈta	-ta	Potential
suˈku-pi	-pi	Irrealis pl.	suku-ˈme	-me	Irrealis sg.
suˈku-ri	-ri/-li	Past	suku-ˈmea	-me/-mea	Future sg.
suˈku-a	-a	Progressive	suku-ˈbo	-bo	Future pl.
suˈku-e	-e	Imperfective	suku-ˈka	-ka	Gerund
suˈku-ra	-ra	Reportative	suku-ˈsi	-si	Imperative pl.

Table 1. Underlyingly accented and underlyingly unaccented suffixes with underlyingly unaccented root *suku-* 'to scratch' (adapted from Caballero 2008:180, Table 22)

Consider the stress pattern which arises when the unaccented root is affixed with one of the accented suffixes in Table 1. Recall also examples (18) and (19) repeated as (29) below:

(29a) ru-ˈsa

     say-COND

     'If s/he says.'

(29b) t͡ʃapi-ˈsa

     grab-COND

     'If s/he grabs.'   (Caballero 2011: 753)

(29c)   raʔiˈt͡ʃa-sa

speak-COND

'If s/he speaks.'   (Caballero 2008: 183)

Caballero (2008, 2011) and Caballero and Carroll (2015) take examples such as (29c) to mean that suffixes which I analyze as *underlyingly accented* are associated with an accent template to produce stress on the third syllable of a word rather than being specified to carry stress, as could be generalized from the verbal forms with disyllabic roots (cf. (29a-b) above and examples in Table 1). This analysis evidently does not hold for verbal words consisting of an unaccented monosyllabic root suffixed with one of the monosyllabic accented suffixes, cf., for instance, example in (29a) above with the verb *ru-ˈsa* 'say'. The generalization that accurately captures all the possible root shapes (mono-, di-, or trisyllabic) in combination with the underlyingly accented suffixes can be stated as follows: underlyingly accented suffixes assign stress as close to the right edge of the three-syllable window as possible. They will thus assign stress to the third syllable of a word if there is one, and the third syllable may be the third syllable of a trisyllabic root (29c), or the underlyingly accented suffix itself if the root it combines with is disyllabic (29a-b). In the cases where the second syllable of a morphological word is the rightmost possible docking site for the underlying accent of the suffix, i.e. in words consisting of a monosyllabic root and the suffix (29a), this generalization still holds and stress is assigned to the second syllable (the underlyingly accented suffix itself).

The complexity of the accent pattern in lexically accented suffixes in CR is produced by the fact that accent in the language must be assigned within a bounded domain. I propose the following account of the underlyingly accented suffixes in Choguita Rarámuri that would naturally capture all the patterns in words with unaccented roots. *Underlyingly accented* suffixes in Choguita Rarámuri are lexically specified to produce an accent that aligns with the

right edge of *OSD*. This can be formally represented by associating a grid mark with the rightmost syllable within the OSD (the right-hand syllable within the Disyllabic Domain) in the context of SUFFIX^{+acc}:

(30)   x

                                x   x

[{$_{OSD}$ σ + ($_{DD}$ σ σ)}…-SUFFIX^{+acc}

The underlying accent contributed by lexically accented suffixes can thus be viewed as a floating prosodic feature, i.e. as an accent feature not associated with any unit of the segmental structure, but specified to dock onto the rightmost syllable within OSD. The accent pattern produced by the lexically accented suffixes in CR would thus formally be treated as either an accenting pattern (31a) or as a type of pre-accenting (31b) depending on whether the suffix contributing the accent falls within the OSD or outside of it:

(31a)   Accenting grid marking
                                    x

                                    x

[{$_{OSD}$ σ + ($_{DD}$ σ σ $_{SUFFIX+acc}$)}…

(31b)   Pre-accenting grid marking

                                    x

                                x   x

[{$_{OSD}$ σ + ($_{DD}$ σ σ)}…   -σ$_{SUFFIX+acc}$

I propose that *all* underlyingly accented suffixes in Choguita Rarámuri are lexically specified to produce an accent which aligns with the right edge of *OSD*[54].

The second class of suffixes in Choguita Rarámuri includes numerous suffixes which I term *underlyingly unaccented.* Recall, in words in which an underlyingly unaccented root is combined with an underlyingly unaccented suffix (as well as in words which consist of only one overt morpheme – an underlyingly unaccented root (23a-c)), stress regularly falls on the second syllable by the application of DEFAULT (24). Consider examples of wordforms with underlyingly unaccented roots affixed with underlyingly unaccented suffixes in (23) repeated below as (32) (cf. also examples in the right-hand column in Table 1 above):

(32a) t͡ʃaˈpi   (32d) t͡ʃaˈpi-li

       'grab.pres'   grab-PST

(32b) koˈt͡ʃi   (32e) koˈt͡ʃi-li

       'sleep.pres'   sleep-PST

(32c) ruˈruwa   (32f) ruˈruwa-li

       'throw liquid.pres'   throw.liquid-PST

Underlyingly unaccented suffixes not only fail to assign accent to the right edge of the OSD (in contrast to the underlyingly accented suffixes), but they also never carry stress themselves,

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which is evident from words with an unaccented monosyllabic root when combined with the underlyingly unaccented suffix *-li:*

(33)　ˈru-li

　　say-PST

　　'S/he said...'

In (33), stress is, unexpectedly, not on the second syllable as would be predicted by the DEFAULT parameter. Instead, the single syllable of the root receives stress. I follow Caballero (2008, 2011) and Caballero & Carroll (2015) who take examples such as (33) to suggest that the suffixes which I call *underlyingly unaccented* are in fact not only unaccented, but *unstressable.*

Unstressable morphemes have been described and analyzed for a number of unrelated languages: e.g. Turkish (Göksel and Kerslake 2004; Kabak and Vogel 2001; van der Hulst and van de Weijer 1991), Squamish and Thompson River Salish (Bar-el 2000; Dyck 2004), Guaraní (Hamidzadeh and Russell 2015). Unstressability of a morpheme in most cases appears to be conditioned by phonological constraints: for instance, some vowel qualities may systematically reject stress. This is the case, for example, in many Salishan languages (see, for instance, Blake 2000 on Sliammon; Czaykowska-Higgins 1993 on Moses-Columbian) and in Passamaquoddy where syllables with a schwa are unstressable (LeSourd 1988: 71-74). Another common pattern is for a language to have a class of morphemes which are systematically excluded from the stress computation. For example, this is the pattern observed in Squamish where all non-reduplicative prefixes are unstressable by virtue of not being part of the same prosodic domain as the root and the suffixes (Dyck 2004: 165-171). While in some languages, the distribution of stressable vs. unstressable affixes has clear phonological or morpho-syntactic grounds, I have not been able to establish any such grounds in Choguita Rarámuri. The affiliation of a

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suffix with the *underlyingly accented* or the *underlyingly unaccented* list appears to be purely lexical or idiosyncratic as these lists do not form a natural class either morpho-syntactically or phonologically.

I will propose that although it is not possible to predict which suffix would be unstressable, the unstressability of the unaccented suffixes in CR can be modelled as a consequence of the way in which stress derivation is carried out in the language. More specifically, I will argue that these suffixes are 'invisible' to the stress algorithm, and are thus 'skipped' by the stress assignment mechanism. No additional lexical stress specification is required for the underlyingly unaccented suffixes – in the account proposed here, they do not produce a specific (second-syllable, according to the previous analyses) stress pattern. Rather, a combination of an underlyingly unaccented suffix with an underlyingly unaccented root produces the default stress pattern (second syllable stress) in words with disyllabic and trisyllabic roots (recall (23)), and first syllable stress in words with monosyllabic roots where that stress position is the only stressable syllable in the word. In the next section, I propose a formal account of stress assignment in words with both, underlyingly accented and underlyingly unaccented suffixes.

4.4 Stress domains in Choguita Rarámuri

In this section, I review the generalization in (28) (Caballero 2008, 2011; Caballero and Carroll 2015) in order to determine the possible size of the domain which can influence the assignment of stress in CR. According to the generalization in (28), the domain which can influence accent assignment in CR can maximally include the root and the immediately adjacent suffix. Examples in (34) are used in Caballero (2008, 2011); Caballero and Carroll (2015) to illustrate the generalization in (28) with the forms of the unaccented root *suku-* 'to scratch' and various combinations and orders of underlyingly accented and unaccented suffixes:

(34a) Root^{-acc}-suffix^{+acc}-suffix^{+acc}

suku-ˈnale-sa

scratch-DESID-COND

'If s/he would want to scratch.'

(34b) Root^{-acc}-suffix^{+acc}- suffix^{-acc}

suku-ˈnale-ki

scratch-DESID-PST.1

'I wanted to scratch.'

(34c) Root^{-acc}-suffix^{-acc}-suffix^{+acc}

suˈku-si-ma

scratch-MOT-FUT.SG

'She will go along scratching.'

(34d) Root^{-acc}-suffix^{-acc}-suffix^{-acc}

suˈku-ri-li

scratch-CAUS-PST

'S/he made it scratch.'   (adapted from Caballero and Carroll 2015:464)

Caballero (2008, 2011) and Caballero and Carroll (2015) observe that in the forms where an underlyingly accented suffix (suffix^{+acc}) immediately follows the root (34a-b), the third-syllable stress surfaces, while in the words where an underlyingly unaccented suffix (suffix^{-acc}) is the closest to the root, the second-syllable default surfaces (34c-d). They argue that the latter holds even if an underlyingly accented suffix *is* present in the word, but, crucially, is further

away from the root than the underlyingly unaccented suffix (34c). The failure of the underlyingly accented suffixes to produce a stress at the right edge of the OSD (i.e. on the third syllable) is thus attributed to the effects of morphological structure: only the morpheme closest to the root participates in stress assignment. However, note, crucially, in forms such as (34c) the failure of the underlyingly accented suffix *-ma* to assign the third syllable stress can be explained by the fact that the suffix preceding it (*-si*) is underlyingly unaccented, i.e. *unstressable*. Thus, examples such as (34), i.e. examples with disyllabic roots followed by an unaccented suffix and then by an accented suffix, used in Caballero (2008, 2011) and Caballero and Carroll (2015) are inadequate to test the generalization in (28), as we can expect forms such as (34c) to bear stress on the second syllable because the third syllable in the word is unstressable. In order to evaluate the generalization in (28), words with non-disyllabic roots must be examined. Specifically, if (28) holds, we expect to see the second-syllable default in words containing a trisyllabic root followed by an unaccented suffix and then by an accented suffix (i.e. in words of the same make-up as (34c) but with trisyllabic roots):

(35)   Stress pattern in multiply affixed words predicted by (28)

$\sqrt{}$ σ'**σ** σ - suffix^{-acc} - suffix^{+acc}

On the other hand, we predict to observe the third-syllable stress assigned by the underlyingly accented suffix in forms like (35) if (28) does not hold and suffixes other than the closest suffix to the root are able to influence stress assignment:

(36)   Alternative stress pattern prediction in multiply affixed words

$\sqrt{}$ σ σ'**σ** - suffix^{-acc} - suffix^{+acc}

Crucially, the prediction made by (28), schematized in (35), is not borne out while the prediction made in (36) is. Consider examples below with the trisyllabic unaccented root *raʔitʃa* 'speak'; stressed syllables are in bold:

(37)   Root⁻ᵃᶜᶜ-suffix⁻ᵃᶜᶜ-suffix⁺ᵃᶜᶜ

(37a)   ne=mi   raʔiˈt͡ʃa-ri-ma

        1SGNOM=2SGA   speak-CAUS-FUT.SG

        'I will make you speak.'   (Caballero 2008: 234, [LEL 06 4:155/Elicit])

(37b)   raʔiˈt͡ʃa-ri-ma

        speak-CAUS-FUT.SG

        'She'll make him speak.'   (Caballero 2008: 242, [LEL 06 4:154/Elicit])

The root *raʔit͡ʃa* 'speak' is unaccented, which can be seen from its behavior when affixed with

underlyingly accented (38a) vs. underlyingly unaccented (38b-c) suffixes:

(38a)   raʔiˈt͡ʃa -ma   (38b)   raˈʔit͡ʃa-a   (38c)   raˈʔit͡ʃa-ri

        speak-FUT.SG   speak-PROG   speak-PST

        'S/he will speak.'   'S/he is speaking.'   'S/he spoke.'

                                                                (Caballero 2008: 119; 183)

It can be seen from examples (38a-c) that the root *raʔit͡ʃa* 'speak' behaves as a regular

unaccented root, i.e. it carries default stress on the second syllable when affixed with

unaccented suffixes (38b-c), and it carries a third-syllable stress when affixed with an

underlyingly accented suffix (38a). Going back to the testing example (37) for the predictions

in (35)-(36), the wordform thus contains an underlyingly unaccented root. Recall also, multiple

examples throughout this chapter and in Caballero (2008, 2011) show that the future singular

suffix *-ma* is underlyingly accented. The causative suffix *-ri* closest to the root in (37) is

unaccented, which can be observed in the following examples where its stress behavior can be

compared to that of an underlyingly accented desiderative suffix when combined with an unaccented disyllabic root:

(39a)   osi-ˈ**nar**-sa

read/write-DESID-COND

'If s/he wants to write/read.'

(39b)   oˈ**si**-ri-ri

read/write-CAUS-PST

'S/he made s.o. write/read.'   (Caballero 2008: 105)

In (39b), we observe that the causative suffix *-ri* does not carry stress when attached to an underlyingly unaccented disyllabic root, as an underlyingly accented suffix would (39a). We can thus conclude that the causative suffix is underlyingly unaccented[55].

Examples in (37) then support (36) and show the prediction of (28) in (35) to be false:

(40)   Stress pattern in multiply affixed words predicted by (28)

√ σ ˈ**σ** σ - suffix^{-acc} - suffix^{+acc} ✘

(41)   Alternative stress pattern prediction in multiply affixed words

√ σ σ ˈ**σ** - suffix^{-acc} - suffix^{+acc} ✔

Additional evidence in support of (41), and contra (40), come from stress patterns in words with the exceptional disyllabic roots exemplified in **4.3.1,** (21). Recall, Caballero (2008: 186) reports that there is a small set of exceptional unaccented disyllabic roots which have first syllable stress when affixed with underlyingly unaccented suffixes and second syllable stress

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[55] This suffix is listed as underlyingly unaccented in Caballero (2008: 180) as well.

when affixed with underlyingly accented suffixes. In words with such roots, the following stress pattern is predicted by the generalization in (28), i.e. if only the closest suffix to the root can affect the stress assignment:

(42)   Stress in multiply affixed words with exceptional disyllabic roots predicted by (28)

√ˈσ σ - suffix^{-acc} - suffix^{+acc}

Alternatively, if the underlyingly accented suffix further away from the root can affect the stress placement, we predict the following pattern:

(43)   Alternative stress prediction in multiply affixed words with exceptional disyllabic roots

√ σˈσ - suffix^{-acc} - suffix^{+acc}

Once again, as with the regular trisyllabic roots (37), prediction in (43) is borne out, while the prediction made by the generalization put forward in Caballero (2008, 2011) and Caballero and Carroll (2015), (42) is not supported. Consider examples with the root *pewa* 'smoke' in (44) below. Examples showing the general stress behavior of this root with underlyingly unaccented suffixes and with underlyingly accented suffixes are repeated as (44) below from (21):

(44a)   ˈpewa-ri   (44b)   peˈwa-ma

        smoke-PST   smoke-FUT.SG

        'S/he smoked.'   'S/he will smoke.'   (Caballlero 2008: 186)

(44a-b) illustrate that the root *pewa* 'smoke' has first syllable stress when affixed with the underlyingly unaccented suffixes and second syllable stress when affixed with the underlyingly accented suffixes. Consider now an example in (45) where this root is followed by the underlyingly unaccented causative suffix *-ri,* and then by the underlyingly accented future singular suffix *-ma*, the stressed syllable is bold-faced*:*

(45)   peˈ**wa-**ri-ma

        smoke-CAUS-FUT.SG

        'S/he makes s.o. smoke.'   (Caballlero 2008: 240)

As predicted by (43), and contrary to the predictions of (42), the verb in (45) carries stress on the second syllable, suggesting that the underlyingly accented suffix non-adjacent to the root can in fact influence the stress assignment:

(46)   Stress in multiply affixed words with exceptional disyllabic roots predicted by (28)

        √ˈ**σ** σ - suffix^{-acc} - suffix^{+acc} ✖

(47)   Alternative stress prediction in multiply affixed words with exceptional disyllabic root

        √σˈ**σ** - suffix^{-acc} - suffix^{+acc} ✓

Data presented in this section show that (i) the previous generalization regarding the involvement of the morphological structure in stress assignment in CR is false, and (ii) that there is a mismatch in the language between the domain where stress must surface (the OSD), and the domain which can participate in the assignment of stress. In the next section I present stress derivations which formalize the analytical points made thus far before moving on to an account of a stress pattern previously deemed to be exceptional in the language.

4.4.1 Stress derivations

Data presented in the previous section suggest that the domain relevant for stress assignment in CR not only includes the root and the immediately adjacent suffix, but can in fact include the whole morphological word[56]. Two domains relevant for stress assignment are thus present in CR. Firstly, stress can result from the lexical marking of the root or of the suffixes. According

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[56] Morphological words with multiple unaccented suffixes between the root and an accented suffix should be examined in order to further test the constraints on the domain of stress assignment in CR. Unfortunately, the appropriate data are not available in the sources.

to the data presented in the previous section, this domain, which triggers the assignment of stress, is isomorphic with the morphological word. Secondly, stress resulting from the lexical marking of the morphemes within a word as well as the default if the lexical marking is absent, must be assigned within the first three syllables of the word – the *Obligatory Stress Domain.*

Recall from **4.3.4,** I treat underlyingly unaccented suffixes as unstressable. This generalization has been previously made in the existing work on the language, and the data supporting it is abundant. I propose to formalize the difference between the stressable and unstressable morphemes in the following way. Stressable morphemes (i.e. underlyingly accented suffixes and all roots) project a corresponding syllabic structure onto the stress grid while unstressable morphemes do not. Consider a sample representation below for a verb consisting of an underlyingly unaccented disyllabic root followed by an underlyingly unaccented suffix and by an underlyingly accented suffix (48)-(49):

(48)   Root^{-acc}-suffix^{-acc}-suffix^{+acc}

   suˈ**ku**-si-ma

   scratch-MOT-FUT.SG

   'She will go along scratching.'

(49)   σ σ   σ

   suku-si-ma

The inability of the unaccented suffixes, such as the motion suffix *-si* in (48)-(49), to project a stressable unit onto the grid then results in (i) these suffixes not being able to have any effect

on the position of stress in a word, and in (ii) these suffixes not being able to carry stress themselves[57].

A typologically interesting pattern observed in CR arises from the mismatch between the two domains participating in stress assignment: primary stress must always be contained within the OSD, i.e. the first three syllables of any word. Stress can, however, be assigned by the suffixes at the opposite edge of the morphological word. Crucially, while accent can only be assigned to the stressable units, i.e. to the syllables projected onto the stress grid (49), the OSD is built over the surface syllable structure. The surface syllable structure is blind to the lexical accent marking and can only reference the information about the edge-orientation and the distance from the word edge in syllables, as is cross-linguistically usual for the stress-window systems (cf. Kager 2012). Consider again the form in (48)-(49), now with the *Obligatory Stress Domain* included in the representation; the OSD is in parentheses:

(50)   σ σ   σ

(suku-si)$_{OSD}$-ma

Thus, the stress mechanism has to be sensitive to both: to the surface sequence of the syllables in a word, and to the linear sequence of stressable units, i.e. the linear sequence of syllables projected onto the stress grid. In a form like (50), the underlyingly accented suffix *-ma* is outside of the OSD, thus, it cannot carry stress itself. It, however, also fails to produce a grid mark at the right edge of the OSD as it is lexically specified to do by (31) since the right edge

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[57] There appears to be a parametric variation in the way unaccented affixes in lexical accent systems are treated cross-linguistically, specifically, they can be visible or invisible to the stress algorithm. While in some languages there is evidence showing that underlyingly unaccented affixes are visible to the stress assignment mechanism (i.e. they can bear stress assigned by underlyingly accented suffixes in further cycles, as is the case, for example, in English), other languages like CR present evidence of underlyingly unaccented affixes being fully excluded from the assignment of stress. A similar pattern is found in Squamish where underlyingly unaccented suffixes are, just like in CR, not only excluded from the stress-assigning algorithm, but also can never carry stress themselves (Dyck 2004: 217). Yet other languages give no clear evidence for either (recall the discussion of stress in the Sahaptian languages from **3.2.1-3.2.2**).

of the OSD coincides with the underlyingly unaccented suffix -*si* which does not project a stressable unit onto the stress grid and thus cannot host an accent grid mark, cf. the representation of a failed stress derivation in (51):

(51)   *   x   Line 2

              x   x   Line 1

       σ σ   σ

       (suku-si)_{OSD}-ma

The assignment of lexical accent in (51) thus would crash (represented by an asterisk) because there is no stressable syllable that would be able to host the grid marks projected by the underlyingly accented suffix. Stress in CR is however obligatory; thus, the second syllable stress will be expected to surface in a form like (51) by the application of DEFAULT (24), which indeed we observe (cf. (48)).

Consider now an example of a stress derivation in forms like (37b) repeated below as (52), where, as I show in the previous section, an underlyingly accented suffix assigns stress at the right edge of the OSD when it coincides with the third syllable of a tri-syllabic root, even if an underlyingly unaccented suffix interferes:

(52)   raʔiˈt͡ʃa-ri-ma

       speak-CAUS-FUT.SG

       'She'll make him speak.'

(53)   x   Line 2

              x   x   Line 1

       σ σ σ   σ

       (raʔit͡ʃa)_{OSD}-ri-ma

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raʔiˈt͡ʃarima   Surface form

As shown above, if an underlyingly accented suffix is outside of the OSD, but the right edge of the OSD is stressable, the pre-accenting pattern surfaces as in (53). Notably, although this pre-accenting appears to be operating at a 'long-distance' in the surface syllabic sequence, it is actually strictly local in the syllabic sequence projected onto the stress grid.

Finally, consider a stress derivation for forms like (20b), repeated below as (54).

(54)   ˈlani-sa

         bleed-COND

         'If s/he bleeds.'

In (54), the root is underlyingly accented on the first syllable, and the conditional suffix *-sa* is lexically accented as well, thus, a competition arises. According to the *Directional Accent* account proposed in this chapter, in the cases of accent competition, the leftmost of the underlying accents always wins due to the application of SELECT (L), (26). The stress derivation for forms like (54) is thus the following:

(55)   x   Line 2: Promote Leftmost 'x' by SELECT (L)

         x   x   Line 1: Project LA

         σ σ σ

         (lani-sa)ₒₛᴅ

         Surface form   Assign primary stress to the promoted 'x'

         ˈ**la**nisa

In (55), the underlyingly accented suffix is the rightmost syllable within the OSD. Its accent is thus in competition with the underlying accent projected by the root. By the regular application

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of the *Directional Accent* competition resolution, the leftmost of the competing accents receives primary stress due to the appropriate setting of the SELECT parameter (26).

4.5 Eliminating the exceptional pattern

So far, I have proposed an analysis of the stress system of CR where all the stress patterns can be accounted for with a combination of (i) the trisyllabic OSD, (ii) underlying accent specification for each of the morphemes within a wordform, (iii) default second-syllable stress, and (iv) an accent competition resolution whereby the leftmost lexical accent wins. In this section, I will propose that under the analysis detailed in this chapter, no additional assumptions or idiosyncratic mechanisms are needed to account for a stress pattern which in the previous analyses required an exceptional rule. I begin this section with a discussion of stress in denominal verbs, proposing that the regular stress variation between the nominal base and the verbal derivative can be captured with the regular in the language interpretation of underlying accents in suffixes as obligatorily aligning to the right edge of the OSD . I will then proceed to the noun incorporation constructions, and I will argue that the same analysis can be applied to those, thus eliminating the need for an exceptional rule proposed in Caballero (2008, 2011).

4.5.1 Stress in denominal verbs

In the previous section, it has been shown that stress assignment fails to apply to some phonological material, namely the phonologically overt affixes which do not carry an underlying accent. In this section, I provide an analysis of stress patterns in denominal verbs, which in CR can be morphologically formed either with one of the overt verbalizing morphemes or with no segmentally overt verbalizing suffix. Crucially, in both cases, the third syllable stress pattern surfaces. I will propose a unified analysis for both kinds of verbalized nominals and I will argue that the third syllable stress pattern arises due to the regular in the language interpretation of underlying accent in the suffixes (cf. **4.3.4**).

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Consider examples of denominal verbs in (56a-d):

(56a) siˈput͡ʃa   (56b) sipuˈt͡ʃa-ma

skirt   skirt-FUT.SG

'a skirt'   'S/he will put a skirt on.'

(56c) naˈpat͡ʃa   (56d) napaˈt͡ʃa-ri

blouse   blouse-PST

'a blouse'   'S/he put a blouse on.'

(adapted from Caballero 2008:119)

In the pairs of examples in (56a-d), despite the lack of an overt verbalizing morpheme, the stress position in verbs changes if compared with the nouns. The stress shift in (56b) and (5d) cannot be attributed to the effects of the tense inflection: while the future single suffix is underlyingy accented and thus could potentially be producing the third-syllable stress, the past tense suffix -ri is underlyingly unaccented, cf. (57) below where default second-syllable stress surfaces:

(57) suˈku-ri

scratch-PST

'S/he scratched.'

Note also that nouns in (56a) and (56c) are underlyingly unaccented and receive the default stress on the second syllable in the bare form. Thus, such forms as (56d) consist of two underlyingly unaccented segmentally overt morphemes, but in a derived environment they behave as though an underlyingly accented suffix is present. This pattern can be naturally accounted for if there is a derivational segmentally null underlyingly accented morpheme in

the word. I propose that one of the allomorphs of the verbalizing morpheme in the little *v* head in the morphological structure of CR is a segmentally null morpheme which carries an underlying accent: $-Ø^{+acc}$.

As with other underlyingly accented suffixes in the language, if $-Ø^{+acc}$ in *v* combines with an underlyingly accented root, the leftmost of the underlying accents is realized as stress (by SELECT (L)), which in most cases means that the underlying accent of the $-Ø^{+acc}$ in *v* loses the competition[58]. Consider the example below where an underlyingly accented noun retains its stress when verbalized:

(58a) reˈme

   tortilla

   'tortilla'

(58b) reˈme-ø-ma

   tortilla-VBLZ-FUT.SG

   'Will make tortillas.'

(adapted from Caballero 2008: 116)

Denominal verbalization in Choguita Rarámuri, as in other Uto-Aztecan languages, can also be achieved with a variety of overt verbalizing suffixes. Notably, all of them show the same stress pattern, i.e. the third syllable stress, consider examples in (59) with the verbalizing suffix *-ta/-ra* 'become, wear' and *-bu* 'remove', glossed as REV – 'reversive'; the relevant stressed syllables are bold-faced:

(59a) nori-ˈ**ra**-ma   ˈre

   cloud- VBLZ-FUT.SG   DUB

   'It will get cloudy.'[59]

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[58] See the next section, however, for cases where the accent in v [+acc] wins in the stress competition.

[59] The English translation of this example in the source is missing a translation for the dubitative morpheme. It is, however, present in the Spanish translation: 'Se va a nublar, parece.' (Cabllero 2008: 125).

(59b) niˈhe aka-ˈ**ra**-sa   sapato

       1SGN sandal-VBLZ-COND   shoes

       'I will wear shoes.'[60]

(59c) paˈt͡ʃa aˈti   muˈni riʔi-ˈ**bu**-a

       inside sitting beans stone-REV-PROG

       'He is sitting inside taking out stones from beans.'   (Caballero 2008: 125-126)

In (59a-b), the verbalizing morpheme is followed by an underlyingly accented suffix, while in (59c), it is followed by an underlyingly unaccented progressive suffix. Crucially, in both cases, the third syllable stress surfaces, just as it does in the denominal forms with no segmentally overt verbalizing morpheme (56). Importantly, overt verbalizing suffixes in CR do not solely signal the change of category, they also have distinct lexical meanings. For instance, the two suffixes exemplified in (59a-c) above have antonymous lexical meanings: the variety of meanings signaled by *-ta/-ra* can be abstractly summarized as 'to have (put, get) something on', while the *-bu* suffix appears to be roughly parallel semantically to the prefix *de-* in English and is used to indicate removal and separation. Moreover, at least some of these suffixes have lexical verbs as their diachronic source: for example, Caballero (2008: 126) suggests that suffix *-bu* has the verb *buʔe* 'to take away' as its lexical source (see also Miller 1996 for a discussion of verbalizing suffixes derived from lexical verbs in a closely related language Guarijío). Such twofold nature of the meaning of these suffixes (i.e. the verbalizing meaning and the lexical

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[60] Choguita Rarámuri, similarly to other Uto-Aztecan languages, allows for denominal verbs to take either a non-cognate but semantically related object as in (56b), or a cognate object, cf. (i) below:

(i)   he ˈna=ni   siˈput͡ʃa sipu-ˈta-mo   ˈra
        he PROX=1SGN skirt   skirt-VBLZ-FUT:SG CER
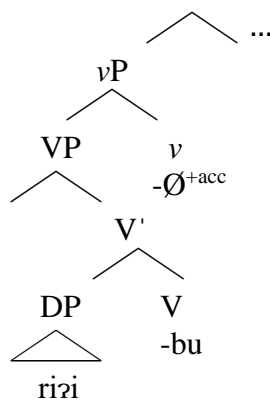   'I will wear this skirt.'   (adapted from Caballero 2008: 126)

I refer the reader to Haugen (2008) for a detailed syntactic analysis of such constructions and for a discussion of the significance of these facts for analyzing denominal verbs in these languages as formed by syntactic noun incorporation via head-movement.
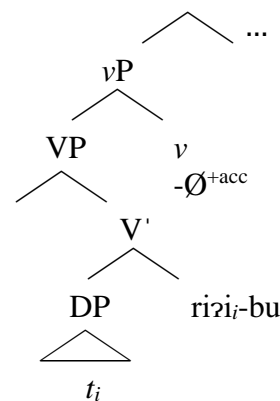
meaning) is captured in the structure proposed for denominal verbs in Uto-Aztecan languages in Haugen (2008) and Hale and Keyser (2002) and adopted here (60a-b)[61]. I follow Haugen (2008) who presents extensive data in support of treating the denominal verbs in Uto-Aztecan as syntactically formed through noun incorporation in the head-movement sense. The structure of denominal verbs adopted here is illustrated with the structure of the denominal verb in (59c)[62]:

(60)

a.

```
            ...
      vP
    /    \
  VP       v
 /  \    -Ø^{+acc}
    V'
   /  \
 DP     V
 /\    -bu
riʔi
```

b.

```
            ...
      vP
    /    \
  VP       v
 /  \    -Ø^{+acc}
    V'
   /  \
 DP    riʔi_i-bu
 /\
t_i
```

In (60), the head noun moves from the object DP and incorporates into the *v* via the V head[63]. I propose that denominal forms in (56) with no overt verbalizing morpheme, and forms with overt verbalizing suffixes in (59) show the same stress pattern because they contain the same morpheme in the structure, whose sole phonological realization is the underlying accent specification: in the structure in (60), this is shown as $-Ø^{+acc}$ in the *v* head. Compare a parallel structure in (62) for the verb in (56d), repeated below as (61):

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[61] For recent analyses of the complex internal structure of category-changing affixes see Creemers, Don, and Fenger (2018), and Lowenstamm (2015).

[62] CR, as most of Uto-Aztecan languages, is head-final, and the structures adopted in this chapter assume that the moving head attaches to the left of the higher head. A detailed morpho-syntactic analysis of these constructions is outside of the scope of this chapter. For empirical and theoretical issues with and justifications for the proposed structure, as well as for a discussion of alternative syntactic accounts I refer the reader to Haugen (2008: 163-204).

[63] DP as a complement of V in these constructions predicts that modifier-stranding should be possible in these constructions, and this prediction is borne out in Uto-Aztecan languages (see Haugen 2008: 140-142 for examples).
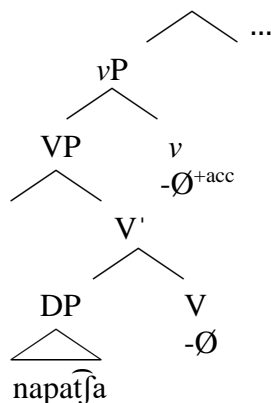
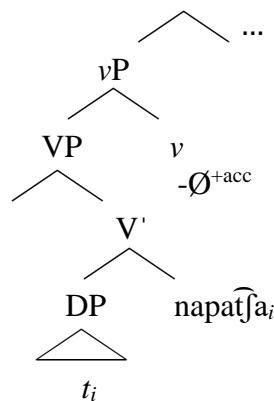(61)   napaˈt͡ʃa-ri

blouse-PST

'S/he put a blouse on.'   (adapted from Caballero 2008:119)

(62)
a.

```
                  ∧ ...
        vP
       ∧
   VP      v
  ∧      -Ø^{+acc}
     V'
    ∧
  DP     V
 △      -Ø
napat͡ʃa
```

b.

```
                  ∧ ...
        vP
       ∧
   VP      v
  ∧      -Ø^{+acc}
     V'
    ∧
  DP     napat͡ʃa_i
 △
  t_i
```

In (62), in parallel to (60) above, the verb is formed through incorporation of the noun via head-movement, and the stress placement in such a form is determined by the presence of an underlyingly accented segmentally null suffix (in the absence of other underlying accents in the word).

Under the proposed analysis the allomorph of *v* in denominal verbs carries an underlying accent while the allomorph of *v* in verbs which do not involve noun incorporation does not have such a specification. A question arises whether there might be any additional evidence in the language for distinguishing the two allomorphs. In the next section, I show that we indeed find such evidence. Crucially, we find it in the type of constructions where we would expect it to surface if the analysis of the denominal verbs in Uto-Aztecan languages as derived through syntactic noun incorporation proposed in Haugen (2008) and adopted here is correct. Such additional evidence will come from the stress pattern observed in body-part incorporation constructions.

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4.5.2 Stress in noun incorporation constructions

In this section, I address a stress pattern which has been deemed exceptional in the previous analyses of CR stress – namely, stress placement in noun-incorporation (NI) constructions. I will argue that the analysis detailed above for denominal verbs can be applied to the NI forms, thus eliminating the need for an exceptional rule proposed in Caballero (2008, 2011). The advantage of the account proposed below for stress in NI is twofold. Firstly, the proposed account explicitly connects identical stress patterns observed in denominal verb forms and the NI constructions to them being morpho-syntactically related, meaning that it is not an accident that we observe the same prosodic behavior in the two constructions. Secondly, it eliminates the need for an exceptional rule in the grammar by capturing the stress pattern in NI constructions through the regular interpretation of the underlying accent in suffixes proposed in this chapter, i.e. through aligning the underlying accent of a suffix to the right edge of the OSD. Moreover, I will argue that the stress pattern in NI forms crucially provides evidence in support of the *Directional Accent* analysis of CR stress proposed in this chapter, and against the *Root-Controlled Accent* (RCA) analysis proposed in Caballero (2008).

4.5.2.1 Data and previous analysis

Noun incorporation in CR is restricted to the so-called 'body-part incorporation' constructions, i.e. incorporation of noun roots referring to body parts and bodily fluids (Caballero 2008: 121). Let us consider examples of body-part incorporation in (63)[64]:

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[64] Other Uto-Aztecan languages do not necessarily limit incorporation to nouns denoting body parts and fluids allowing for incorporation of semantically diverse nominals. In addition, other Uto-Aztecan languages also have productive instrument- and manner-incorporation, while CR retains only a small set of lexicalized non-productive incorporated roots of this category (see Caballero 2008: 121 for some examples, and Haugen 2008: 120 for examples of productive instrument-incorporation constructions in other Uto-Aztecan languages).

(63a) t͡ʃoma-ˈbiʔwa　　　(63b) busi-ˈkasi

　　　mucus-clean　　　　　　　eye-break

　　　'to clean mucus'　　　　　'to be blind'

(63c) moʔo-ˈrepi-ri　　　(63d) siwa-ˈboti-ri

　　　head-cut-PST　　　　　　　guts-loosen-PST

　　　'behead.pst'　　　　　　　'disembowel.pst'　　　(Caballero 2008: 122)

Examples in (63) above show that, just like in the denominal verbs, (i) the third-syllable stress surfaces in NI forms, and that (ii) the third-syllable stress surfaces in NI forms which are not carrying any overt inflection (63a-b) as well as in the forms affixed with the underlyingly unaccented past tense suffix *-ri* (63c-d). Crucially, and unlike the denominal verbs, Caballero (2008: 191) observes that the third syllable stress pattern surfaces in NI forms regardless of the underlying accentual make-up of the verbal roots[65]. For instance, the verb *biʔwa* 'to clean' from (63a) has an underlying accent on the second syllable which can be seen when it is affixed with underlyingly accented suffixes (64a-c below):

(64a) biʔˈwa-ma

　　　clean-FUT.SG

　　　'S/he will clean.'

---

[65] The majority of the body-part noun roots are underlyingly unaccented and receive the second syllable default when used in isolation, I have not been able to find clear examples of incorporated underlyingly accented noun roots.

(64b) biʔˈwa-sa

clean-COND

'If s/he cleans.'

(64c) biʔˈwa-nare

clean-DESID

'S/he wants to clean.'   (Caballero 2008:192)

In verbal forms with body-part incorporation such as (63a), the stress position thus does not coincide with the position of the underlying accent in the verb root, which would produce an illicit fourth syllable stress. However, the second syllable default, which could be predicted in such a situation, also fails to apply, and instead the third-syllable stress surfaces in all cases. The third syllable stress thus is surprising under the RCA analysis, since the root accent gets deleted. This also holds for the verb forms incorporating trisyllabic nouns, consider the examples below[66]:

(65a) t͡ʃameˈka-repu   * t͡ʃameka-ˈrepu

tongue-cut

'to cut a tongue'

---

[66] Caballero (2008: 191-193) notes that trisyllabic body part roots are not very common, and it is usual for trisyllabic noun roots to syncopate the last syllable in the body-part incorporation constructions, for example, the root *kutat͡ʃi* 'neck' from (65b) would regularly surface as *kuta* when incorporated:

(i)   kuta-ˈbiri
           neck-twist
           'to twist a neck'

The forms in (65) with the unsyncopated trisyllabic roots and the stress on the third syllable are, however, reported as acceptable by the speakers.

(65b) kutaˈt͡ʃi-repu   * kutat͡ʃi-ˈrepu

       neck-cut

       'to cut a neck'   (Caballero 2008: 193)

Caballero (2008) argues that a special noun-incorporation stress rule is needed to account for the third-syllable stress in the NI forms:

(66)   The head of the incorporation construction, the verbal root, must bear stress in the first

        syllable.   (Caballero 2008: 192)

In Caballero (2011), the rule in (66) is stated in the form of a special, Choguita-Rarámuri-specific, constraint:

(67)   ACC-TO-HEAD(σ1): The head of an incorporation construction must have a stress in

        the first syllable.

The rule in (66)-(67), however, wrongly predicts the stress position in the forms where a verb incorporates a trisyllabic noun, recall examples in (65). In forms such as (65), Caballero's rule predicts that we should find the stress on the first syllable of the verb root, contrary to the facts. This means that the forms like (65), under Caballero's analysis, would be treated as an 'exception to an exception' requiring yet another additional rule.

4.5.2.2 Proposal: NI involves -Ø⁺ᵃᶜᶜ in *v*

In this section, I propose an alternative account of stress in the NI forms in CR. I argue that the third-syllable stress in NI constructions in CR results from the same accentual specification of *v* as seen in **4.5.1** for the denominal verbs. It has been argued on multiple occasions that denominal verbs are morpho-syntactically formed in a way which is highly comparable to noun-incorporation (Hale and Keyser 1993; Haugen 2008; Hill 2003; Johns 2017; Sadock 1980, 1986). I follow Haugen (2008) who presents extensive empirical and theoretical evidence

in support of treating denominal verbs and NI constructions as stemming from an identical syntactic construction specifically in Uto-Aztecan. Haugen (2008) proposes a unified morpho-syntactic analysis for the denominal verbs and NI as derived via head-movement of the noun into *v* in Uto-Aztecan languages. I will thus argue that the identical stress pattern observed in the denominal verbs and the NI constructions in CR is not an accident.

Recall the structure which I adopt from Haugen (2008) for the denominal verbs in (60)-(62), and compare it to the incorporating structure of the verb in (63a), repeated as (68) below:

(68) t͡ʃoma-ˈbiʔwa

mucus-clean

'to clean mucus'

(69)
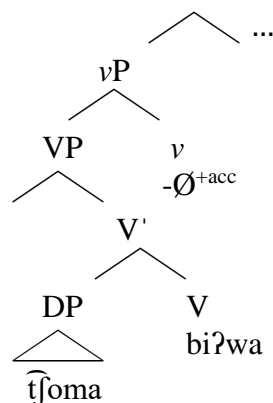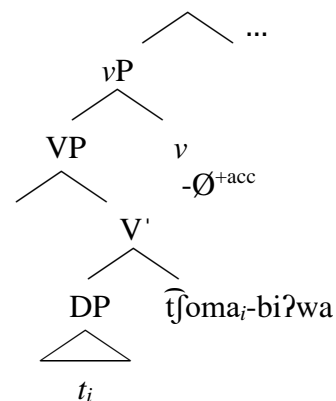
In (69), the noun originates in the direct object position and incorporates via head-movement into verbal position (keeping in mind the head-final nature of the language)[67]. Crucially, I

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[67] Incorporated nominals in the body-part incorporation constructions in CR may be modified, i.e. stranded modifiers are grammatical, which motivates positing a DP as the origin of the head noun in (69), consider an example in (i):

(i) ma   koˈsurti rono-ˈrepi-ri   ˈmono
     already   left   leg-cut-PST   doll
     'The doll's left leg already fell.'   (adapted from Caballero 2008: 122)

Haugen (2008), however, reports that in some Uto-Aztecan languages stranded modification of an incorporated noun in constructions like (i) is banned.

propose that the structure of the NI constructions in CR, just like the structure of denominal verbs, contains a segmentally null but underlyingly accented morpheme in *v:* $-Ø^{+acc}$.

Recall that third-syllable stress surfaces across the board in NI constructions. This pattern is particularly problematic for the RCA analysis of CR stress since the root accent does not win in forms like (68). Recall that the RCA analysis states that the underlying accent of the root must always surface as primary stress. In forms like (68), this would however result in stress on the fourth syllable which is disallowed in the language with an initial trisyllabic stress window. It can then be predicted that the second-syllable default would surface in such forms. Consider an abstract form in (70) below, where (70a) shows stress on the underlyingly accented syllable in the root, and (70b) shows the predicted second-syllable default; the underlyingly accented syllable in the root is bold-faced for clarity of exposition:

(70)   Stress position in NI constructions predicted by RCA analysis

   a.   √ σ σ -√ σ ˈσ   (potentially by DEFAULT) →   b.   √ σ ˈσ -√ σ **σ**

A different prediction is, however, made by the analysis proposed here. By (69), the structure of a NI construction contains an underlyingly accented suffix $-Ø^{+acc}$ in *v*. Recall from **4.3.4**, I proposed that underlying accent in suffixes is always interpreted in CR in the same way, namely it results in an accent at the right edge of the OSD (31). Recall also that I proposed that CR is a *Directional Accent* system, meaning that whenever a competition between underlying accents within a single morphological word arises, it is resolved by preserving the leftmost of the competing accents. This has been formalized with the setting of the SELECT (L) parameter in (26) repeated as (71) below:

(71)   SELECT   **L/R**

     preserve the leftmost or the rightmost of the competing accents

The prediction of this analysis for a form like (70) is thus in (72), where (72a) shows the two accents in competition (i.e. the underlying accent of the root, and the underlying accent of the suffix), and (72b) shows the predicted surface stress position due to SELECT (L), (71). The underlyingly accented syllable in the root is bold-faced for clarity of exposition:

(72)   Stress position in NI constructions predicted by *Directional Accent* analysis

   a. $\sqrt{}\ \sigma\ \sigma\ \text{-}\sqrt{}'\sigma\ '\boldsymbol{\sigma}\text{-}\emptyset^{+acc}$ (by SELECT)   →   b. $\sqrt{}\ \sigma\ \sigma\ \text{-}\sqrt{}'\sigma\ \boldsymbol{\sigma}$

The third syllable stress observed in (68) is thus exactly what is predicted by an analysis in which NI involves an underlyingly accented suffix in *v* (69) in combination with the setting of the SELECT parameter in (71). Thus, as predicted by the analysis proposed here, and contrary to the predictions of the *Root-Controlled Accent* analysis, in NI constructions, the leftmost underlying accent wins (even though it is not the underlying accent of the root). Consider now the full stress derivation in an actual form as an illustration of (72).

(73)   t͡ʃoma-ˈbiʔwa-Ø$^{+acc}$

   mucus-clean-VBLZ

   'to clean mucus'

(74)   x   Line 2: Promote Leftmost 'x'

        x   x   Line 1: Project LA

     σ σ σ   σ

   (t͡ʃoma-biʔ)$_{OSD}$wa-Ø$^{+acc}$

   Surface form: Assign stress to the promoted 'x'

   t͡ʃomaˈ**biʔ**wa

The derivation in (74) thus shows that the prediction made by the analysis proposed in this chapter is borne out while the prediction of the RCA analysis is not. However, recall that Caballero (2008) proposed a separate rule for the NI stress, making it in a way exempt from the predictions made by the RCA analysis. That rule (66)-(67) would result in the same surface stress position in forms like (73), i.e. it explicitly demands the stress in NI to fall on the initial syllable of the head of the NI construction. However, the predictions of the analysis proposed here and the NI stress rule proposed by Caballero differ with respect to the stress position in NI forms where a trisyllabic root is incorporated, consider (74) vs. (76) below:

(75)   Prediction of the Special rule (66)-(67) for NI with 3-syl. noun roots

   a. √ σ σ σ -√ 'σ σ (potentially by DEFAULT) →   b. √ σ 'σ σ -√ σ σ

(76)   Prediction of the current analysis for NI with 3-syl. noun roots

   √ σ σ 'σ -√ σ σ -Ø$^{+acc}$

Recall, examples in (65) show that the prediction made by the special NI stress rule in Caballero (2008, 2011) and schematized in (75) does not hold, while the prediction made by the current analysis (76) is borne out.

The analysis of stress in NI constructions developed above captures a number of important generalizations. Firstly, unlike the special stress rule in (66)-(67), the current analysis captures the generalization that NI constructions behave with respect to stress in exactly the same way as denominal verbs. The analysis proposed here explicitly derives the identical stress pattern in denominal verb forms and the NI constructions from them being morpho-syntactically related. It is thus not an accident that we observe the same prosodic behavior in the two constructions. Secondly, the current analysis, unlike the special rule in (66)-(67) also captures the generalization that NI forms behave with respect to stress in the same way as any word containing an underlyingly accented suffix, i.e. they exhibit the third-syllable stress. In

the current analysis, this is naturally derived from NI forms containing an underlyingly accented (segmentally null) suffix in *v*. That suffix behaves in exactly the same way as all the other underlyingly accented suffixes in the language (refer back to **4.3.4**), namely it projects an accent at the right edge of the OSD, i.e. always on the third syllable if one is available. The seemingly exceptional pattern is thus captured with the regular stress mechanism in the proposed analysis.

The noun incorporation constructions provide crucial evidence in support of the analysis of the Choguita Rarámuri stress patterns proposed in this chapter. More specifically, they show that even though the language lacks productive prefixation, it is still possible to differentiate between the *Directional Accent* analysis proposed here and the *Root-Controlled Accent* analysis previously proposed for this language. Crucially, we find no support for the *RCA*, while all the stress patterns in the language can be uniformly captured with the *Directional Accent* analysis. Compare the stress assignment mechanisms required for the two analyses in table 2 below:

Rules required in previous analysis	Rules required in current analysis
i. Underlying ±acc	i. Underlying ±acc
ii. 3-syllable stress window	ii. 3-syllable stress window
iii. Root^{+acc}-Suffix^{+acc}: Root wins	iii. 2nd-syllable Default
iv. NI rule	iv. *Directional Accent:* SELECT (L)
v. NI rule in 3-syl. verbs	
vi. Denominal verbs w/o overt VRBLZ	
vii. Denominal verbs w. overt VRBLZ	

Table 2. Comparison of the stress assignment mechanisms required in Caballero (2008, 2011) vs. the current analysis

The analysis proposed here for Choguita Rarámuri stress thus achieves a larger empirical coverage with a smaller set of analytical operations and without requiring idiosyncratic language-specific rules or constraints.

4.6 Summary of the chapter

In this chapter, I have reviewed the evidence for Root-Controlled lexical accent systems. The main take-aways of this chapter are the following. Firstly, there appear to be no clear cases of Root-Controlled Accent in highly synthetic languages described and analyzed in the literature. Secondly, I propose that the two cases where roots seem to win in stress competition over affixes can be reanalyzed in a typologically more economical and unmarked way – namely as *Directional Accent* systems.

An analysis of Cupeño stress proposed by Yates (2017) ultimately shows that an account in terms of privileged root faithfulness advanced by Alderete (1999, 2001) is disadvantageous when compared to the BAP analysis (i.e. to a *Directional Accent* analysis). Such *Directional Accent* analysis makes no reference to the morphological distinction between roots and affixes, instead appealing only to the type of phonological mechanisms which are cross-linguistically well-established in both lexical stress systems and in phonologically predictable stress systems. I have proposed that the other language previously analyzed as a Root-Controlled Accent system – Choguita Rarámuri in fact can also be analyzed as a *Directional Accent* system. Such an analysis uniformly accounts for all the stress patterns in the language including the patterns which are problematic for the Root-Controlled Accent analysis[68].

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[68] It should be mentioned that a number of highly synthetic languages have been discussed in the literature where accent appears to be restricted to the root (see Rice *forth.* for an overview). In such languages, primary stress must be assigned within the root. These however are categorically different from the languages discussed in the current chapter: in languages such as Gitksan, Jamul Tiipay, Wappo and others discussed in Rice (*forth.*) there is no competition between accents in morphologically complex words as only roots carry underlying accent while all affixes are underlyingly unaccented (see for example a typologically interesting case of Gitksan stress in Forbes 2015 and a rather simple case of Wappo fixed root-initial stress in Sawyer 1991).

In the previous chapter, I addressed two Sahaptian languages - Ichishkiin and Nez Perce, which have been discussed in the literature as examples of Affix-Controlled Accent. Ichishkiin and Nez Perce have been analyzed as languages where affix faithfulness appears to be ranked higher than root faithfulness. I showed, however, that stress facts in these languages are better captured with a *Cyclic Accent* account thus eliminating the need for typologically unsupported constraints and constraint rankings. Thus, the analyses of Sahaptian stress (chapter **3**) together with the analyses of Uto-Aztecan stress proposed in the current chapter support the prediction made in the introduction (**1.3.1.3**): we do not find lexical accent languages where accent competition would be resolved by appealing to the identities of morphemes. The seeming cases of *Root-Controlled Accent* and *Affix-Controlled Accent* can always be reanalyzed in a more economical and typologically unmarked way as either *Cyclic Accent* or *Directional Accent.*

CHAPTER 5. CULMINATIVITY OF STRESS AS A MACROPARAMETER

5.1 Culminativity of stress in highly synthetic languages

This chapter begins the discussion of the second group of proposals made in this dissertation, namely proposals related to re-evaluating the defining properties of stress and prosody – Culminativity and Obligatoriness of stress and primary versus non-primary stress in their application to languages with complex morphology. The main focus of this chapter is on the notion of Culminativity of stress. To an extent, I concur with the view on Culminativity and Obligatorinness presented in Hyman (2006, 2009), specifically in that Culminativity and Obligatorinness should be regarded as parameters rather than principles. However, I propose to define Culminativity of stress as a macroparameter encompassing a number of microparameters rather than a simple binary parameter. I argue that even when on the surface it might seem that some languages with complex morphology have non-culminative stress, they still have culminative stress if Culminativity is defined as a macroparameter consisting of a number of relevant microparameters.

The goal of this chapter is twofold: firstly, I aim to evaluate two hypotheses stated in the introduction regarding the role of Culminativity and Obligatoriness of stress in languages with complex morphology (see (4) below). Secondly, I aim to define the possible domains of culminativity of stress in highly synthetic languages. I will propose that the domains of stress Culminativity vary from language to language and the observed variation should be captured with a macroparametric definition of Culminativity.

Culminativity of stress has been a topic of debate in the accent and stress literature ever since the introduction of the concept in Trubetzkoy (1939). Since then, the formal scholarship has attempted to envision Culminativity as a principle (Hayes 1995), as a parameter (Hyman 2006, 2009); in Optimality Theory accounts – as a violable or an inviolable constraint (Alderete

1999, and Smith 2005, respectively), or as a universal property of Gen (McCarthy 2003: 110). While some studies view Culminativity as an independent trait of stress systems, others treat it as being conjoined with another definitional trait – Obligatoriness. Consider a representative definition of Culminativity as an independent trait from Hyman (2009: 217) in (1):

(1) 'Culminativity: every lexical word has AT MOST one syllable marked for the highest degree of metrical prominence (primary stress).'

On the other hand, many accounts take Culminativity of stress to mean *one and only one* stress per word, compare (1) to (2) below from Hayes (1995: 24):

(2) 'One distinctive phonological characteristic of stress is that it is normally **culminative,** in the sense that each word or phrase has a single strongest syllable bearing the main stress (Liberman and Prince 1977, 262).'

Culminativity has been modelled as a definitional trait of metrical stress systems. In the early instantiations of the Metrical Theory (Liberman 1975; Liberman and Prince 1977; Halle and Vergnaud 1978), Culminativity followed from the formal organization of the prosodic structure. The theory aimed to capture the hierarchical nature of stress using metrical trees where stress was represented as a hierarchy of binary *strong* and *weak* structures. A single most prominent head of a word (the so-called Designated Terminal Element, or DTE) was a consequence of such representation:

(3)　　　　word

　　　　w　　　　s

　s　　w　　s　　w

　A　　la　　ba　　ma　　　　　　　(example adopted from Kager 1995: 368)

In the versions of Metrical Theory relying on metrical grid (Liberman 1975), Culminativity had to be stipulated since in contrast to the versions of the Metrical Theory relying on the hierarchical tree structures such as (3), the structure of a metrical grid in itself does not formally impose Culminativity. Thus, *ad hoc* principles and mechanisms were introduced to ensure that the highest level of the grid contains only one grid mark, for example the 'End Rule' (Prince 1983).

Culminativity as a principle, as a parameter, as a violable constraint, or a non-violable constraint has been proposed for and largely empirically substantiated by metrical accent systems. On the other hand, theories which treat lexical accents formally in the same way as metrical accents, would make identical predictions for the two. Thus, for instance, theories which treat lexical accent marking as *diacritic weight* (i.e. with traditional metrical devices), would be expected to apply Culminativity to lexical accent systems in the same way that it is applied to metrical accent systems (for the *diacritic weight* take on lexical accent see van der Hulst 1999, 2009, 2010, 2012; Idsardi 1992, 2009). With regard to Culminativity of stress, such theories appear to capture the common pattern: examples of breaches of Culminativity at the morphological word level in lexical accent systems are remarkably scarce in the literature[69]. In what follows, I will argue that even when on the surface it might seem that some of lexical stress languages with complex morphology have non-culminative stress, they still have

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[69] An important note on the level of application of Culminativity is in order. As noted in van der Hulst (forth.), Culminativity in the traditional sense is a property of stress rather than accent. In other words, languages seem to not impose restrictions on the number of abstract accent marks within the word domain, however, there is a competition between the abstract marks to be realized as a single primary stress. It may, however, turn out that in some domains accent, and not stress, is culminative. The most obvious candidate for such domain of accent Culminativity in lexical stress languages appears to be a morpheme. Indeed, I am not aware of a single language where morphemes would regularly be marked with more than one underlying accent.

Culminative stress if Culminativity is defined as a macroparameter consisting of a number of relevant microparameters[70].

5.1.1 Culminativity: Hypotheses

I begin this section with two hypotheses (H) regarding the application of Culminativity and Obligatoriness of stress to highly synthetic languages stated in the Introduction to this thesis and repeated below as (4).

(4)   Culminativity and Obligatoriness of Stress in highly synthetic languages

H1. Phonological length and morphological complexity of morphological words in languages with highly synthetic morphology creates less pressure to demarcate morphological words which diminishes the relevance of Culminativity and Obligatoriness of stress in such languages as traditionally understood.

H2. We expect to find an emphasis on demarcation of morphemes or sub-word morphological domains.

The hypotheses in (4) raise three relevant research questions (RQ):

(5)   Culminativity and Obligatoriness: Research questions

RQ1. Do highly synthetic languages present counterexamples to the hypothesized universals of accent – culminativity and obligatoriness?

RQ2. Is prominence in highly synthetic languages dependent on the demarcation of word-internal morphological domains?

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[70] It is worth noting that the observed scarcity of examples of languages with non-culminative stress might be attributed to the pressure from the Metrical Theory bias. Linguists might want to seek to analyze multiple accents in a word whenever they observe them as a single primary stress and a number of secondary stresses (or stresses belonging to some other non-word level, e.g. phrasal). Such analyses, especially for under-described languages, are most often based on impressionistic assessment of phonetic salience of multiple accented syllables in a word. In the recent years, a number of publications have brought to light problems faced by such metrical bias in the analyses of understudied accent systems (see for example de Lacy 2014, Molineaux 2018, *forth.*).

RQ3. Does prominence in highly synthetic languages demarcate morphological words?

In the remaining of this chapter, I will review evidence relevant for evaluating the hypotheses in (4), and for answering the research questions in (5). It will be shown that languages with highly synthetic morphologies indeed tend to allow for (or require) the demarcation of word-internal morphological domains more readily than languages of other morphological profiles traditionally presented in the stress literature, thus suggesting an affirmative answer to RQ2 above. I will, however, conclude answering RQ1 that Obligatoriness of stress appears to be inviolable among the languages in question, while Culminativity of stress needs to be revised and restated as a macroparameter in order to account for the diversity of constraints on stress competition observed in highly synthetic languages. Answering RQ3, I will demonstrate that although languages with highly synthetic morphology tend to demarcate word-internal domains, stress always demarcates the morphological word domain as well.

5.1.2 Culminativity as a macroparameter

It has long been noted that languages vary in the domain of application of Culminativity. In fact, Hayes (1995: 25) in a brief note on languages which have been reported to violate Culminativity (which also includes Obligatoriness in his terminology) states that 'culminativity may be a universal of stress systems, which is subject to parametric variation for the level at which it holds.' In *lexical accent* systems, the definition of the domain of Culminativity is closely related to the definitional trait of the lexical accent systems, i.e. the competition between underlying accents to be realized as primary stress, as it defines the boundaries of accent competition. I will argue that the domain of competition between lexical accents for stress as well as the surface manifestation of the competition vary from language to language, and this variation is produced by different possible setting of microparameters of Culminativity.

The maximal size of the domain of Culminativity appears to be empirically universal – stresses are in competition maximally within the boundaries of a morphological word. In other words, we do not find languages in which accents would be competing for being realized as primary stress across word boundaries (see Kaisse 2017 for a typological overview and some seeming exceptions)[71]. The universality of the maximal domain of Culminativity holds for highly synthetic languages as well. Consider an example from Arapaho. Recall from **2.3.2,** Arapaho disallows stress clashes within a morphological word, and they trigger the application of SELECT (R). Importantly, clashes are tolerated *between* morphological words (the clash is bold-faced):

(6)   nih-ˈnoohow-oʔ   hiˈ**nen** ˈ**h\<e\>et**-noˈhʔ-ot

         PST-see-1>3   man   \<IC\>FUT-kill-2SG

         'I saw the man that you were going to kill.'   (Goddard, *n.d.*)

The universal isomorphism of the maximal domain of Culminativity with a morphological word produces the axiom stating that the domain of stress assignment is a (lexical/morphological/phonological/prosodic) word. Consequently, it produced the widely accepted assumption that stress is a definitional trait of *wordhood* in stress languages (e.g. Hayes 1995, van der Hulst 1999) and the formula of '*one stress=one (P)word'.* This latter assumption is, however, what appears to be problematic for the highly synthetic languages data. In these languages, the *minimal* domain of Culminativity may in fact be smaller than both the morphological word and the prosodic word, coinciding rather with some morphologically defined domain within a complex morphological word: the root or the stem (root+some affixes), the prefixal domain, or the suffixal domain[72]. I propose to account for this by

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[71] See, however, Gordon and Applebaum (2010) for an interesting case of an interaction between stress and minimal word constraints in a highly synthetic Northwest Caucasian language Kabardian.

[72] For a recent morpho-syntactic account of mismatches between morphological and prosodic words and the effects of such mismatches on stress assignment see Fenger (2020: chapters 2,3).

redefining Culminativity as a macroparameter. Below, I propose a definition of Culminativity of a phonological feature x (PF$_x$) as a macroparameter encompassing the related microparameters:

(7)   Culminativity microparameters

    i.   Is PF$_x$ culminative in *some* domain in the language?   Y/N, if Y:

        a. Is PF$_x$ culminative in roots?   Y/N

        b. Is PF$_x$ culminative in stems?   Y/N

        c. Is PF$_x$ culminative in MWord?   Y/N

        d. …

    ii.   Are two adjacent units bearing PF$_x$ banned in *some* domain?   Y/N

The definition of Culminativity in (7) is stated in general terms and does not imply that these microparameters must be unique to stress. On the contrary, for any phonological property which exhibits culminativity, we might expect to encounter systems which vary along these microparametric values. Such general definition of Culminativity is motivated by the fact that phonological features other than stress may exhibit Culminativity[73]. The most obvious example of this is culminative tone found, for example, in Tibeto-Burman languages of Sichuan (Evans 2009) and in Somali (Hyman 2006). However, non-prosodic phonological features can exhibit culminativity as well. Hyman (2006, 2011), for instance, lists the following examples of Culminativity outside of stress:

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[73] This is crucially different from Culminativity as defined in the Metrical Theory which derives Culminativity from the structural nature of stress: stress is culminative within a domain because prominence relations are imposed at all levels of the grid. Thus, there is always a topmost level with a single grid mark. Hayes (1995: 30) explicitly states that 'genuine phonological features such as [round] or [nasal] are not distributed culminatively because they do not form hierarchical domains across the phonological string.' This is contrary to the empirical facts presented in Hyman (2006, 2011), see examples of culminative phonological features in (8).

(8)   Culminative properties

(8a)   aspiration and glottalization in Cuzco Quechua (Quechuan; on the topic see Parker and

        Weber 1996; Parker 1997);

(8b)   vowel length in Mam (Mayan; see Willard 2004);

(8c)   mid vowels in Punu (Bantu; see Hyman 2002);

(8d)   nasalized vowels in Karo (Tupian; see Gabas 1999).

The microparameters in (7) may be restated specifically for Culminativity of stress in the

following way:

(9)   Stress Culminativity microparameters

    i.   Is stress culminative in *some* domain in the language?   Y/N, if Y:

        a. Is stress culminative in roots?   Y/N

        b. Is stress culminative in stems?   Y/N

        c. Is stress culminative in MWord?   Y/N

    ii.   Is stress clash banned in some domain?   Y/N

The motivation behind stating (9-i) and (9-ii) as the microparameters of Culminativity of stress

is based on the fact that the positive setting for either of these microparameters would trigger

the application of a stress competition resolution active in a particular language. Thus, for

example, in a *Directional Accent* language, if either of the two microparameters is set to 'Y',

the application of SELECT (L/R) will be triggered in the appropriate environment.

        According to the traditional definitions of Culminativity, we should not be able to find

a stress language, i.e. a language in which syllabic prominence is phonetically cued with a

combination of multiple acoustic features (duration, modulations of F0, higher intensity,

among other possible cues, see Gordon and Roettger 2017), in which more than one syllable

of the highest degree of prominence can be found within a *word*. According to the macroparametric definition of Culminativity (9), we should not be able to find a stress language with the negative setting for both microparameters (9-i) and (9-ii). Let us consider data from three unrelated synthetic languages – Arapaho, Mapudungun, and Bininj Gun-wok to evaluate the predictions made by the traditional definitions of Culminativity (1)-(2) versus the predictions made by the macroparametric approach to Culminativity proposed here. The three highly synthetic languages discussed in the next section present three possible combinations of the settings of parameters (9-i) and (9-ii): Arapaho allows for multiple stresses across different domains within a morphological word thus having the **'N'** setting for the parameter (9-i), but it disallows stress clashes within a morphological word, setting the parameter (9-ii) to **'Y'.** Mapudungun will be shown to have a positive setting for both microparameters. Finally, Bininj Gun-wok has culminative stress within several intra-word domains setting the parameter (9-i) to **'Y'**, but it appears to allow stress clashes between such word-internal domains, setting parameter (9-ii) to **'N'.**

5.1.2.1 Culminativity macroparameter in highly synthetic languages

Recall from **2.3.2-2.3.3,** complex words in Arapaho often have multiple stresses on the surface. Consider again examples of nouns repeated below as (10), and of verbal forms repeated below as (11); stressed syllables are bold-faced:

(10)   Nouns with more than one stress

(10a)   be.ˈce.ʔi.ʔoo   'cheek'   (10b)   be.ˈ**ce**.ʔi.ˈ**ʔoo.**no   'cheeks'

(10c)   ni.ˈsi.ko.coo   'cake'   (10d)   ni.ˈ**si.**ko.ˈ**coo.**no   'cakes'

(11)   Verbs with more than one stress

(11a)   ˈ**nii.**ʔee.ne.ˈ**be.**θen

         ˈn\<i\>iʔeeneˈb-eθen

         \<IC\>like-1\>2

         'I like you.'

(11b)   ˈ**nii.**ʔee.ˈ**ne.**be ˈ**ti.**θiʔ

         ˈn\<i\>iʔeeˈneb-eˈti-θiʔ

         \<IC\>like-REFL-3PL

         'They like themselves.'

In both nouns in (10a-d), the roots are underlyingly accented, and they realize their accent as stress. When these nouns are affixed with the plural suffix, a default accent is additionally assigned to the penultimate syllable by DEFAULT (R) (see **2.3.2.2** for an analysis). The resulting wordform thus carries two stresses on the surface. The same pattern is responsible for two stresses in the verb in (11a), where the underlying accent on the initial syllable of the verb root is realized as stress, and a default stress is assigned to the penultimate syllable. In (11b), two surface stresses stem from underlying accents: the initial syllable of the verb root carries an underlying accent, while the reflexive suffix -*eti* is underlyingly pre-accenting, and its accent is realized as stress on the final syllable of the verb root. Finally, a default accent is additionally

assigned to the penultimate syllable by DEFAULT (R). Arapaho thus unambiguously allows for multiple stresses within a morphological word[74].

However, as discussed in **2.3.2-2.3.3,** Arapaho does not allow for clashing stresses within the morphological word domain, which suggests the positive setting for the microparameter (9-ii). In all cases stress clashes are resolved through the application of SELECT (R) (see **2.3.2.4** for examples and analysis). Thus, even though at first look it might seem that stress in Arapaho is non-culminative given frequent cases of multiple stresses in the surface forms, Arapaho has culminative stress and presents the first of three possible combinations of the stress Culminativity microparameters. It allows for multiple stresses across different domains within a morphological word thus having the **'N'** setting for the parameter (9-i), which creates the illusion of non-culminative stress in the language. However, it disallows stress clashes within a morphological word, setting the parameter (9-ii) to **'Y'.** The Culminativity microparameters in Arapaho are thus set in the following way:

(12)　　Stress Culminativity microparameters in Arapaho

　　i.　　　Is stress culminative in *some* domain in the language?　　　　Y/**N**

　　ii.　　Is stress clash banned in MWord?　　　　　　　　　　**Y**/N

It is worth noting that the domain of Culminativity in Arapaho coincides with the edges of the morphological word: stress clashes are banned in morphological words however long and

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[74] The issue of possible mismatches between morphological and prosodic words in highly synthetic languages is beyond the scope of this chapter (see for some examples, discussion and analyses in Arnhold 2014; Buckley *forth.;* Fenger 2020; Gordon *forth.;* Windsor 2017). There is however evidence that multiple stresses within morphological words in Arapaho belong not only to the same morphological word, but to the same prosodic word as well. Such evidence comes from phonotactic phenomena characteristic for within-the prosodic word syllable boundaries vs. those that are observed between prosodic (and morphological) words. For example, hiatus resolution patterns suggest that at least roots and suffixes form a single prosodic domain (which can be called a prosodic stem or a prosodic word) in Arapaho. This pattern is found in other languages as well, eg. Ojibwe, Plains Cree, Sahaptian languages, among many others. This then suggests that multiple stresses in the root+suffixes part of the word in examples such as (10)-(11) belong to the same prosodic word (or stem). The same is suggested by the vowel harmony patterns in the language: vowel harmony applies throughout the morphological word if the phonological environment permits (see Cowell and Moss 2011: 15-16, 20-22).

morphologically complex they might be. The morphological word domain is also demarcated by the Obligatory Stress Domain: recall from **2.3.2.1**, an accent must be assigned in a three-syllable window at the right edge of a morphological word in the language.

Another highly synthetic language which has been observed to allow for (and in fact to require) multiple stresses in complex verbal words is Mapudungun (isolate, Chile, Argentina; see Molineaux 2018, *forth.;* Pache 2014). The discussion of the Mapudungun stress patterns in this section is based on the data and analysis presented in Molineaux (*forth.*). Mapudungun presents an interesting case of a stress system which employs both weight-sensitivity and lexical marking in nominals and verbs, while in words of other categories it has a fixed stress – in adjectives, adverbs, and pronouns stress is word-final.

In minimally inflected verbs, i.e. in verbs affixed only with the obligatory mood, person, and number suffixes, stress is weight-sensitive right-aligned; it falls on the final syllable if closed, otherwise on the penultimate:

(13a)   ki.ˈm-in

       'know-1SG.IND'

(13b)   ʈʂi.ˈpa-n

       'enter-1SG.IND'

(13c)   ki.ˈm-i.-m-i

       'know-IND-2-SG'

(13d)   ʈʂi.ˈpa-j.-m-i

       'enter-IND-2-SG'   (Molineaux *forth.:* ex. 10a-d)

Morphologically complex verbs regularly have more than one stress none of which can be distinguished as 'primary' by either linguists working with the language or by the native speakers (Molineaux *forth.*; Smeets 2008: 49; Zúñiga 2017: 64). Consider the morphologically complex verbs in (14) adapted from Molineaux (*forth.*: ex. 11a-d); root (R) and word (W) in brackets, stressed syllables are bold-faced:

(14)   Morphologically complex verbs

(14a)   [[ˈ**lef**.]R-pu.-ˈ**le-j**]W

run-TRLOC-PROG-3SG.IND

'She/he/they is/are running here.'

(14b)   [[θew.ˈ**ma**.]R-ka.-ˈ**ki-j**]W

make-CONT-HAB-3SG.IND

'She/he/they is/are usually making.'

(14c)   [[ɨ.ˈ**t͡ʂif**.]R-tu.-pu.-ke.-ˈ**la-j.-**m-i]W

throw-rest-TRLOC-HAB-NEG-IND-2-SG

'You don't usually throw X back here.'

(14d)   [[t͡ʂi.ˈ**pa**.]R-ke.-ˈ**la-j.-**m-i]W

exit-HAB-NEG-IND-2-SG

'You don't usually go out.'

Molineaux (*forth.*) identifies two stress assignment patterns in complex verbs such as (14a-d). The first pattern is identical to the pattern identified for the minimally inflected verbs in (13), namely stress is weight-sensitive at the right edge of a morphological word. Thus in (14a-b),

we observe word-final stress because the last syllable is heavy, but in (14c-d) we observe penultimate stress because the final syllable is light. The stress at the left edge is, however, weight-insensitive and is assigned either (i) to the final syllable of the root (as in 14a-d), or (ii) to one of the valency or voice-changing suffixes if present (15a-b). Molineaux (*forth.*) terms the root+one of such suffixes a Stem (S):

(15)   Stress in verbs with complex verbal stems

(15a)   [[[tu.ku.]R-ˈŋe.]S-la.-ˈfu-j]W

         place-PASS-NEG-BI-3SG.IND

         'S/he (it) didn't used to be placed.'

(15b)   [[[la̰ .ŋ]R-ˈɨm.]S-ke-ˈfi-j]W

         die-CAUSE-HAB-DIR.3SP-3SG.IND

         'S/he usually killed him/her.'

Molineuax (*forth.*) proposes to analyze the left-edge stress as assigned to the final syllable of the Stem in all cases: whenever one of the stress-attracting valency/voice suffixes is present, they form the Stem together with the root. When no such suffixes are present, the root forms the Stem by itself (in the following examples, the root constituent is thus not marked, but the Stem constituent is marked instead in all cases).

Examples in (14)-(15) demonstrate that two stresses in complex verbal words are regularly assigned in Mapudungun, which clearly violates the Culminativity principle stated in traditional terms. However, by the macroparametric definition of Culminativity, Mapudungun has culminative stress as it sets both of the microparameters in (9) to '**Y**': firstly, as shown in the examples (14)-(15), it has culminative stress within the Stem (or the Root) domain. Secondly, clashes of the two obligatory stresses are banned in the language. When the

assignment of two regular stresses at the right edges of the two domains within a complex verb would result in a clash, Molineaux (*forth.*) reports that a clash is resolved directionally, and the right-hand stress wins. Consider the examples in (16) below:

(16a)   [[le.li.]ₛ-ˈ**fi-j**.-m-i]_W

   watch-3SP-IND-2-SG

   'You (sg.) watch him/her/it.'

(16b)   [[le.li.]ₛ-ˈ**fi.-j**]_W

   watch-3.SP-3.IND

   'She/he/they watch(es) him/her/it.'

In the terms proposed in this dissertation, the accent competition in Mapudungun is resolved *Directionally*. The relevant setting of the SELECT parameter is in (17):

(17)   SELECT   L/**R**

   preserve the leftmost or the rightmost of the competing accents

By (17), the right-hand stress in a clash situation is selected, and the left-hand one gets deleted, as observed in (16)[75]. The Culminativity microparameters in Mapudungun are thus set in the following way:

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[75] Molineaux (*forth.*) notes that the reverse pattern is observed when a competition arises between the 'word-level stress' and the stress on the Stem in forms like (15) where the Stem contains a root and one of the valency/voice-changing suffixes. In these cases, the stress on the suffix wins, and the right-hand stress gets deleted:

(i)   [[e.lu-ɲ.ˈ**ma.**]ₛ-fi-j.-m-i]_W
   give-APPL-3SP-IND-2-SG
   'You (sg.) give him/her/it x.'

(ii)   [[la̠ .ŋ-ˈ**ɨm**.]ₛ-fi-j]_W
   die-CAUS-3SP-3.IND
   'She/he/they kill(s) him/her/it.'

(18)   Stress Culminativity microparameters in Mapudungun

   i. Is stress culminative in *some* domain in the language?   **Y**/N, if Y:

      a. Is stress culminative in stems?   **Y**/N

      b. Is stress culminative in MWord?   Y/**N**

   ii. Is stress clash banned in MWord?   **Y**/N

It is also worth noting that stress is culminative in Mapudungun in morphologically simplex words, which is predicted by the parameter settings in (18). Stress patterns observed in Mapudungun, just like in Arapaho, thus provide crucial evidence for evaluating the hypotheses in (4) and for answering the research questions in (5). While we do observe that this language requires the demarcation of a domain internal to morphological words (i.e. the Stem domain), we also can observe that (i) Mapudungun just as well requires the demarcation of the morphological word domain by imposing obligatory stress assignment at the right edge of morphological words. Mapudungun presents the second possible combination of the Culminativity microparameters in (9): both (9-i) and (9-ii) are set to the positive setting in the language.

I illustrate the analytical differences between the traditional take on Culminativity and the macroparametric approach proposed here with another highly synthetic language – Bininj Gun-wok (also known as Bininj Kunwok and Mayali; Gunwinyguan, Bishop 2002; Evans

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Molineaux states the pattern exemplified in (i)-(ii) is an exception to the pattern in (16). An alternative way of analyzing this pattern would, perhaps, be to analyze these suffixes as underlyingly accented and carrying a 'dominant' lexical accent, which would ensure that their accent is always projected as stress, and would not require a reversal of the SELECT parameter. An in-depth analysis of these patterns is, however, beyond the scope of this chapter.

1997, 2003; Fletcher & Evans 2000; Mansfield *forth.*). In this language, morphologically simplex words normally carry a single fixed stress on the initial syllable[76]:

(19a)   ˈdaluk

'woman'

(19b)   ˈbininj

'man'

(19c)   ˈngurrurdu

'emu'

(19d)   ˈnganapbaru

'water buffalo'   (Bishop 2002: 122-124)

Morphologically complex verbs, however, regularly have multiple stress domains, each of which carries stress on the initial syllable. The verb root and TAM suffixes form a single domain, while each prefix that meets the bimoraic minimality requirement and each incorporated root forms a stress domain of its own; consider examples (20) below:

(20a)   ˈ**bi**rri-ˈ**kay**hmeng

3AUG-call.out.PST.PFV

'They called out.'

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[76] The description of the accent system of Bininj Gun-wok given here is simplified. The reader is referred to Bishop (2002) and Mansfield (*forth.*) for the details.

(20b)   Ø-ˈ**ra**woyh-ˈ**rdurd**du-ˈ**dad**jeng

   3-again-heart-cut.into.pieces.PST.PFV

   'They cut his heart into pieces.'   (Bishop 2002a: 150, 237)

Such word-internal stress domains in the language have been previously analyzed as
unbounded feet (Bishop 2002; Evans 2003) or as prosodic words with the entire morphological
word corresponding to a prosodic phrase (Mansfield *forth.*). The prominence on the initial
syllables of these domains is manifested both phonetically – primarily through higher
fundamental frequency, and phonologically: while vowels in non-initial syllables within
morphemes may be deleted, vowel deletion is unattested in the initial syllables of morphemes
(Bishop 2002; Fletcher & Evans 2002; Mansfield *forth.*). Multiple examples of complex
morphological words with more than one stress are reported in Bishop (2002), suggesting that
stress is not culminative within the morphological word domain in Bininj Gun-wok. However,
the observation that monomorphemic words normally carry a single stress, as does each of the
morphologically defined domains within a complex verb, suggests that stress is culminative in
Bininj Gun-wok in *some* domain.

   An unusual (albeit predicted by the parameters in (9)) property of the Bininj Gun-wok
stress system reported in Bishop (2002: 135-144) is that in polymorphemic words stress clashes
resulting from the regular accent assignment are tolerated. Consider examples in (21) where
two adjacent morphemes are assigned the regular initial stress, and both stresses are realized in
the surface forms resulting in a clash[77]:

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[77] See, however, Bishop (2002: 131-135) for a description of cases where clashes seem to be resolved by
deleting one of the clashing stresses.
.

(21a) ˈ**kan-**ˈ**wey**bu

     2>1-give.IMP

     'Give it to me.'

(21b) ˈ**ben-**ˈ**beng**kang

     3>3PL-know

     'He knew them.'

Stress Culminativity in Bininj Gun-wok is then parametrized in the following way:

(22)   Stress Culminativity microparameters in Bininj Gun-wok

    i. Is stress culminative in some domain in the language?   **Y**/N, if Y:

       a.   Is stress culminative in stems?   **Y**/N

       b.   Is stress culminative in MWord?   Y/**N**

    ii. Is stress clash banned in MWord?   Y/**N**

Bininj Gun-wok is thus another language which would traditionally be analyzed as a language with non-culminative stress, but which can be analyzed as a language with culminative stress if Culminativity is approached as a macroparameter. Bininj Gun-wok can be taken as an example of the third possible combination of the Stress Culminativity microparameters in (9): it has culminative stress within multiple word-internal domains setting the parameter (9-i) to **'Y'**, but it does not exhibit a ban on stress clashes between these word-internal domains, setting parameter (9-ii) to **'N'.**

5.1.3 Evaluating the hypotheses

Having reviewed the evidence for the Culminativity microparameters, let us now get back to the hypotheses and research questions stated in **5.1.1.** As shown by the examples of Arapaho,

Bininj Gun-wok, and Mapudungun in the previous section, we do observe that languages with complex morphology tend to demarcate morphemes or word-internal morphological domains through the assignment of multiple stresses of equal strength. An alternative employed in other highly synthetic languages is to signal such demarcation through secondary prominence. This is observed, for instance, in one of the highly synthetic languages discussed in detail in chapter **3** of this dissertation – Nez Perce. Recall from **3.3**, in Nez Perce multiple morphemes in a morphologically complex word can be underlyingly marked for accent. In such cases, one of the underlying accents receives primary stress (see **3.3.3-3.3.4** for the analysis). It is shown in Crook (1999: 383-387) that the remaining underlying accents, however, do not get deleted, but receive secondary stress. Consider the following form of the verb *ˈweeyik* 'cross' which is underlyingly accented on the initial syllable (23). In (23), the underlyingly accented root is combined with an underlyingly accented prefix *ˈnes-* marking a plural object, and an underlyingly accented directional suffix *-ˈuu.* The first line in the example presents the surface form, and the second line presents the underlying form:

(23)   hi-ˌnes-ˌweyiˈk-uu-se

hii-ˈnees-ˈweeyik-ˈuu-see

3-PL.OBJ-cross-toward-INC

'He is crossing toward them.'   (adapted from Crook 1999: 480)[78]

In (23), we observe that the root, one of the prefixes, and the suffix realize their underlying accent as stress. The primary stress is on the suffix, and the root and the prefix carry secondary stress. Thus, even though this language has Culminative primary stress, it does promote

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[78] In Nez Perce, in addition to lexical secondary stress, there is also regular rhythm. In these examples, I omit marking rhythm for the clarity of exposition. Refer to Crook (1999: 352-382) for a detailed description and analysis of predictable secondary stress in the language, and to chapter **6** of this dissertation for a theory of separation of secondary stress and rhythm.

demarcation of morphemes within a complex morphological word by retaining the underlying accents as secondary stresses.

Other highly synthetic languages have been reported to assign predictable secondary accents which could also be analyzed as demarcating morphological domains within complex verbs. An example of such a system is an Algonquian language Plains Cree[79]. According to Russell (1999), multiple accent domains are present in morphologically complex verb forms in the language. Primary stress is assigned in the default case to antepenultimate syllable in the Root+suffixes domain:

(24a) ˈpimisin   'S/he lies down.'

(24b) piˈmisin-i   'Lie down!'   (Russell 1999: 208)

Crucially, preverbs are outside of the primary stress assignment domain in Plains Cree, which is evident from verbs in which the Root+suffixes domain contains only two syllables and is preceded by a preverb. In these cases, primary stress falls on the penultimate syllable of the verb, i.e. within the Root+suffix domain with the exclusion of the preverb. The preverb, however, receives secondary stress, which, according to Russell (1999), is assigned in the same way as the primary stress within the Root+suffix domain – to the antepenultimate syllable if one is available, otherwise to penultimate, otherwise to the only syllable available in monosyllabic preverbs:

(25a) ˌki:-ˈni:pin   (25b) *ˈki:-ni:pin

        PST-be.summer

        'It was summer.'

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[79] Here, I rely mostly on the patterns presented in Russell (1999). See, however, Eung-Do Cook (1991) for a description of different patterns, as well as Claire Cook (2006) and Mühlbauer (2006) for some recent takes on the accent system of Plains Cree.

A similar pattern of word-internal domains demarcation is found in an Athabaskan language Tahltan. In the majority of cases, primary stress in this language is assigned to the initial syllable of the root, but a secondary stress is required in the prefixal domain. Secondary stress is penultimate in the prefixal domain, but is also obligatory even if the root is only prefixed with a single monosyllabic prefix, in which case a clash between the primary and the secondary stress occurs (Bob and Alderete 2005). The clashing secondary and primary stress pattern is exemplified in (26a-c) and the secondary stress assigned to the penultimate syllable in the prefixal domain is exemplified in (26d-f); the root morpheme in all examples is bold-faced:

(26)   Tahltan primary and secondary stress

(26a)   ˌme-ˈ**laʔ**   'his/her hand'

(26b)   ˌka:-ˈ**ts'et**   'I scratched it out.'

(26c)   ˌʔes-ˈ**θone**   'my star'

(26d)   meˌʔe-ˈ**k'ahe**   'his/her fat'

(26e)   ʔuˌdeθi:-ˈ**dlet**   'We (dual) melted it.'

(26f)   ʔeˌdʒi-da-ˈ**dał**   'S/he is going hunting.'   (Bob and Alderete 2005: 374)

In (26a-f), the root receives primary stress while the prefixal domain receives secondary stress, and both are predictable which potentially can serve for a clear demarcation of the word-internal domains for a learner. Athabaskan languages employ a wide range of segmental and prosodic devices to cue such domains; these include tone, stress, asymmetries in segmental inventories between the stem domain and the prefixal domain, as well as asymmetries in phonotactic restrictions (see, for example, McDonough 1999, 2000; Rice 1989, 2005).

Thus, examples of various techniques of highlighting word-internal domains, and, predominantly – the root or the stem – in highly synthetic languages support the hypothesis 2 (H2) stated in (3), and seem to suggest an affirmative answer to the research question 2: in functional terms, we find that in languages with complex morphologies, stress is often used to demarcate morphemes or word-internal domains rather than to demarcate word boundaries. However, the overall picture is hardly this straightforward. Firstly, we also find numerous highly synthetic languages which do not use stress to demarcate word-internal boundaries, but rather use it to demarcate word edges, as do languages of more moderate morphological complexity. Nahuatl (Uto-Aztecan) is an example of such a system, where a single stress is assigned to every word, generally to the penultimate syllable (Guion et al. 2010; Sischo 1979; Tuggy 1979; see, however, Wolgemuth 2002 for a discussion of dialects which exhibit a different pattern). Thus, even phonologically very long and morphologically complex forms bear a single penultimate stress, consider the verb form in (27):

(27) timit͡swa:lpale:wi:sˈnekin

      ti-mit͡s-wa:l-pale:wi:-s-ˈneki-n

      1PL.S-2SG.OBJ-INTRA.DR-to.help-FUT.SG-to.want-PRES.PL

      'We want to come help you.'   (Guion et al. 2010: 140)

Some other examples of highly synthetic languages with no evidence of word-internal domains demarcation include Kabardian – a Northwest Caucasian language (Gordon and Applebaum 2010, *forth.*), and two highly synthetic languages discussed in this dissertation in detail – Ichishkiin Sɨnwit (Hargus and Beavert 2006) and Choguita Rarámuri (Caballero 2008; Caballero and Carroll 2015). While it is possible that some reports simply do not mention secondary stress, which can create an illusion of the lacking stress marking for morphemes or

word-internal domains, the authors of the descriptions and analyses of the latter three languages specifically search for such marking and do not find it.

Secondly, and importantly, we find that stress participates in word demarcation in most of highly synthetic languages: stress placement at one of the edges, at least in the default case, appears to be the preferred pattern. Thus, even in languages where the demarcation of morphemes or word-internal domains is observed, we also observe the demarcation of the morphological word[80]. Consider the Mapudungun stress pattern again. In a morphologically complex word, one of the two obligatory stresses is assigned at the right edge of the word: word-final stress is assigned if the last syllable is heavy (28a), and penultimate stress is assigned when the final syllable is light (28b), recall examples in (15), repeated below as (28):

(28a)   [[tu.ku.-ˈŋe.]ₛ-la.-ˈfu-j]w

        place-PASS-NEG-BI-3SG.IND

        'S/he (it) didn't used to be placed.'

(28b)   [[la̠.ŋ-ˈɨm.]ₛ-ke-ˈfi-j]w

        die-CAUSE-HAB-DIR.3SP-3SG.IND

        'S/he usually killed him/her.'

Other languages, as has been discussed throughout this dissertation, impose an Obligatory Stress Domain at one of the edges – for example, the three-syllable OSD at the right edge of a morphological word in Arapaho, and the three-syllable OSD at the left edge of a morphological

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[80] An interesting question in highly synthetic languages is whether prominence at the edges of morphological words should be analyzed as being assigned at the Prosodic Word level or as prominence at higher levels of prosodic structure (Gordon *forth.*). Multiple unrelated highly synthetic languages have in fact been analyzed as associating the prominence at the edges of complex morphological words with Accent Phrase-level prominence rather than Prosodic Word-level prominence (e.g. Chickasaw, Gordon 2005; Greenlandic, Arnhold 2014; Kashaya, Buckley *forth.;* Pitjantjatjara, Tabain et al. 2014). I refer the reader to Gordon (*forth.*) for a detailed discussion and further examples.

word in Choguita Rarámuri. The obligatory stress within a two- or three-syllable window at either of the edges can then be Culminative within the morphological word domain, as it is in Choguita Rarámuri and in a number of highly synthetic languages with phonologically predictable stress, such as Tsishaath Nootka (Southern Wakashan; Stonham 1999); Passamaquoddy (Algonquian; LeSourd 1988, 1993); Western Abenaki (Algonquian; Day 1994), among other examples. The obligatory stress within a window at one of the edges can also be non-Culminative within the morphological word, as it is in Arapaho. Another example comes from an Arawak language Satipo Ashaninka, which demarcates both the right and the left edge of a morphological word. The primary stress is assigned within a three-syllable window at the right edge of a morphological word, and the secondary stress is assigned within a three-syllable window at the left edge of the word (Mihas and Maxwell *forth.*), consider examples in (29) below, stressed syllables are in bold:

(29a) o.ˌ**nea**.ye.ˈ**ti.**ɾi

o-ne-a-ye-t-i-ri

3F.A-see-EP-DISTR-EP-REAL-3M.OBJ

'She saw one after another.'

(29b) no.ˌ**ma**.na.β̥e.ta.ˈ**ka.**ɾo

no-man-a-be-t-ak-a-ro

1SG.A-hide-EP-FRUS-EP-PFV-REAL-3F.OBJ

'I hid it in vein.'   (Mihas and Maxwell, *forth.:* ex. 14)

In some highly synthetic languages, however, stress is not obligatory at the edges of a morphological word. Recall, for instance, stress patterns in Ichishkíin Sɨnwit discussed in **3.2.** Lexical accent can be assigned to any morpheme in the language (prefixes, roots, or suffixes), which in many cases can potentially produce stress removed from the edges of the morphological word. Moreover, the default rule in the language operates over the Root domain

(see **3.2.4**), which also does not provide any clues for demarcating the word edges[81]. However, word demarcation in Ichishkíin Sɨnwit is achieved through Culminativity of stress in the morphological word domain: this language allows for one and only one primary stress per morphological word, and secondary stresses are not projected either.

A similar apparent issue with word demarcation arises in an Australian highly synthetic language Murrinhpatha (Southern Daly, Mansfield 2017, *forth.;* Mansfield and Nordlinger 2020). Stress in Murrinhpatha is regularly placed on the penultimate syllable of a Prosodic Word. However, the demarcation of the right edge of a morphological word is obscured because some morphemes are regularly excluded from the PWord domain: these include TAM suffixes (30a-b) and some adverbials which in the sources are analyzed as enclitics (these are adjoined with a '=' in the examples), (30c):

(30a) [puˈme-nga]ₚᵥ-dha

say.3PL.PST-1SG.OBL-PST

'They (pl.) said to me.'

(30b) [me-ngintha-ˈnu-purl]ₚᵥ-nu

use.hands.REFL.3SG.IRR-DU.F-REFL-wash-FUT

'The two of them will wash themselves.'

(30c) [nungam-ˈrti-dharl]ₚᵥ=warda=kathu-wurran

use.feet.3SG.NFUT-bottom-open=now=from-go.IPFV

'Now he's slipping as he comes.'

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[81] Recall that Nez Perce exhibits similar patterns of unbounded stress. However, the default rule in Nez Perce references the right edge of a morphological word and assigns stress to the penult.

Thus, in Murrinhpatha, there is no reliable way for a learner to determine how far from the right edge of a morphological word stress would be placed: cf. in (30a) above, the stress is two syllables away from the right edge, but in (30c), the stress is seven syllables away from the right edge of a morphological word. However, similarly to Ichishkiin Sinwit, primary stress is culminative within the morphological word domain, thus ensuring the demarcation[82].

5.2 Summary of the chapter

Having surveyed a number of highly synthetic languages with both phonologically predictable accent and with lexical accent, let us now return to the research questions stated in the beginning of this section. Table 1 below summarizes the answers and the evidence presented throughout this chapter:

Research Question	Answer	Evidence
RQ1. Do highly synthetic languages present counterexamples to the hypothesized universals of stress – culminativity and obligatoriness?	No	All languages surveyed either (i) have culminative stress in *some* domain, or (ii) ban stress clashes, or both (i) and (ii).
RQ2. Is prominence in highly synthetic languages dependent on the demarcation of word-internal morphological domains?	Yes	Highly synthetic languages show stress patterns demarcating individual morphemes (eg. Arapaho, Nez Perce, Bininj Gun-wok) or word-internal domains

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[82] Evidence for secondary stress in the language is inconclusive. Mansfield (*forth.*) notes that some accounts of Murrinhpatha prosody describe secondary stress (Clemens 2013; Street & Mollinjin 1981; Walsh 1976). However, no details on the possible phonetic cues or native-speaker perceptions have been reported. Moreover, Mansfield (2019, *forth.*) notes that existing accounts differ significantly in their proposed locations for secondary stress.

		(Mapudungun, Plains Cree, Athabaskan languages).
RQ3. Does prominence in highly synthetic languages demarcate morphological words?	Yes	All languages surveyed demarcate the word boundaries through (i) edge-oriented accent, or (ii) edge-oriented default, or (iii) culminative stress within a morphological word.

Table 1. Summary of the Culminativity research questions

We are now in a position to evaluate the hypotheses posited in **5.1.1:**

(31)   Culminativity and Obligatoriness of Stress in highly synthetic languages

H1.   Phonological length and morphological complexity of morphological words in languages with highly synthetic morphology creates less pressure to demarcate morphological words which diminishes the relevance of Culminativity and Obligatoriness of stress in such languages as traditionally understood.

H2.   We expect to find an emphasis on demarcation of morphemes or sub-word morphological domains.

Hypothesis 1 is not supported: morphological words are demarcated in highly synthetic languages through a variety of stress assignment strategies, and no evidence is found of Culminativity and Obligatoriness of stress playing a lesser role in languages with complex morphology (compared to the languages with more moderate morphological complexity). We do, however, find a larger variation in the sizes of the domains of Culminativity, which range from as small as a single morpheme (cf. Bininj Gun-wok) to as large as a maximally complex verbal word (cf. Nahuatl).

Hypothesis 2 is supported with the data from highly synthetic languages: multiple genetically unrelated languages exhibit preference for signaling word-internal morphological domains or individual morphemes within complex morphological words through stress assignment.

CHAPTER 6. SECONDARY ACCENT AND RHYTHM

6.1 Tripartite prosodic system

The main discussion in this dissertation has been focused on principles governing *primary* stress assignment in lexical accent languages. In this chapter, I discuss the insights that can be drawn from languages with complex morphologies with respect to *secondary* prominence. Before I proceed to the main topic of this chapter, it is worth noting the general challenge in studying secondary prominence. In the recent literature on stress, the discussion of the methodology of description and analyses of stress has been increasingly more prominent. It has been demonstrated that linguists' assessment of (primary) stress properties in under-described languages often suffers from inconsistencies, biases imposed by the native system of the researcher, and challenges in assessing the relevant properties experimentally (cf. for example de Lacy 2014). One such challenge comes from the lack of procedures for reliable differentiation of certain phonetic properties as cueing stress as opposed to other prosodic phenomena. Both fundamental frequency and duration, for example, are not uniquely associated with stress, but are subject to significant variation depending on the domain environment: thus, F0 is often affected by the closeness of domain edges (e.g. Gordon 2004), while consonant and vowel duration may change depending on the syllable structure or position of the syllable with respect to domain edges (e.g. Chen 1970; Cho and Keating 2009). Examination of secondary prominence in this regard is arguably even more challenging since by definition such prominence is less 'prominent' from the acoustic, perceptual, and, presumably, from the psycho-linguistic standpoint. Even studies specifically focusing on prosody often omit discussing secondary prominence, or simply do not make a distinction between primary and secondary stress. Additionally, whenever secondary prominence is being reported, such reports are rarely verified instrumentally, and, in fact, have often turned out to be a product of investigators' bias (see, for example, discussion in Molineaux *forth.*). It is fair

to say that secondary prominence cross-linguistically has not been sufficiently investigated; thus, at the current state of the field, descriptions and analyses of secondary prominence (including this chapter) should be considered with caution. A number of fundamental research questions about secondary prominence remain unanswered even for the better-studied languages. These include both empirical and theoretical questions, for instance:

(1)   Secondary prominence: Research Questions[83]

    a. Is secondary prominence ever contrastive?

    b. Can secondary prominence be lexicalized?

    c. What are the acoustic cues of secondary prominence?

    d. What is the relationship between the acoustic cues of secondary prominence and primary prominence?

    e. What is the relationship between the acoustic cues of secondary prominence and higher-level (phrasal, intonational) prominence?

    f. What is the relationship between the acoustic cues of secondary prominence and segmental contrasts, i.e. does the Function Load Hypothesis (Berinstein 1979) or the Relativized Functional Load Hypothesis (chapter **2** of this dissertation) apply to secondary prominence?

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[83] A number of these questions have been answered (at least to some extent) for some Indo-European languages, with most attention in both experimental and formal literature focused on English secondary prominence. For phonetic qualities of secondary prominence in American English see Fear, Cutler, and Butterfield (1995); Plag, Kunter, and Schramm (2011). Mattys (2000) addresses perceptual differences between primary and secondary prominence in English. A number of studies addressed the phonetic differences between primary and non-primary prominence in compounds in English: Farnetani et al. (1988), Kunter (2010), Plag, Kunter, & Lappe (2007), Plag (2006). For a recent OT analysis of secondary stress in English and an overview of formal phonological accounts see Pater (2000). Dialectal differences in distribution of secondary prominence in American English are discussed in Dinkin (2009: Chapter 6). For phonetic differences between primary and secondary prominence in Dutch see van Heuven (1987). Gouskova (2010) and Gouskova and Roon (2013) address phonetic and phonological properties of secondary stress in Russian compounds. Phonological and morphological factors influencing the assignment of secondary prominence in Italian are analyzed in Vogel and Scalise (1982). Hualde (2010) presents evidence for different acoustic cues involved in marking primary vs. secondary stress in Spanish. A cross-linguistic study of asymmetries in phonological behavior between primary and secondary prominence is presented in McGarrity (2003).

g. Is secondary prominence constrained in the same way as primary prominence?

h. What is the relationship between secondary prominence and morphology?

i. Is secondary prominence a monolithic phenomenon, or are there different types?

The list in (1) is far from being exhaustive, but it illustrates the gap in the current scholarship. In this chapter, I attempt to answer the last of the research questions in (1), and I will argue that at least two broad types of secondary prominence should be distinguished – *secondary accent* and *rhythm.*

Languages with complex morphologies present an ideal environment for testing hypotheses regarding different levels of prominence and rhythm, as these languages have sufficiently long morphological words for the rhythmic patterns to emerge (see Gordon *forth.* for an extensive discussion). Traditionally, a broad distinction is made between primary stress/accent and non-primary stress (or rhythm). This distinction is assumed in all the influential theories of word prominence: in classical metrical theory, where primary stress assignment is derived from the rhythmic structure (Liberman and Prince 1977; Prince 1983; Hayes 1989, 1995), in Accent-First theory, where primary stress is assigned independently and prior to the calculation of rhythmic structure, and rhythm is dependent on primary accent (van der Hulst 1996, 2009, 2010, 2012), as well as in non-derivational models (Prince and Smolensky 1993). In this chapter, I provide evidence for the theoretical claim that the notion of *rhythm* and the notion of *secondary accent* ought to be treated separately. I argue that languages which are the main focus of this dissertation provide evidence for treating *rhythm* and *secondary accent* as distinct prosodic phenomena. I propose to draw the following distinction between the two:

(2)   **Rhythm**

Automatic iterative alternation of strong and weak syllables within a word, governed

by the set of parameters in (2a).

(2a)   Rhythm parameters

a.   RHYTHM (POLAR/ECHO)

b.   LAPSE (Y/N)

c.   NONFINALITY (Y/N)

(3)   **Secondary accent**

Abstract marking for inherent prominence phonetically realized as secondary stress and

governed by the set of parameters in (3a).

(3a)   Secondary Accent parameters

Accent Domain	(BOUNDED) (R/L)
	(SATELLITE) (R/L)
Accent Placement	WEIGHT-TO-ACCENT (Y/N)
	(SELECT) (R/L)
	(DEFAULT) (R/L)
	(CULMINATIVITY) (Y/N)
	(OBLIGATORINESS) (Y/N)

I will thus argue that not only do rhythm and *primary* accent require separate algorithms in

their assignment (as is argued in the Separation Theory, van der Hulst 1996, 2009, 2010, 2012,

2014), but that *secondary* accent and rhythm require separate algorithms in their assignment as

well. I will also show that the mechanism of secondary accent assignment does not require any

parameters that are not already required for primary accent assignment. I begin this chapter

with an overview of the Separation Theory (van der Hulst 1996, 2009, 2010, 2012, 2014), and I then continue with evidence for the '*Ultra-Separation Theory'* which is the main proposal of this chapter. The vast majority of the examples in this chapter are drawn from languages with highly synthetic morphologies. In the last section of this chapter, I elaborate on the parameters governing accent and rhythm assignment (2a)-(3a), and I propose a formal account of secondary accent vs. rhythm.

6.2 Separation of primary stress and rhythm

The key proposal of this chapter is based on the formal theory of word stress that separates the representation of primary stress and the representation of rhythmically strong syllables (also known as rhythmic beats), proposed and elaborated on in van der Hulst (1996, 2009, 2010, 2012)[84]. Primary stress (or rather accent) in this approach is calculated first, and independently of the rhythmic structure, while rhythm is assigned at a later derivational stage and may have some reference to the already assigned accent. This 'Accent First' theory is in opposition to the assumptions of standard Metrical Phonology (Liberman and Prince 1977, Vergnaud and Halle 1978; Hayes 1980, 1995; Halle and Vergnaud 1987; Idsardi 1992), which treats primary stress and rhythm as derived by a single computation whereby primary stress is 'promoted' from one of the rhythmic beats. Below, I mostly focus on summarizing the motivations for separating primary stress and rhythm leaving aside the issue of the ordering in assignment of accent and rhythm.

Van der Hulst (1996, 2009, 2010, 2012) draws the crucial evidence for separating accent and rhythm from systems in which different algorithms govern their assignment. Firstly, as shown in Goedemans and van der Hulst (2013) on the basis of StressTyp (Goedemans and van der Hulst 2009), it is not unusual for primary stress and rhythm (in languages which have

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[84] See also Goldsmith (1990), Odden (1979), Roca (1986) for similar proposals to separate primary and non-primary stress.

both) to be assigned from the opposite edges of a word. These so-called *polar rhythm* systems (van der Hulst 1984)[85] crucially require contrasting settings of the relevant parameters for the assignment of stress and rhythm (see also Moskal 2012).

Secondly, directionality parameters are not the only kind of parameters which may be required to be set differently for stress and rhythm within a single language. The two may differ in the setting of the Extrametricality parameters as well. Thus, Goedemans and van der Hulst (2013) mention languages like Khalkha, Munsee, and Unami where primary stress assignment is sensitive to right-edge extrametricality while rhythm is not.

Thirdly, Goedemans and van der Hulst (2013) show that primary stress and rhythm may differ in the settings of parameters dealing with foot structure: weight-sensitivity, headedness, boundedness, and foot size (binary or ternary). For weight-sensitivity, Goedemans and van der Hulst (*ibid.*) provide evidence that languages can have all the possible combinations of the relevant parameter settings (which is unexpected if primary stress and rhythm are assigned by a single mechanism): languages can have weight-sensitive primary stress and weight-insensitive rhythm[86], languages can have weight-insensitive primary stress and weight-sensitive rhythm, and languages can have weight-sensitive primary stress and weight-sensitive rhythm with different weight criteria for the two[87].

Additionally, primary stress and rhythm often display properties suggesting that they are assigned at different stages of prosodic derivation. While it is typical for primary stress to exhibit lexical exceptions and/or sensitivity to morphological classes of words, as well as to morphological structure and stratal differences, such sensitivities are typically not involved in

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[85] These systems are sometimes referred to as *dual rhythm systems* (Gordon 2002), or *bidirectional rhythm systems* (Kager 2005).

[86] Note that below I will argue that only this kind of secondary prominence, i.e. weight-insensitive, is actually rhythm, while weight-sensitive secondary prominence is not rhythm proper.

[87] I refer the reader to McGarrity (2003) for a thorough discussion of asymmetries in primary stress and rhythm.

the calculation of rhythm. Rhythm is typically fully automatic, 'post-lexical', and implementational[88]. Thus, as an automatic 'post-lexical' prosodic phenomenon, rhythm is expected to be sensitive to the 'post-lexical' influences such as phrasal prosodic effects, and to surface phonetic influences such as speech rate (see, for example, Hualde and Nadeu 2014). On the other hand, accent, as a 'lexical' phenomenon is expected to be sensitive to lexical and morphological effects: Goedemans and van der Hulst (2013) as an example mention sensitivity to various morphological domains such as 'stem' versus 'word' and sensitivity to particular sets of affixes in stress assignment.

Finally, there are systems which have no primary stress, but nevertheless exhibit rhythmic patterns, and the reverse pattern can also be found in the languages of the world where we find primary stress, but no evidence for rhythmic structure. Such systems are unexpected if rhythm and primary stress are assigned by a single algorithm, but are predicted by the Separation Theory. Crucially, the Separation Theory thus argues that primary stress is non-metrical, rejecting the major postulates of the metrical theory.

I adopt the main idea of the Separation Theory, namely that primary stress and rhythm are assigned by different prosodic modules. However, I argue that this separation is not sufficient. Specifically, I propose that the word-level prominence system is not bipartite: primary stress vs. secondary stress, but tripartite: primary stress vs. secondary stress vs. rhythm. I propose that rhythm is post-cyclic and automatic while secondary accent assignment occurs in parallel to primary accent assignment and thus can potentially interact with segmental phonology and with lexical information. Such *Ultra-Separation Theory* provides a better empirical coverage for the prosodic systems found in languages with complex morphology.

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[88] Goedemans and van der Hulst (2013) note, however, that 'apparent counterexamples' exist, including languages in which secondary prominence needs to be specified as unpredictable – a note crucial for the theory of separation of secondary stress and rhythm proposed in this section. Refer to **6.3** for a discussion.

6.3 Secondary accent typology

In this section, I present empirical evidence and theoretical justification for further deconstruction of the notion of word-level prominence. I will show that the notion of *rhythm* as commonly used in prosodic literature, in fact, is used to analyze two different prosodic properties which regularly exhibit non-trivial discrepancies in their phonological (and, perhaps, phonetic) behavior. The theory proposed here, which I call the *Ultra-Separation Theory,* explains these discrepancies and predicts that they would occur regularly, which accords with the empirical facts.

I propose to reserve the term *rhythm* for secondary prominence which is (i) automatic, (ii) iterative, and (iii) is governed by a specific set of parameters (see (2)). Thus, somewhat tautologically, a language has rhythm iff it regularly exhibits a rhythmic alternation of strong and weak syllables. Secondary accent, on the other hand, by the proposed definition (3), is not dependent on iterative application of the rhythmic pattern, and as such, its assignment is governed by other, non-rhythmic, parameters (3). It will be evident that secondary accent assignment in fact parallels primary stress assignment, and I will argue that this parallelism is not accidental but is due to the identical sets of parameters governing the two.

The empirical evidence for the *Ultra-Separation Theory* centers around two general observations. Firstly, it will be shown that some languages present evidence for all three prosodic properties, and all the logical combinations of rhythm and secondary accent are attested: (i) languages with only primary accent and rhythm, (ii) languages with primary accent and secondary accent but no rhythm, and (iii) languages with primary accent, secondary accent, and rhythm. Secondly, rhythm and secondary accent in languages which have both, exhibit discrepancies which are unaccounted for if both rhythm and secondary accent are assigned by a single algorithm. I propose that these discrepancies stem from two different sets of parameters governing the two properties. I also argue that these discrepancies are not random, but follow

from the nature of accent vs. rhythm as separated in van der Hulst (1996, 2009, 2010, 2012), namely while rhythm is fully automatic, secondary accent exhibits properties of *accent*.

I begin with evidence for the latter point: secondary accent assignment parallels the assignment mechanisms common in primary accent assignment (and does not parallel the mechanisms common in the assignment of rhythm). The following three strategies of primary accent assignment are common across languages with highly synthetic morphologies and in languages of moderate morphological profiles alike. Firstly, primary accent can be *fixed,* i.e. primary accent always falls on the same syllable. The most common patterns cross-linguistically involve fixed primary stress on one of two edge-most syllables at either of the word edges. Such systems are also called *bounded* which reflects the fact that the domain in which primary accent must surface in these languages is limited (or bounded) by the closeness to the word edges. Examples of these are multiple and include, for instance, such synthetic languages as Amur Nivkh (initial, Mattissen 2003, *forth.*), Dakota (second, Shaw 1985), Apurinã (penultimate, Facundes 2000), Trumai (final, Guirardello 1999). In **6.3.1,** I propose that in parallel to *fixed* primary accent, *fixed* secondary accent can be found. Secondly, primary accent assignment may depend on the sensitivity to syllable weight distinctions. Vast descriptive and theoretical literature is available on the role of syllable weight in primary accent assignment; however, the role of syllable weight in secondary accent assignment has received far less attention and has been a subject of controversy even for the best-studied systems like English (see for example Pater 2000 and references therein). In **6.3.2,** I will show that in parallel to weight-sensitive primary accent, weight-sensitive secondary accent patterns are common cross-linguistically, and in **6.5,** I will argue that they can be accounted for with the same formal tools as weight sensitivity in primary accent. Finally, I will consider the third common type of accent, namely, phonologically unpredictable or *lexical* accent. Contrary to the predictions of some theories of accent (e.g. de Lacy 2019), and to descriptive claims (e.g. Goedemans and

van der Hulst 2014), I will argue that secondary accent, in parallel to primary accent, can in fact be *lexical.* I provide examples of lexical secondary accent in languages with complex morphology in **6.3.3** and I propose a parametric account of such systems in **6.5.**

6.3.1 Fixed secondary stress

The first type of secondary accent is predictably located in a fixed position within a word. *Fixed* secondary accent, in parallel to *fixed* primary accent, may be located at the edge of a domain (e.g. at one of the edges of a morphological word or another morphological domain). A common type of *fixed* secondary accent has previously been termed *polar beat* (van der Hulst 2014) or *edge prominence* (Moskal 2012)[89]. The *polar beat* term refers to its characteristic positioning at the edge opposite to the edge of the word where the primary accent is found in a language. Consider, for instance, the general pattern observed in a highly synthetic Algonquian language Passamaquoddy, where primary accent falls on the penultimate syllable, and secondary accent falls on the initial syllable:

(4a)	ˌle.ˈwes.to	(4b)	ˌwi.ke.ˈwes.to	(4c)	ˌseh.ta.ye.ˈwes.to
	l-ewesto		wik-ewesto		sehtay-ewesto
	thus-speak		like-speak		backwards-speak
	'He speaks.'		'He likes to talk.'		'He speaks while walking backwards.'

(adapted from Hagstrom 1995: ex. 5)[90]

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[89] Van der Hulst (2012) provides multiple examples of such systems.

[90] Note that in addition to *fixed* secondary accent and primary accent, Passamaquoddy also has rhythm. I do not mark rhythm in these examples for clarity of exposition, but see **6.4.2** below where this pattern is discussed.

Examples in (4) show the regular assignment of *fixed* primary accent and *fixed* secondary accent in Passamaquoddy. An identical pattern has been reported in van der Hulst (2012) for a number of languages: Maithili, Biangai, and South Conchucos Quechua[91]. The *polar beat* or *edge prominence* has been explicitly analyzed as a prosodic phenomenon independent of rhythm (Moskal 2012; van der Hulst 2014). Moskal (2012) shows how such separation leads to a natural account of the systems where clashes and lapses between primary and secondary prominence are regularly observed. Assuming the Accent First theory of accent assignment (van der Hulst 1996), Moskal proposes to treat primary accent and edge prominence as determined at the 'grammatical level', while rhythm is assigned post-lexically and depends on either the primary accent position or on the edge prominence position. The former mechanism of rhythm assignment results in a clash of the final rhythmic beat and the edge prominence, while the latter mechanism may result in a lapse in the so-called dual systems if the language prohibits clashes involving primary stress. Consider schematic representations of such clashes and lapses found in Tauya and Piro in (5)-(6). The edge prominence is abbreviated as 'EP', primary accent is abbreviated as 'A'; both the edge prominence and the rhythmic beats are marked with the IPA secondary stress symbol; syllables carrying rhythmic beats are additionally underlined for clarity; clash is bolded in (5a), and lapse is bolded in (6a); the direction of rhythm propagation is indicated with an arrow:

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[91] A fixed initial secondary accent might also be present in Arapaho (based on my impression, and on personal communication with Ives Goddard and Andrew Cowell).

(5)   Tauya (Trans-New Guinea; McDonald 1990)

    (a) even-numbered (clash)   (b) odd-numbered

      EP   A   EP   A

      | | | |

      ˌ**σ** ˌ**σ̲** σ ˌσ̲ σ ˈσ   ˌσ σ ˌσ̲ σ ˌσ̲ σ ˈσ

      | | | |

      x x . x . ←x   x . x . x . ←x

(6)   Piro (Arawak; Levin 1987)

    (a) even-numbered   (b) odd-numbered (lapse)

      EP   A   EP   A

      | | | |

      ˌσ σˌσ̲ σ ˈσ σ   ˌσ σ ˌσ̲ σ **σ** ˈσ σ

      | | | |

      x→ . x . x .   x→ . x . . x .

                         (adapted from Moskal 2012)

Expanding on the intuition behind separating edge prominence and rhythm (Moskal 2012; van der Hulst 1996, 2014), I propose that edge prominence, or polar beat, is only one type of *fixed* secondary accent. In other words, I propose that *fixed* secondary accent is not universally located at the edge of a word opposite to the edge carrying primary stress. In close parallel to the behavio r of fixed primary accent observed cross-linguistically, namely to the tendency for fixed primary accent to be located at one of the word edges, fixed secondary accent is arguably more common at the word edges as well (see, for instance, examples of 'edge prominence' in Hayes 1995). However, neither the word-edge location nor the 'polar' property is universal for fixed secondary accent. Below I consider examples of languages where fixed secondary accent is either not word-edge adjacent or is not at the opposite edge of the word from primary accent, or both.

Fixed non-polar secondary accent is found in several dialects of a highly synthetic Algonquian language Ojibwe. Both, accounts of the so-called syncopating dialects of Odawa

and Eastern Ojibwe (Hayes 1995: 216-218; Kaye 1973; Newell 2008; Piggott 1980, 1983) and the so-called non-syncopating dialects, for example, Border Lakes Ojibwe (Swierzbin 2004) describe a stress pattern where, in addition to primary stress, at least in some parts of the lexicon secondary stress is obligatory on the last syllable of the word. This obligatory word-final secondary prominence is most accurately analyzed as *fixed* secondary accent since the 'polar' status of it is questionable. Consider data from Border Lakes Ojibwe where one regular stress pattern is the following: primary accent assignment is sensitive to syllable weight, and secondary accent is required on the final syllable of a word (Swierzbin 2004)[92]. Thus, in the examples in (7) the initial syllable receives primary stress because it is heavy (CVV) while secondary stress falls on the final syllable:

(7a)   ˈaːnd͡ʒɪgoˌzɪ   'S/he is moving to a new place.'

(7b)   ˈʃaːboniˌgʌn   'needle'   (Swierzbin 2004: 357)

In examples in (7), primary stress is word-initial while secondary stress is word-final, which creates a 'polar' pattern. However, primary stress can be located at the same edge as the word-final secondary stress, since the position of primary stress in this pattern is not bounded to the word-edges but is determined by the syllable weight. The generalization made in (Swierzbin 2004) states that primary stress is assigned to the right-most non-final heavy syllable in a word. Thus, consider examples in (8), where weight-sensitive primary stress and word-final secondary stress are located at the same edge of the word:

(8)   ˌaːnd͡ʒɪˈnaːgoˌzɪ   'S/he looks different'   (Swierzbin 2004: 358)

Additional evidence for the claim that *fixed* secondary accent is not required to only occur at the edge of a word opposite to the primary stress (as previously proposed for the notion

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[92] As reported in detail in Swierzbin (2004), this is not the only stress pattern observed in the language as stress assignment appears to also be sensitive to lexical marking of some suffixes as well as to word-internal prosodic domains. I refer the reader to Swierzbin (2004) for a detailed description and a possible analysis.

of *polar beat*) can be found. Patterns found in languages with complex morphology suggest that this is in fact not the only possible fixed position for secondary stress, as we also find *fixed* secondary accent in languages which do not associate primary accent with a particular distance from the word edges. Recall, for instance, the pattern found in an Athabaskan language Tahltan (discussed in **5.1.3**). In the majority of cases, primary accent in this language is assigned to the initial syllable of the root, but a secondary accent is required in the prefixal domain. Secondary accent is penultimate in the prefixal domain, but is also obligatory even if the root is only prefixed with a single monosyllabic prefix, in which case a clash between the primary and the secondary accent occurs (Bob and Alderete 2005). The clashing secondary and primary stress pattern is exemplified in (9a-c) and the secondary stress assigned to the penultimate syllable in the prefixal domain is exemplified in (9d-f), the root morpheme in all examples is bold-faced:

(9)   Tahltan primary and secondary stress

(9a)   ˌme-ˈ**laʔ**   'his/her hand'

(9b)   ˌkaː-ˈ**ts'et**   'I scratched it out.'

(9c)   ˌʔes-ˈ**θone**   'my star'

(9d)   ˌmeʔe-ˈ**k'ahe**   'his/her fat'

(9e)   ʔuˌdeθiː-ˈ**dlet**   'We (dual) melted it.'

(9f)   ʔeˌdʒi-da-ˈ**daɬ**   'S/he is going hunting.'   (Bob and Alderete 2005: 374)

In (9), the root receives primary stress while the prefixal domain receives secondary stress, and both are predictable with no reference to the word edges. Thus, both primary accent and, crucially, secondary accent in Tahltan can be analyzed as *fixed* within the relevant domains – the root domain in the case of the primary accent, and the prefixal domain in the case of

secondary accent. I therefore propose to treat *polar beat* as one kind of *fixed* secondary accent[93].

Independence of fixed secondary accent from the position of primary accent is functionally natural if we consider such fixed secondary accent to be a case of grammaticalization of phonetic prominence. It holds cross-linguistically that edges of domains tend to be phonetically reinforced, which presumably facilitates the parsing problem for the learner. Thus, for instance, the initial and/or the final syllable in a word tend to be cross-linguistically phonetically more prominent than other syllabic positions. In a language where primary accent is not fixed on the initial or the final syllable of a word, such additional phonetic prominence may exist independently from the properties of the phonological system, and can eventually get grammaticalized as fixed secondary accent. The polar beat pattern from this point of view may appear optimal since both edges of a domain are made prominent reducing the parsing ambiguities. However, it is conceivable that secondary accent historically derived from the phonetic reinforcement of this kind would by accident be found at the same edge of the word as primary stress.

6.3.2 Weight-sensitive secondary stress

The second type of secondary accent, which also finds a parallel in primary accent assignment, is *weight-sensitive* secondary accent. Weight-sensitive primary accent, where accent-placement is dependent on the phonological weight of syllables, is extremely common cross-linguistically. Similarly, secondary accent assignment can also be sensitive to syllable weight. This has been reported for a number of languages with complex morphology. For instance,

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[93] Goedemans and van der Hulst (2013) also note that such fixed secondary accent ('polar beat') can diachronically get reanalyzed as lexical accent, for example, leading a system with penultimate accent to become a system with initial accent or vice versa. They list as examples of such possible historical reanalysis the aboriginal languages of Australia (see Goedemans 2010) and the Slavic languages (with penultimate accent in Polish and initial accent in Czech; see Dogil 1999). Perhaps, another example can be added to this list, namely the change from penultimate accent to second-syllable accent in Blackfoot (Plains Algonquian; Bogomolets *forth.;* van der Mark 2003; Weber 2016). Importantly for the proposal put forward in this chapter, such reanalysis seems more plausible if it involves *accent* rather than *rhythm.*

secondary accent is placed on all heavy syllables within a word in Satipo Ashaninka (Mihas and Maxwell, *forth.*). Syllables with a branching nucleus count as heavy, all the other syllable structures are treated as light. Consider examples in (10) below; note that clashes between primary and secondary stress are not banned, which is evident in (10b):

(10a)   o.ˌnea.ye.ˈti.ɾi

　　　　o-ne-a-ye-t-i-ri

　　　　3F.A-see-EP-DISTR-EP-REAL-3M.OBJ

　　　　'She saw one after another.'

(10b)   i.ɾi.ˌneaN.ta.ˌße:.ˈtea.ɾi

　　　　iri-neant-a-bee-t-ea-ri

　　　　3M.IRR-test-EP-DUR-EP-IRR-3M.OBJ

　　　　'He will test him.'　　　　　　　　　　　(Mihas and Maxwell *forth.:* ex. 14)

Mihas and Maxwell (*ibid.*) report that both primary accent placement and secondary accent placement in Satipo Ashaninka are sensitive to syllable weight. While primary accent in the language can be analyzed as culminative, bounded to the right edge of the word, and weight-sensitive, secondary accent is non-culminative, unbounded and weight-sensitive, clearly suggesting an asymmetry in parametric values governing primary and secondary accent assignment in the language (parameters relevant for both primary and secondary stress are discussed in **6.5.1**).

A similar pattern is found in synthetic East Mongolian languages Khalkha and Buriat: primary stress falls on the last syllable if it is the only heavy in the word, otherwise on the rightmost nonfinal heavy, otherwise on the initial syllable. Secondary stress falls on all heavy syllables, including the final syllable (Walker 1997). Syllables with branching nuclei are heavy

for the purposes of both primary and secondary stress assignment; syllables with non-branching nuclei including closed syllables are treated as light. Consider examples from Buriat in (11):

(11a) ˈboːˌsoː   (11b) ˌxyːxenˈgeːˌreː   (11c) ˌbuːzaˌnuˈdiːje

'bet, wager'   'by one's own girl'   'steamed dumplings.acc'

(Walker 1997: ex. 33)

As can be observed in (11), secondary accents in Buriat are assigned to all heavy syllables. Interestingly, clashes between primary accent and secondary accent are allowed, and secondary accent assignment does not obey the same constraints as primary accent in this language which is evident from the fact that secondary accent can fall on the final syllable while primary accent cannot (I refer the reader to Walker 1997 for a detailed analysis of these patterns within the OT framework).

6.3.3 Phonologically unpredictable secondary stress

Finally, the third type of secondary accent, in parallel with primary accent, is phonologically unpredictable, or *lexical.* Let us consider three examples of languages which have this kind of secondary accent. The first example comes from a highly synthetic Sahaptian language discussed in chapter **3** of this dissertation – Nez Perce. Recall, in this language, primary accent is lexical and, I argue, is assigned cyclically. In Nez Perce, multiple morphemes in a morphologically complex word can be underlyingly marked for accent. In such cases, one of the underlying accents receives primary stress (see **3.3** for the analysis). It is shown in Crook (1999: 383-387), that the remaining underlying accents, however, do not get deleted, but receive secondary stress. Consider the following form of the verb ˈweeyik 'to cross' which is underlyingly accented on the initial syllable in (12). In (12), the underlyingly accented root is combined with an underlyingly accented prefix ˈnes- marking a plural object, and an

underlyingly accented directional suffix -ˈuu. The first line in the example presents the surface form, and the second line presents the underlying form:

(12)   hi-ˌnes-ˌweyiˈk-uu-se

       hii-ˈnees-ˈweeyik-ˈuu-see

       3-PL.OBJ-cross-toward-INC

       'He is crossing toward them.'   (adapted from Crook 1999: 480)[94]

In (12), we observe that the root, one of the prefixes, and the suffix realize their underlying accents as stress. The primary stress is on the suffix, and the root and the prefix carry phonologically unpredictable, i.e. *lexical* (*cyclic*) secondary stress.

Phonologically unpredictable, or *lexical*, secondary accent is also attested in an Austronesian language Chamorro. In morphologically simple words in Chamorro, lexical primary accent is obligatorily assigned in the trisyllabic window at the right edge of a word, and penultimate syllable is the default position. In morphologically complex words, primary accent is assigned cyclically: accents assigned at all cycles but the outermost one are retained as secondary while primary stress is either assigned to an underlyingly accented affix if there is one or to the penultimate syllable of the word (Chung 1983). Consider simple forms in (13a), (14a), and (15a) with phonologically unpredictable primary stress. Compare the simplex (a)-forms to the corresponding (b)-forms where affixation shifts the position of primary stress: in (13b) and (14b), primary stress predictably shifts to the penultimate default. In (15b), primary stress shifts to the underlyingly accented prefix *mi-* 'abounding in'. Importantly, syllables that hosted primary stress in the unaffixed (a)-forms receive secondary stress in the (b)-forms when affixation is added:

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[94] In Nez Perce, in addition to lexical secondary stress, there is also regular rhythm. In these examples, I omit secondary stress marking which is not assigned lexically for the clarity of exposition. Refer to Crook (1999: 352-382) for a detailed description.

(13a) iˈneŋŋuluʔ   (13b) iˌneŋŋuˈloʔɲa

      'peeping'   'his peeping'

(14a) ˈsweddu   (14b) ˌsweddunˈmami

      'salary'   'our (exc.) salary'

(15a) ˈneŋkanuʔ   (15b) ˈmiˌneŋkanuʔ

      'food'   'abounding in food'   (adapted from Chung 1983: 42)

Examples in (13)-(15) show that, similarly to Nez Perce, secondary stress in Chamorro results from phonologically unpredictable *cyclic lexical* accents[95]. It should be noted that as with the accent systems exemplified in the previous sections, primary and secondary accent assignment in languages with phonologically unpredictable secondary accent may be governed by conflicting settings of the relevant parameters. Thus, for instance, in Chamorro, primary accent is culminative and is assigned within a bounded trisyllabic domain at the right edge of a word, while secondary accent is non-culminative and the domain of its assignment is unbounded.

Another example of phonologically unpredictable secondary accent comes from North Saami (also spelled as Sámi; Finno-Ugric). The literature on North Saami prosody is scarce and, to my knowledge, no systematic study of stress in this language has been done to date.

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[95] The examples of Chamorro secondary stress resulting from the retained accents of simpler morphological forms are in some way reminiscent of the well-known examples of phonologically unpredictable secondary accent in English, which has received a considerable amount of attention in formal literature (Chomsky and Halle 1968; Halle and Kenstowicz 1991; Pater 2000). The classic example of such stress is in words like ˌconˌdenˈsation where the secondary stress on the second syllable conflicts with the tendency for a syllable immediately preceding the syllable with primary stress to be stressless and reduced (see Pater 2000 for a discussion and multiple additional examples of this sort). This phonologically unexpected secondary stress is usually assumed to be retained from the morphologically simpler form, i.e. to be *cyclic – con ˈdense.* However, Halle and Kenstowicz (1991: 460) show that English has a parallel secondary stress pattern where it has to be lexically specified and not result from primary stress at the earlier cycle in words like ˌchimˌpanˈzee, ˌinˌcarˈnation, ˌosˌtenˈtation. Based on these examples, Halle and Kenstowicz (1991) proposed to treat all *condensation*-type words as having lexically conditioned weight-to-stress rule. In the terms adopted in this dissertation, all phonologically unpredictable accent is *lexical,* thus secondary accent in forms like ˌconˌdenˈsation would be treated as cyclic lexical accent (see Pater 2000 and references therein for various analyses of this pattern).

The available sources on phonology of North Saami characterize primary accent as fixed on the initial syllable (Aikio and Ylikoski 2010) or on the penultimate syllable of the root (Bals, Odden, and Rice 2012). Native roots are disyllabic, and their first syllable coincides with the left edge of the word which produces fixed accent on the initial syllable (see also Bye, Sagulin, and Toivonen 2009 for some relevant discussion of prosody in a related language Inari Saami which also exhibits fixed initial primary stress). In addition to the fixed primary stress, North Saami has a regular rhythm alternating left-to-right from the primary stress. Significant for the current discussion are the reports of *lexical* secondary stress in North Saami[96]. Aikio and Ylikoski (2010) report such phonologically unpredictable secondary stress in two different environments. Firstly, lexicalized secondary stress is found on the penultimate syllable of some loanwords or what the authors term 'irregularly shortened compounds', consider examples in (16) below:

(16a) ˈorganiˌseret 'organistion'

(16b) ˈteleviˌʃuvdna 'television'

(16c) ˈvilˌbealli 'male cousin' (*viellja* 'brother', *bealli* 'half')

<div align="right">Aikio and Ylikoski (2010: sect. 2.1.3)</div>

Secondary stress in words like (16) appears to be lexicalized in the sense that it only appears in select lexical items, but does not appear in others of comparable phonological shape.

The second environment where phonologically unpredictable secondary stress surfaces is determined by the presence of lexically accented suffixes. These, according to Aikio and

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[96] North Saami thus is a language with all three prosodic properties: primary accent (fixed), regular trochaic rhythm, and lexical secondary accent. Refer to section **6.4.1** for a discussion of other examples of languages which have independent evidence for the three separate prosodic properties.

Ylikoski (2010) are a set of disyllabic suffixes which always carry secondary stress; compare (a)- and (b)-forms in (17)-(22) below[97]:

(17a) ˈvattis

‘difficult’

(17b) ˈvattis-ˌvuohta

‘difficulty’

(18a) ˈvejolaʃ

‘possible’

(18b) ˈvejolaʃ-ˌvuohta

‘possibility’

(19a) ˈdahkat

‘to do’

(19b) ˈdahka-ˌgoahtit

‘to begin doing’

(20a) ˈmuitalit

‘to tell’

(20b) ˈmuitaliʃ-ˌgoahtit

‘to begin telling’

(21a) ˈdahkat

‘to do’

(21b) ˈdahka-ˌndihte

‘in order to do’

(22a) ˈmuitalit

‘to tell’

(22b) ˈmuitala-ˌndihte

‘in order to tell’[98]

Aikio and Ylikoski (2010*: sect. 2.1.3)

The data available in the literature is insufficient at this point to provide an analysis for secondary stress in forms like (17)-(22), but nevertheless the lexical status of such secondary

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[97] It should be noted that a more careful investigation of these suffixes and their relation to secondary stress is needed. While Aikio and Ylikoski (2010) report that these suffixes are unpredictably marked for carrying secondary stress (i.e. bear a *lexical* secondary stress), it is also plausible that this pattern reflects a preference for foot boundaries to align with morpheme boundaries. This could be suggested by the fact that all the suffixes which produce this pattern are disyllabic. It, however, does not appear to be the case that all disyllabic suffixes in the language produce this pattern.

[98] (22b) is apparently wrongly translated as ‘to begin telling’ in the source.

stress is evident since secondary stress in these examples results from the underlying accent of a lexically marked set of suffixes.

6.4 Combination of secondary accent and rhythm

In this section, I illustrate the following empirical argument in favor of the *Ultra-Separation Theory:* some languages present independent evidence for each prosodic property – primary accent, secondary accent, and rhythm. I will also show that all the logical combinations of rhythm and secondary accent are attested; thus, we find languages with only primary accent and rhythm, languages with primary accent and secondary accent but no rhythm, and languages with primary accent, secondary accent, and rhythm.

6.4.1 Languages with secondary accent and rhythm

Let us first consider languages which show evidence for all three prosodic properties. Crucially, it will be shown that in all cases, parameters governing the assignment of secondary accent versus rhythm are different, which is predicted to be the case under the theory proposed in this chapter, but is unaccounted for under other theories.

Consider first languages which in the previous section have been shown to have a *fixed* secondary accent. In a highly synthetic Algonquian language Passamaquoddy, (i) primary stress falls on the penultimate syllable, (ii) secondary stress falls on the initial syllable, and (iii) regular rhythm falls on alternate syllables from the primary stress right-to-left (*echo* rhythm in terminology of van der Hulst 2012). Consider the forms in (23); both rhythm and secondary accent are marked in the examples with the IPA diacritic <ˌ>, but rhythmically prominent syllables are additionally underlined for clarity of exposition:

(23a)   ˌteh._sah_.kwa._ˌpa_.sol.ˈti.ne

'Let's walk around on top.'

(23b)   ˌwi._coh_.ke.ˈke.mo

'He helps out.'

(23c)   ˌwi.coh._ˌke_.ta.ˈha.mal

'He thinks of helping the other.'   (LeSourd 1988: 140-143)

Note in (23), the mechanisms of secondary accent assignment and those of rhythm assignment may result in a clash (23a), which additionally suggests that secondary accent in Passamaquoddy is not rhythmic, while (tautologically) rhythm is.

Another Algonquian language with fixed secondary accent discussed in the previous section – Ojibwe – presents a similar pattern. Recall, several dialects of Ojibwe have a fixed secondary accent on the final syllable. In addition, rhythm is regularly assigned left-to-right from the syllable carrying primary accent. Consider Eastern Ojibwe examples in (24); rhythmically prominent syllables are underlined for clarity of exposition:

(24a)   mi.ˈzi.na._hi_.ˌgan

'my book'

(24b)   ni.ˈgi:.na._ma_.da._bi_.ˌmin

'We sat.'   (Piggott 1983: 92-93)

We also observe evidence for the separate systems of secondary accent and rhythm in languages where secondary accent is phonologically unpredictable, i.e. lexical. Rhythm in these languages, however, just as in languages like Passamaquoddy and Ojibwe, is fully predictable, regular, and automatic. The case in point here comes from Chamorro. Recall from

the previous section, all lexical accents in morphologically complex words with multiple underlying accents are retained as stresses in Chamorro: one of them is realized as primary stress, and all the others are realized as secondary stresses. Secondary stress in Chamorro, as shown in (13)-(15), results from phonologically unpredictable cyclic *lexical* accents. However, in addition, Chamorro also has a regular rhythm assigned to alternating syllables right-to-left from the primary stress. In contrast to the secondary accent assignment, morphological complexity is not a pre-requisite for rhythm to occur (cf. (25a-b) below), but it may also appear in morphologically complex forms (25c-d) and (25e-f). Consider examples in (25) below, rhythmically prominent syllables are underlined:

(25a) ˌat.may.ˈgo.su

       'vegetable'

(25b) ˌki.ma.ˈson

       'to burn'

(25c) ba.ˈpot   (25d) ˌba.pot.ˈni.ha

       'ship'   'their ship'

(25e) ka.ˈdu.ku   (25f) ˌman.ka.ˈdu.ku

       'crazy'   'crazy (pl.)'   (adapted from Chung 1983: 43)

In (25a-b), primary stress is assigned to penultimate syllable, and rhythmic beat is predictably found on the initial syllable. In (25c), primary stress is assigned to the penultimate syllable of the simplex form. In (25d), when that root is suffixed with the 3 Pl. possessive agreement, primary stress predictably falls on the penultimate syllable of the newly formed word (cf. the discussion of (13)-(15)). Note that in this case, primary stress of the 'ship' form (25c) is not preserved as a secondary stress due to Chamorro not allowing for a syllable preceding a syllable

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with primary stress to bear stress (the so-called *Destressing Rule,* Chung 1983: 42). However, we observe that a rhythmic beat surfaces in (25d) on the initial syllable. The same is observed in (25e-f).

Secondary accent and rhythm in Chamorro not only are assigned by different parameters (secondary accent being phonologically unpredictable and rhythm being fully automatic), their interaction with morpho-phonology differs, which is to be expected under the theory proposed here since rhythm is post-cyclic while secondary accent assignment occurs in parallel to primary accent assignment and thus can potentially interact with segmental phonology and with lexical information[99]. The difference in morpho-phonological interactions between rhythm and secondary accent in Chamorro is evident in the processes of Umlaut and Gemination (Chung 1983; Kaplan 2008). Let us consider the patterns of Gemination as an example (and I refer the reader to Chung 1983; Kaplan 2008 for available analyses of the Umlaut process). Gemination in Chamorro doubles the initial consonant of suffixes with the underlying CV shape if (i) the word contains a closed stressed syllable, and (ii) the syllable immediately preceding the suffix is open. Another condition on the application of the Gemination rule is that the stress in a closed syllable must stem from primary stress of some less complex word, in other words, only primary accent or secondary accent but not rhythmic beats can trigger gemination. Consider examples in (26)-(28) below; the suffixes undergoing gemination are bold-faced in all examples:

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[99] I should note that no examples are available in the sources where both secondary accent and rhythm would be observable in the same form. However, it is possible for both to be present within one word if the word is long enough and is morphologically complex (Sandra Chung, p.c.).

(26a) ˈded.di.gu   (26b) ˌded.di.ˈgo**m.mu**

       deddigu   deddigu-mu

       heel   heel-2SG

       'heel'   'your heel'

(27a) ˈdaŋ.ku.lu   (27b) ˌdaŋ.ku.ˈlo**n.ɲa**

       daŋkulu   daŋkulu-ɲa

       big   big-COMPR

       'big'   'bigger'

(28a) ˈbat.ku   (28b) bat.ˈko**n.ɲa**

       batku   batku-ɲa

       ship   ship-3SG

       'ship'   'his ship'   (adapted from Chung 1983: 44)

In (26)-(28), we observe the application of the Gemination rule because in all cases the base forms – (a)-forms contain a closed stressed syllable, and all of the (a)-forms end in an open syllable (note also that in (28b) the secondary stress is deleted by the Destressing rule, but we still observe the effect of that stress in the gemination). Compare the examples in (26)-(28) to the example in (29) below where gemination does not occur because the base form does not have a stressed closed syllable:

(29a) ˈhi.ga.du   (29b) ˌhi.ga.ˈdu.**ɲa**

       higadu   higadu-ɲa

       liver   liver-3SG

       'liver'   'his liver'

In the examples below in (30)-(31), the secondary stresses in the (a)-forms derive from primary

stresses in the roots and trigger gemination, as expected, even though they get deleted in the

(b)-forms by the Destressing rule:

(30a) ˈmi.ˌbat.ku   (30b) ˌmi.bat.ˈko**n.ɲa**

       mi-batku   mi-batku-ɲa

       abounding-ship   abounding-ship-COMPR

       'abounding in ships'   'more abounding in ships'

(31a) ˈmi.ˌcod.da   (31b) ˌmi.cod.ˈda**n.ɲa**

       mi-codda   mi-codda-ɲa

       abounding-banana   abounding-banana-COMPR

       'abounding in bananas'   'more abounding in bananas'

Examples in (26)-(31) demonstrate that primary accent and secondary accent can trigger the

Gemination rule. In contrasts, rhythmic beats do not trigger gemination, consider examples in

(32) below; the syllable bearing rhythmic prominence in (32b) is underlined:

(32a) cin.ˈcu.lu   (32b) ˌcin.cu.ˈlu.mu

      cinculu   cinculu-mu

      fishing.net   fishing.net-2sɢ

      'fishing net'   'your fishing net'

In (32b), even though the closed initial syllable receives (rhythmic) prominence, it does not produce gemination of the consonant in the suffix.

To summarize, two morpho-phonological rules in Chamorro are sensitive to the difference between secondary accent and rhythm – gemination and umlaut. Both only are triggered by secondary accent and not by rhythm, firstly supporting the idea that the two are different properties; secondly, supporting the idea that secondary accent is *accent*, i.e. is a property of the same class as primary accent – which in this language also triggers umlaut and gemination.

6.4.2 Languages with secondary accent and no rhythm

In the previous section, I demonstrated that some languages present evidence for having both a secondary accent and a rhythmic structure. In this section, I turn to languages which have secondary accent, but lack rhythm. One such example comes from an Austronesian language Sibutu Sama (Allison 1979; Elenbaas and Kager 1999; Gordon 2002). This language has a fixed primary stress on the penultimate syllable and fixed secondary stress on the initial syllable[100]. Consider examples in (33) below, note that clashes between primary and secondary stresses are disallowed in Sibutu Sama, thus only penultimate primary stress surfaces in (33a):

(33a) bisˈsala   'talk'

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[100] Kager (1997) provides a discussion and an analysis of prefixed words in the language which do not necessarily exhibit the same stress pattern.

(33b) ˌbissaˈlahan   'persuading'

(33c) ˌbissalaˈhanna   'he is persuading'

(33d) ˌbissalahanˈkami   'we are persuading'   (Gordon 2002: 505)

Sibutu Sama thus presents a clear example of a language where primary stress assignment and secondary stress assignment are governed by different parameters (to produce the penultimate and the initial fixed stress respectively). Crucially, there is no evidence of rhythm, as is evident from lapses in (22c-d) above.

Some examples of languages with weight-sensitive secondary accent and no rhythm were presented in **6.3.2.** Recall, for instance, the example of a highly synthetic language Satipo Ashaninka. Both primary accent and secondary accent are sensitive to syllable weight in this language. Primary accent is oriented towards to right edge of a word, while secondary accent is placed on all heavy syllables within a word in Satipo Ashaninka (Mihas and Maxwell, *forth.*). Crucially, there is no alternating rhythmic structure. While in Satipo Ashaninka both primary accent assignment and secondary accent assignment are weight-sensitive, in other languages with secondary accent but no rhythm, only one of the two accent assignment mechanisms may be sensitive to syllable weight. This is the case in a synthetic language Waalubal (Pama-Nyungan) where primary stress is fixed and is word-initial, and secondary stress is assigned to heavy syllables (Hagberg 2006: 108)[101]. Consider examples in (34) below; syllables with branching nuclei count as heavy in Waalubal:

(34a) ˈbandaŋ   'other'

(34b) ˈbaɲdʲaniˌbeː   'only covered'

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[101] McGarrity (2003: 16) lists a number of languages where primary stress is weight-insensitive and secondary stress is weight-sensitive, including Finnish, Koya, Cahuilla, Waalubal, Apalai, Cambodian, Cayapa, Estonian, Irish Gaelic, Gidabal, Tubatulabal, W. Shoshoni, Margany/Gunya, Alabama, Veps, Votic.

(34c) ˈwurguˌlu:m   'magpie'

(34d) ˈŋaˌma:lu   'tree goanna (erg.)'   (Hagberg 2006: 108)

Examples in (34) show that (i) primary accent assignment and secondary accent assignment are governed by different parameter settings, namely the setting of the parameters for weight and domain are different, and (ii) no rhythmic pattern is present in the language.

6.4.3 Languages with rhythm and no secondary accent

Finally, let us consider examples of languages with a clear rhythmic structure, but no secondary accent. Languages with complex morphologies which have rhythm but no secondary accent have in fact been the center of attention for most of metrical stress typology. These languages regularly offer long enough words to observe and study both binary and ternary rhythmic patterns (see Gordon *forth.* for a detailed discussion). Examples of highly synthetic languages with primary stress and rhythm but no secondary accent are abundant (see, for instance, Hayes 1995; Goedemans and van der Hulst 2013; Gordon *forth.;* Rice 2010); in this section I only provide a few illustrative cases.

As an example of a language with fixed primary accent and regular binary rhythm echoing the primary stress consider a highly synthetic language Apurinã (Arawak; Facundes 2000). In Apurinã, primary stress is fixed on the penultimate syllable, and rhythm is assigned to alternating syllables right-to-left from the penult, consider examples in (35):

(35a) ta.ˈka   'to put/plant'

(35b) nɨ.ˈta.ka   'I put/plant.'

(35c) ˌnɨ.ta.ˈka.rɨ   'I put/planted it.'

(35d) nɨ.ˌta.ka.ˈrɨ.ko   'I will put/plant it.'

(35e) ˌnɨ.ta.ˌka.pe.ˈrɨ.ko   'I will have put/planted it.'

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(35f) nɨ.ˌta.ka.ˌpe.ka.ˈrɨ.ko   'I will put/plant it.'   (Facundes 2000: 103)

Trochaic rhythmic pattern originating at the opposite edge – left-to-right from fixed primary accent on the initial syllable can be exemplified with a Western Pama-Nyungan language Pintupi (Hansen and Hansen 1969; Kager 1995):

(36a) ˈma.ɭa.ˌwa.na   'through (from) behind'

(36b) ˈpu.ɭiŋ.ˌka.la.tju   'We (sat) on the hill.'

(36c) ˈtja.mu.ˌlim.pa.ˌtjuŋ.ku   'our relation'

(36d) ˈyu.ma.ˌɹiŋ.ka.ˌma.ra.ˌtja.ɹa.ka   'because of mother-in-law'

(adapted from Hansen and Hansen 1969)[102]

An iambic left-to-right rhythm pattern is found in a synthetic language Osage (Siouan; Altshuler 2009); primary stress is fixed on the second syllable:

(37a) pa:ˈxo   'mountain'

(37b) ka:ˈsa:ki   'knock someone out'

(37c) xõ:.ˈt͡so.ði:b.ˌrã   'smoke cedar'

(37d) aˈwala:ˌxyɣe   'I crunch up my own (e.g. prey) with teeth.' (Altshuler 2009: 6)

Finally, languages with complex morphologies have also been instrumental in providing evidence for ternary rhythm. Consider examples from a highly synthetic language Cayuvava (isolate?; Gordon *forth.;* Key 1961, 1967):

(38a) ki.ˈhi.be.re   'I ran.'

(38b) a.ri.ˈu.u.t͡ʃa   'He came already.'

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[102] Assignment of rhythm to the word-final syllable is banned in Pintupi.

(38c)   d͜ʒi.hi.ra.ˈri.a.ma   'I must do.'

(38d)   ma.ˌra.ha.ha.ˈe.i.ki   'their blankets'

(38e)   i.ki.ˌta.pa.re.ˈre.pe.ha   'The water is clean.'

(38f)   ˌt͜ʃa.a.di.ˌro.bo.βu.ˈu.ru.t͜ʃe   'ninety-five (first digit)'

(38g)   me.ˌda.ru.t͜ʃe.ˌt͜ʃe.i.ro.ˈhi.i.ɲe   'fifteen each (second digit)'

(Gordon *forth.*)

Importantly for the discussion in this chapter, languages like Apurinã, Pintupi, Osage, or Cayuvava show no evidence of secondary accent in addition to primary stress (which is fixed in all these examples) and rhythm (which is regularly echoing the primary stress).

6.5 Theoretical implementation

In the previous two sections, I presented a typology of secondary accent systems, arguing that we find striking parallels between primary accent assignment and secondary accent assignment, and I presented evidence for separating the rhythmic module and secondary accent. In this section, I review parameters proposed for primary accent and rhythm in earlier studies (most importantly for the current discussion – in van der Hulst 2012, 2014). I argue that (i) a smaller set of parameters than previously proposed is sufficient to account for rhythm, and that (ii) secondary accent requires the same set of parameters as primary accent.

6.5.1 Secondary accent parameters

Let us begin with the parameters necessary to account for the behavior of *accent.* The following parameters have been argued for in van der Hulst (2012) and adopted throughout this dissertation[103]:

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[103] Note that WEIGHT-TO-ACCENT has not been discussed in this dissertation since the focus of this study is on lexical accent languages, i.e. on languages with no sensitivity to syllable weight. Thus, in all the case studies, the setting for this parameter for primary accent assignment is negative.

(39)   Primary accent parameters

Accent Domain	(BOUNDED) (R/L)
	(SATELLITE) (R/L)
Accent Placement	WEIGHT-TO-ACCENT (Y/N)
	SELECT (R/L)
	DEFAULT (R/L)

Two sets of parameters governing accent assignment are presented in (39). The Accent Domain parameters determine whether accent is assigned within a bounded domain at one of the word edges – BOUNDED (R/L), as well as the size of the domain – bisyllabic or tri-syllabic. Note that, following van der Hulst (2012), both of the Accent Domain parameters may be either active or inactive (which is indicated by parentheses). The Accent Placement parameters govern the particulars of accent assignment. Firstly, the WEIGHT-TO-ACCENT parameter determines the source of accent: if this parameter receives a positive setting, accent placement in a language is weight-sensitive. The SELECT and DEFAULT parameters, as was discussed previously in this dissertation, deal with a competition of more than one accents (SELECT), and with absence of accent (DEFAULT), assigning primary stress to the leftmost or the rightmost accentable unit in a domain. It should be clear from the analyses of case studies in this dissertation that SELECT does not have the same status in different types of accent systems. Its functional load will be the highest in weight-sensitive accent systems and in *Directional* lexical accent systems, while in systems with fixed accent or with *Structure-Controlled* lexical accent systems its role is diminished.

In addition, in Chapter **5**, I motivated treating CULMINATIVITY and OBLIGATORINESS of stress as parameters as well:

(40a)   CULMINATIVITY (Y/N)

(40b)   OBLIGATORINESS (Y/N)

Note, as discussed in detail in Chapter **5**, I argue for a macroparametric treatment of Culminativity, thus (40) presents this parameter simplistically. SELECT and DEFAULT parameters are dependent on the active status of CULMINATIVITY and OBLIGATORINESS and they determine the way in which CULMINATIVITY and OBLIGATORINESS are achieved. Note that the two sets of parameters – CULMINATIVITY and OBLIGATORINESS on one hand, and SELECT and DEFAULT on the other hand, are independently motivated in that only if the CULMINATIVITY parameter is active, SELECT can be active as well, but the active status of CULMINATIVITY does not guarantee the active status of SELECT. For instance, in a system with culminative fixed primary accent, the CLMINATIVITY parameter must be active, but the SELECT parameter is redundant since competition in such a system never arises. Different combinations of the settings of parameters in (39)-(40) create the typological diversity found in primary accent systems. I propose that the same set of parameters is responsible for the diversity of secondary accent systems presented in the previous section. More specifically, I propose that the mechanisms of primary accent assignment and the mechanism of secondary accent assignment are formally identical, and this is due to them being governed by the same set of parameters (39)-(40).

Firstly, just like with the primary accent systems, we find a parametric variation in secondary accent systems with respect to boundedness. *Bounded* secondary accent systems are found in languages where secondary stress must fall on a syllable at the edge of a domain: initial, second or third syllable, and antepenultimate, penultimate, or final. As discussed in **6.3.1,** we find such secondary accent in a number of languages with complex morphology, for instance, in Passamaquoddy (initial, cf. (3)), Ojibwa (final; cf. (7)), Tahltan (penultimate in the

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relevant domain, cf. (9)). In these systems, secondary accent placement is limited by the active status of the BOUNDED parameter, and is thus restricted either to the left or to the right edge of a domain. An active status of the SATELLITE parameter produces a trisyllabic bounded domain for secondary accent assignment, while its inactive status produces a disyllabic domain. Thus, for instance, in Ojibwe, the parameters for secondary accent assignment are set as in (41) below, resulting in fixed final secondary stress:

(41)   Ojibwa secondary accent

Accent Domain	BOUNDED (R)
	(SATELLITE) N/A
Accent Placement	WEIGHT-TO-ACCENT (N)
	SELECT (R)
	DEFAULT (R)
	CULMINATIVITY (Y)
	OBLIGATORINESS (Y)

The SATELLITE parameter is not active in Ojibwe, and by (41), a single secondary accent in Ojibwe is assigned within a disyllabic domain at the right edge of a word, and within that disyllabic domain, accent is assigned to the right syllable, which results in a fixed final secondary stress in the language. We find an active SATELLITE parameter in secondary accent assignment in another Algonquian language – Plains Cree. As discussed in **5.1.3,** primary stress is assigned in the default case to antepenultimate syllable in the Root+suffixes domain. Secondary stress, according to Russell (1999), is assigned to the antepenultimate syllable in the prefixal ('preverb') domain. The settings of the Accent Domain parameters in Plains Cree will thus be as in (42) below, and will be minimally different from Ojibwe (41):

(42)   Accent Domain parameters settings in Plains Cree

BOUNDED (R)

SATELLITE (R)

Unbounded secondary accent systems, on the other hand, are those where secondary accent can be assigned in any part of a domain since its placement is not restricted by the BOUNDED parameter, and thus accent is not required to be assigned at one of the edges of a domain. The placement of secondary accent in an *Unbounded* secondary accent system is, however, restricted by the other parameters, most notably by the WEIGHT-TO-ACCENT parameter. Secondary accent systems which have a positive setting for this parameter, differentiate between heavy and light syllables in secondary accent assignment. Recall, this is the case in Satipo Ashaninka and in East Mongolian languages. Consider, for example, the set of parameters in (43) governing secondary accent assignment in Buriat (see data in **6.3.2**):

(43)   Buriat secondary accent

Accent Domain	(BOUNDED) N/A
	(SATELLITE) N/A
Accent Placement	WEIGHT-TO-ACCENT (Y)
	(SELECT) N/A
	(DEFAULT) N/A
	CULMINATIVITY (N)
	OBLIGATORINESS (N)

By (43), secondary accent in Buriat is assigned to heavy syllables within a word (i.e. secondary accent is unbounded weight-sensitive). Notably, both CULMINATIVITY and OBLIGATORINESS are set to the negative value in secondary accent assignment of Buriat. The question that needs

to be addressed is whether CULMINATIVITY and OBLIGATORINESS parameters are ever active in secondary accent systems, and, consequently, whether SELECT and DEFAULT are active.

In evaluating this issue, it is useful to once again address the functional role of stress and the place of CULMINATIVITY and OBLIGATORINESS in performing that role (cf. discussion in chapter **5**). The "prototypical" one-per-domain stress is traditionally seen as assisting in demarcation of the relevant domain. In chapter **5**, I argued that primary stress is always culminative in one of three possible ways: (i) it can be culminative in *some* domain (e.g. word, stem, morpheme), or (ii) its culminativity is manifested in the ban on stress clashes, or (iii) both (i) and (ii). Demarcation as the main function of stress can also be considered responsible for the near-universal status of OBLIGATORINESS of primary stress. Importantly, in primary stress assignment, the demarcative function of stress can compete with the demand that primary stress be assigned to prominent syllables. Such prominence can result from syllable weight, sonority considerations, or diacritic weight. Thus, for instance, in a weight-sensitive primary stress system, in a word with multiple heavy syllables, demarcative function of stress, ensured by the positive settings of the CULMINATIVITY and OBLIGATORINESS parameters, demands that only one of the heavy syllables receives primary stress. The demand that inherently prominent syllables have to be realized as stress is thus subordinate to the requirements of CULMINATIVITY and OBLIGATORINESS[104]. The demarcating function of secondary stress, however, appears to be 'losing' to the demand of associating a prominent syllable with stress at least in some cases. For example, this is the case in languages with weight-sensitive secondary accent discussed above – Satipo Ashaninka and in East Mongolian languages, where SELECT crucially does not apply resulting in multiple secondary stresses within a word. The subordinary status of the demarcative function of secondary stress in such systems is also supported by the inactive

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[104] This can be straightforwardly expressed with a ranking of groups of constraints in Optimality Theory models, see, for example McGarrity (2003).

status of DEFAULT: indeed, if no heavy syllables are present within a word, secondary stress simply does not get assigned. However, we do find languages where secondary stress is culminative and obligatory within some domain. This, for instance, was shown to be the case in Ojibwe (41), Plains Cree (cf. **5.1.3** and (42) above), and in Tahltan (cf. **6.3.1**) where a single obligatory secondary stress is assigned in the relevant domain. The conclusion that can be drawn then is that CULMINATIVITY and OBLIGATORINESS are always active in primary stress assignment, while they can be inactive for secondary stress assignment purposes. What we observe thus is that some of the parameters active for primary stress assignment might not be active for secondary stress assignment. Crucially, the proposal put forward in this section, namely, that secondary accent assignment is governed by the same mechanism as primary accent assignment, predicts that we should not find any systems where secondary accent assignment would require any additional parameters (i.e. parameters which are not already required for primary accent assignment cross-linguistically).

6.5.2 Rhythm parameters

As shown above, secondary accent assignment is governed by the set of parameters which have been previously proposed to account for primary accent assignment (van der Hulst 2012, 2014). In the Separation Theory (van der Hulst 1996, 2009, 2010, 2012), a different set of parameters has been proposed to account for the rhythmic patterns since, crucially for the Separation Theory, accent and rhythm are treated as two different kinds of prosodic phenomena. The following parameters governing rhythm have been proposed in van der Hulst (2014):

(44) Rhythm parameters in van der Hulst (2014)

  a. POLAR BEAT (Y/N)

  b. RHYTHM (POLAR/ECHO)

  c. WEIGHT (Y/N)

d. LAPSE (Y/N)

e. NONFINALITY (Y/N)

The list of parameters in (44) includes the POLAR BEAT parameter, although a remark is made in van der Hulst (2014) that this 'edge prominence' is independent of rhythm. Parameter RHYTHM (b) governs the directionality of rhythm propagation: the 'echo' rhythm is assigned to alternating syllables from primary stress, while the 'polar' rhythm in the terms proposed in van der Hulst (2014), is assigned to alternating syllables from the 'polar beat'. Parameter (c) determines whether rhythm is weight-sensitive. The LAPSE parameter (d) determines whether rhythm is binary or ternary. The NONFINALITY parameter (e) decides whether the final syllable is provided with a rhythmic beat or not. It is worth noting that parameters (a) and (c) in (44) determine the assignment of prominence which does not create a rhythmic pattern. Indeed, as noted above, it has been indicated in van der Hulst (2014) that the polar beat parameter is non-rhythmic. Additionally, I argue that the WEIGHT parameter is non-rhythmic as well since its setting does not govern the creation of a rhythmic pattern.

Under the account proposed for secondary accent in this chapter, the 'polar beat' is analyzed as one type of fixed secondary accent. The role of syllable weight in non-primary prominence in the current approach is also restricted to secondary accent. Specifically, I argued that weight-sensitivity is a property of accent stemming from the WEIGHT-TO-ACCENT parameter (39).

I thus propose that only three out of five parameters proposed in van der Hulst (2014) are needed to account for rhythm (45a-c)[105]:

(45) Rhythm parameters: revised

    a.   RHYTHM (POLAR/ECHO)

    b.   LAPSE (Y/N)

    c.   NONFINALITY (Y/N)

By (45), three properties are definitional of a rhythm system: a specified anchor (primary or secondary accent, or both in *bidirectional* systems, see van der Hulst 2014), the size of a rhythmic unit – binary or ternary, and whether final syllables in a domain are visible to the rhythm-assigning mechanism. In languages which have rhythm, rhythm is thus automatically assigned and the variation found cross-linguistically in rhythm systems is constrained by the parameters in (45).

As an example of separate parameter settings required for primary accent, secondary accent, and rhythm assignment within one language, consider again the Passamaquoddy data in (23) repeated below as (46). Both rhythm and secondary accent are marked in the examples with the IPA diacritic <ˌ>, but rhythmically prominent syllables are additionally underlined for clarity of exposition:

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[105] It is possible that one more parameter might be relevant for rhythm assignment – DIRECTION (of propagation) with possible settings being 'leftward' or 'rightward'. Positing this parameter would be warranted if rhythm systems may differ in the direction of rhythmic alternation, regardless of the rhythm anchor. Thus, if indeed such parametric variation exists, we should find 'echo' systems differing solely in the direction of rhythmic beats assignment. Consider (i) vs. (ii) below; the syllable carrying primary accent is represented with a bold-faced capital sigma, syllables in rhythmically strong positions are underlined:

(i)   Binary 'Echo' rhythm L-R
      σ σ σ σ **Σ** σ σ̱ σ σ̱ σ

(ii)   Binary 'Echo' rhythm R-L
     σ̱ σ σ̱ σ **Σ** σ σ σ σ σ

I am not aware of such pairs of languages, and it is possible that rhythmification is always automatic and exhaustive, in which case specifying the anchor (i.e. primary accent or secondary accent) is sufficient.

(46a) ˌteh.ˌsah.kwa.ˌpa.sol.ˈti.ne

'Let's walk around on top.'

(46b) ˌwi.ˌcoh.ke.ˈke.mo

'He helps out.'

(46c) ˌwi.coh.ˌke.ta.ˈha.mal

'He thinks of helping the other.'   (LeSourd 1988: 140-143)

Recall, in Passamaquoddy, (i) fixed primary stress falls on the penultimate syllable, (ii) fixed secondary stress falls on the initial syllable, and (iii) regular rhythm falls on alternate syllables from the primary stress (*echo* rhythm in terminology of van der Hulst 2014). The following settings of the parameters at each level derive the observed pattern:

Primary Accent	Secondary Accent	Rhythm
BOUNDED (R)	BOUNDED (L)	RHYTHM (ECHO)
SATELLITE (N/A)	SATELLITE (N/A)	LAPSE (N)
WEIGHT-TO-ACCENT (N)	WEIGHT-TO-ACCENT (N)	NONFINALITY (N/A)
SELECT (L)	SELECT (L)	
DEFAULT (L)	DEFAULT (L)	
CULMINATIVITY (Y)	CULMINATIVITY (Y)	
OBLIGATORINESS (Y)	OBLIGATORINESS (Y)	

Table 1. Settings of prosodic parameters in Passamaquoddy

Table 1 captures the account proposed in this chapter for secondary accent as separate from rhythm in application to the prosodic system of Passamaquoddy. Note that by virtue of being dependent on the same set of parameters, primary accent and secondary accent are formally united, while rhythm is treated as formally different. Since the approach put forward in this

chapter formally unites primary accent and secondary accent as belonging to the same kind of word-level prominence, while rhythm is regarded as belonging to a different kind, some of the issues which were unresolved in the Separation Theory of van der Hulst (2014) and Goedemans and van der Hulst (2014) receive an explanation. For instance, it is unexplained in the Separation Theory why some properties may be shared between primary stress and secondary prominence since the two types of prominence are regarded as unrelated phenomena. Under the account proposed here, it is predicted that primary accent would be sharing some properties with secondary accent (but not with rhythm). Thus, for instance, cases mentioned in Goedemans and van der Hulst (2014) like English swapping of primary and secondary stresses in ábsolùte/ àbsolútely is problematic for the Separation Theory, but not for the Ultra-Separation Theory. Another example in Goedemans and van der Hulst (2014) includes primary stresses preserved as secondary stresses in word formation as in medícinal/medìcinálity. In the approach proposed in this chapter, such examples would be regarded as a case of cyclic *lexical* secondary accent (cf. **6.3.3**).

Finally, I propose, building on the Accent-First theory (van der Hulst 2009, 2011a, 2012, 2014) that another formal difference between secondary accent and rhythm is in the timing of assignment. In van der Hulst (2009, 2011a, 2012, 2014) it is argued that the 'irregularity' observed in prosody cross-linguistically is to be attributed to the accentual module which belongs to the 'lexical phonology'. Van der Hulst also proposed that the rhythmic module is 'post-grammatical', fully regular, and automatic. I propose that both primary and secondary accent are assigned at the level of 'lexical phonology', at a point of the prosodic derivation when morpho-lexical and morpho-phonological material is accessible. This is generally assumed to be true of primary accent assignment in order to ensure that primary accent can be (i) sensitive to segmental phonology, (ii) sensitive to morpho-lexical information, and (iii) can drive phonological (segmental) processes. I thus argue for a more general

application of the Accent-First theory: I propose that secondary accent, being formally *accent,* i.e. a prosodic property defined in (3) and governed by the parameters in (3a), is assigned in parallel to primary accent. This predicts that secondary accent might exhibit morpho-lexical and morpho-phonological interactions comparable to primary accent because it is assigned at the same time as primary accent. Rhythm, on the other hand, following the Accent-First theory, is fully automatic and is assigned at a later point in the prosodic derivation when it cannot drive segmental processes and is insensitive to morpho-lexical information. As shown in this chapter, this prediction is borne out. The Chamorro case discussed in **6.3.3** can be taken as an illustration. Recall, in Chamorro both primary stress and secondary stress result from underlying (lexical) accent marking, while binary rhythm is a fully automatic alternation of strong and weak syllables. Crucially, primary and secondary stress participate in the morpho-phonological processes of gemination and umlaut. Rhythm, on the other hand, does not participate in any morpho-phonological or lexical processes as predicted by the theory proposed in this chapter (Chung 1983; Kaplan 2008).

CHAPTER 7. CONCLUSION

7.1 Summary and Implications

This thesis makes two major proposals. **Firstly**, this dissertation proposes a novel typology of lexical accent systems based on the accent behavior observed in lexical accent languages with highly synthetic morphologies. I argue that such typology ought to be based on the definitional traits of lexical accent languages, which I identify as lexical marking of morphemes for accent and competition between input lexical accents for being realized as primary stress. In the core of the proposed typology is identifying the particular strategies of resolving accent competitions. I argue that accent competition in lexical accent languages can be resolved in one of two ways: either *cyclically*, involving some morphological information, or *directionally* (or post-cyclically) involving only phonological information in resolving accent competitions. Thus, I propose that only two types of lexical accent systems are attested cross-linguistically. The main theoretical framework that this dissertation relies on is the Accent-First Theory (van der Hulst 1984, 1996, 2012, 2014). The application of the Accent-First Theory and the proposed typology of lexical accent systems makes predictions regarding lexical accent systems which should not be possible. Specifically, I predict that (i) lexical accent systems which would rely on morpheme identities in resolving accent competition should not exist, and that (ii) syllable weight distinctions cannot be the deciding factor in lexical accent competition. While the latter prediction appears to be empirically true, I evaluate the former prediction in detail in Chapters **3** and **4** of this dissertation and show that it holds. **Secondly,** this dissertation makes a novel proposal regarding the status of fundamental properties of stress and prosody – Culminativity and Obligatoriness of stress (Trubezkoy 1939; Hyman 2006, 2009) and primary versus non-primary stress in their application to languages with complex morphology. Firstly, I argue that, contrary to previous claims that Culminativity of stress can be breached in highly synthetic languages, stress in stress-accent languages is in fact always culminative, but

Culminativity should be regarded as a macroparameter allowing for a set of language-specific ways to implement it. Secondly, I propose that the word-level prosodic system is not bipartite: primary stress vs. rhythm, but tripartite: primary stress vs. secondary stress vs. rhythm. Below, I provide a more detailed summary of specific issues addressed in every chapter of this dissertation.

Chapter **1** presents an overview of the proposals made in this thesis and the necessary theoretical background. Chapter **2** presents the first of the two types of lexical accent systems proposed in this dissertation – *Directional Accent* systems. *Directional Accent* systems are defined as follows:

(1) *Directional Accent*

   In an accent competition, either the right-most or the left-most accent wins, i.e. competition is resolved *directionally.*

It is argued that despite being *lexical accent* systems, languages with *Directional Accent* do not require access to any morphological information in the process of stress assignment. A novel analysis of lexical accent in a Plains Algonquian language Arapaho is presented as a case study in Chapter 2.

Chapter **3** presents the second type of lexical accent systems proposed in this dissertation – *Cyclic Accent,* which is defined in the following way:

(2) *Cyclic Accent*

   In an accent competition, accent in the outermost derivational layer within the relevant morpho-prosodic domain wins, i.e. competition is resolved *cyclically.*

Two case studies of stress in Sahaptian languages are presented – Nez Perce and Ichishkiin Sɨnwit. Sahaptian stress systems have previously been analyzed as Affix-Controlled (Hargus and Beavert 2002, 2006, 2016), and have been viewed as a rare example of stress systems that

seemingly require a high ranking of the Affix Faithfulness constraints over the Root Faithfulness constraints (cited as such, for instance, in Inkelas 2014, van Oostendorp and Rice 2011). I argue that these languages do not warrant positing high-ranking affix faithfulness. Instead I propose to treat these systems as examples of lexical accent being assigned cyclically, thus, eliminating the need to posit the third typologically marked type of lexical accent systems.

Chapter **4** is dedicated to a revision of evidence for Root-Controlled Accent (Alderete 1999, 2001) as a separate type of lexical accent systems. I argue that the prediction made by the typology proposed in this thesis holds; namely, I argue that true Root-Controlled Accent systems do not exist. I propose that all accent systems previously analyzed as Root-Controlled can be reanalyzed as either *Directional* or *Cyclic* eliminating the need to posit the third (typologically marked) type of Root-Controlled Accent. I review evidence from two Uto-Aztecan languages to support this proposal: Cupeño, as analyzed in Alderete (1999, 2001) and as analyzed in Yates (2017), and Choguita Rarámuri (first analyzed in Caballero 2008). I adopt Yates' (2017) analysis for Cupeño, and I propose a novel analysis for Choguita Rarámuri, in which I show that an account in terms of *Directional Accent* makes correct predictions for the data which remain unaccounted for under the Root-Controlled Accent analysis. I thus ultimately conclude that no clear cases of Root-Controlled Accent have been attested cross-linguistically, supporting the prediction made by the theory of lexical accent proposed in this dissertation.

Chapter **5** addresses the issue of Culminativity of stress, especially in its application to languages with complex morphology. Data from a number of genetically and geographically diverse languages with complex morphology are considered, and it is proposed that the domains of stress Culminativity vary from language to language. I argue that the observed variation should be captured with a macroparametric definition of Culminativity.

In Chapter **6,** a novel view on the organization of word-level prosodic system is proposed. Based on data from multiple languages with complex morphology, I argue that cross-linguistic data is better accounted for if we assume that the prosodic system has three levels of prominence: primary accent, secondary accent, and rhythm. Secondary accent is defined as abstract marking for inherent prominence phonetically realized as non-primary stress. Rhythm is defined as automatic iterative alternation of strong and weak syllables. I show that secondary accent and rhythm regularly exhibit non-trivial discrepancies in their phonological behavior and I propose that these discrepancies stem from two different sets of parameters governing the two properties. It is argued that secondary accent is governed by the same parameters as primary accent, but the settings of the relevant parameters for primary and secondary accent within a single language may be conflicting. This is taken to suggest that separate applications of the accent-assigning algorithm are required for primary and secondary accent leading to the proposed tripartite structure of the prosodic system.

7.2 Future research

There remain a number of unanswered questions concerning prosodic and morpho-prosodic processes in lexical accent systems. The first and most obvious avenue for future investigation would be to supplement the current study with additional case studies of lexical accent in both highly synthetic languages and in languages of more modest morphological complexity. A limited number of lexical accent languages have been in the phonological theory limelight historically. The general ideas about lexical accent in the existing scholarship have been formed on the basis of a small set of often genetically related languages. An important empirical aim of the current study was to include a broader range of (historically understudied) lexical accent systems into the theoretical discourse. However, it is undeniable that the findings of the existing large-scale studies on lexical accent, including the findings of this thesis, as well as of

Revithiadou (1999), and Alderete (1999) ought to be tested on a larger genetically and geographically diverse set of languages.

Research in the area of morpho-prosodic interactions in the assignment of lexical accent can potentially be extended in a number of promising directions. The first overarching question that remains to be investigated further is just how much of morphological information lexical accent languages require to or can access in their stress assignment. The second question in this area concerns the nature of morphological domains relevant for lexical accent computation. Thus, for instance, it has been observed in this thesis and elsewhere that the prefixal domain in many languages does not participate in accent assignment in the same way as the root+suffixes domain does. Various asymmetries are found: as has been shown in chapter **3,** some languages (e.g. Sahaptian) appear to integrate prefixes into the accent placement algorithm only after all the suffixes have been integrated. In other languages, the prefix-suffix asymmetry in accent calculation manifests itself in the requirement to treat prefixes as a separate domain for the purposes of accent assignment: this pattern, for instance, has been reported for Passamaquoddy (LeSourd 2013). Note however, that accent assigned in prefixes in Passamaquoddy is not lexical, i.e. it is phonologically predictable. An empirical question is whether this type of asymmetry is ever found with lexical accent. Finally, we encounter languages where prefixes are excluded from accent assignment altogether, while roots and suffixes participate in the accent-related processes. This is the case, for example, in some Salishan languages (Dyck 2009). These asymmetries in the accentual behavior of prefixes and suffixes should be investigated in connection with other prefix-suffix asymmetries found in various phonological processes.

Another research question requiring further investigation is the following: *What is a stress domain?* This thesis touches upon the issue of possible non-isomorphic accent domains within a single language. However, an in-depth research of the possibility of deconstructing

the *stress domain* is required. Recall, for instance, the discussion of multiple domains relevant for accent assignment in Choguita Rarámuri (see §**4.4**), which suggests that the notion of a 'stress domain' must be deconstructed as no single 'stress domain' can be defined in at least some languages. Rather, multiple non-isomorphic domains, some purely phonological and others – morpho-phonological, must be defined in order to account for the stress assignment patterns in these languages. More specifically, it might turn out that any discussion of a stress domain must include separate definitions for (i) the domain of culminativity, (ii) the domain of obligatorinness, and (iii) the domain which can assign stress. For instance, as detailed in Chapter **4**, Choguita Rarámuri has a three-syllable Obligatory Stress Domain (OSD) aligned to the left edge of a morphological word, a simplified representation is given in (3) below:

(3) Obligatory Stress Domain in Choguita Rarámuri

$$[\{_{\text{OSD}} \; \sigma \; \sigma \; \sigma\}\ldots$$

The OSD in Choguita Rarámuri references only the distance from one of the word edges measured in syllables. This domain is maximally three syllables long, and is the target of both the lexical accent assignment, which can result in stress on any of the first three syllables, and of the Default rule, which assigns stress to the second syllable. Crucially, the domain which can participate in the assignment of lexical stress is (i) non-isomorphic with the OSD, and (ii) is not constrained by the distance from the word edges in syllables. I show that this domain incorporates the whole morphological word. Further research is required in order to establish patterns of interactions between different possible stress-related domains within a language.

Yet another theoretical issue, which parts of this dissertation raise but do not fully explore, is the issue of the diacritic nature of phonological cyclicity. In the treatment of *Cyclic Accent,* one of the assumptions adopted throughout this dissertation is that phonological cyclicity is *diacritical*, i.e. it is an inherent, unpredictable, and non-derivable property of individual morphemes (this in fact has been suggested by Czaykowska-Higgins 1993; Halle

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and Vergnaud 1987a,b; and recently by Schwayder 2015). Thus, a morpheme is *cyclic* for the purposes of the *cyclic accent* assignment if it carries a relevant diacritic, or a morpheme is *cyclic* for the purposes of the application of *cyclic vowel harmony* if it carries a relevant diacritic; i.e. there is no reliable way to predict which morphemes would be cyclic for a particular phonological process cross-linguistically or even within a single language. This then predicts that different phonological processes can create non-isomorphic phonological cycles, for instance, for the application of segmental and prosodic rules, since there is no reason to expect diacritics to align if their distribution is not governed by any predictable property of morphemes or syllables. Thus, for instance, if *lexical accent* is *cyclic* in a language, i.e. the accent algorithm reapplies iteratively from the most embedded morphemes to the outermost morphemes, the cycles created by the stress algorithm may not be isomorphic to morpho-syntactic cycles or cycles where segmental processes apply (e.g. vowel harmony, syllabification). If this is on the right track, we might expect to find systematic differences between different (types of) phonological cycles. For instance, we might expect that (i) different phonological cycles may be subject to different constraints, or that (ii) a single morpheme or a class of morphemes can be cyclic with respect to one process but non-cyclic with respect to another. Preliminarily, we find evidence for both (i) and (ii). For instance, supporting (i), cross-linguistically we find different constraints on the behavior of prosodic cycles vs. segmental cycles in that stress assigned cyclically can be rewritten or overwritten, but segmental processes cannot be. Prosodic cyclic overwriting is found, for example, in Ichishkin stress (see chapter **3**) and in Hausa tones (Trommer 2011); overwriting of segmental cyclic effects, however, appears to be cross-linguistically disallowed (see Schwayder 2015: 69-71 for discussion). The full range of predictions and outcomes of viewing phonological cyclicity as diacritical and thus potentially applying in different ways to different processes is yet to be explored.

Finally, a number of outstanding issues concerning the nature of secondary prominence have been outlined in chapter **6.** As mentioned in **6.1**, phonetic and phonological properties of secondary accent and rhythm require further investigation both cross-linguistically and within individual languages.

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