Accent in Proto-Indo-European Athematic Nouns: Antifaithfulness in Inflectional Paradigms

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Abstract

Melissa Frazier: Accent In Proto-Indo-European Athematic Nouns: Antifaithfulness in Inflectional Paradigms
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This paper examines four accent patterns displayed by athematic nouns in Proto-Indo-European. Each accent pattern is distinguished by either alternating stress or vowel quality between "weak" forms (nominative, accusative, vocative) and "strong" forms. I argue that surface stress is the result of the interplay of the lexical accent specifications of the morphemes that compose the stem. The strong endings are classified as dominant and are thus responsible for the accent/ablaut alternations.

Optimality Theory is used to provide a synchronic phonological analysis of athematic noun accent. The weak forms are accounted for with a ranking of faithfulness and alignment constraints, including a positional faithfulness ranking in which faithfulness to roots is preferred over faithfulness to derivational affixes. The strong endings, which are dominant, trigger antifaithfulness constraints (Alderete 1999), and so a new type of antifaithfulness constraint is introduced that works within inflectional paradigms, based on the Optimal Paradigms model (McCarthy 2005).

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List of Abbreviations

abl:	ablative
acc:	accusative
adj:	adjective
anim:	animate
BAP:	basic accentuation principle
dat:	dative
deriv:	derivational affix
dom:	dominant
E:	inflectional ending
fem:	feminine
gen:	genitive
IE:	Indo-European
infl:	inflectional affix
instr:	instrumental
IO:	input-output correspondence relation
loc:	locative
masc:	masculine
n:	noun
nom:	nominative
nt:	neuter
OO:	output-output correspondent relation
OP:	Optimal Paradigms

OT: Optimality Theory

PIE: Proto-Indo-European

PoA: post-accenting

PrA: pre-accenting

PrWd: prosodic word

R: root

rec: recessive

ROA: Rutgers Optimality Archive [http://roa.rutgers.edu/index.php3]

S: derivational suffix

TAF: Transderivational Antifaithfulness Theory

voc: vocative

¬OO: antifaithfulness on the output-output correspondence relation

¬OP: antifaithfulness on the ¬OP correspondence relation

Chapter One

Introduction

The reconstruction of accent in Proto-Indo-European, and particularly the reconstruction of accent in athematic nouns, has undergone a revolution in the field of Indo-European linguistics. Through the first half of the 20th century, the neogrammarian could have sat in on an IE lecture and felt perfectly at home, and the student of the 1960's could have consulted the classic Karl Brugmann text (1911: *Grundriß der Vergleichenden Grammatik der Indogermanischen Sprachen*) without worrying about it being outdated. Despite pioneering work by Pederson and Kuiper earlier in the century, many thought up to the 1970's that accent in PIE athematic nouns was essentially unpredictable and lexically dependent. A coherent system of accentual patterns in PIE athematic nouns grew out of several seminars (notably at Erlangen), most fully reflected in a series of articles by Schindler (such as 1972, 1975a, 1975b, 1975c). Specifically, Schindler describes four accentual patterns in the athematic nouns, three in which there is an accent alternation and one in which accent is fixed. While there are currently several variants of the system and continuing debate about the details, the basic schema as presented by Schindler has won wide acceptance. This system would be unintelligible to the original IE scholar because surface accent is not a straightforward result of lexical specifications or of phonological rules.

The problems presented by the position of accent in athematic nouns, which would have troubled the pioneers of the field and have troubled contemporary scholars, are rooted in the observation that surface accent does not always appear where there is underlying accent even when underlying accent is present in the word. Additionally, generalizations that can be made about the realization of underlying accent appear to have inexplicable exceptions. Thus, the accent patterns of athematic nouns in PIE have been notoriously difficult to fit into a system of phonology, and the primary goal of this thesis is to present a phonological analysis of the accent alternations, using the theoretical framework provided by Optimality Theory.

The details of PIE athematic nouns will be presented in chapter 2. Until then, a few words of description will be necessary before continuing with the remainder of this chapter. There are four accent patterns that distinguish athematic nouns, three of which are distinguished by a different placement of stress in "strong" forms (the "direct" cases: nominative and accusative) as compared to the placement of stress in the "weak" forms (the "non-direct" cases). Nouns are morphologically composed of a root, a derivational suffix (or more than one), and an inflectional ending. Some nouns, called root nouns, are composed of only root and ending. In the *acrostatic* accent class, stress is always on the root, and there is an ablaut distinction (vowel alternation) between strong and weak cases. In the *proterokinetic* accent class, stress alternates between the root in the strong cases and the suffix in the weak cases. For *hysterokinetic*, there is a stress alternation between the suffix in the strong cases and the ending in the weak cases. Finally, *amphikinetic* nouns display stress on the root in strong cases and on the ending in weak cases.

I will argue that the accent alternations between strong and weak form are the result of dominant affixes. Because it is the same stem that is inflected by weak and strong endings for any given noun, and there is generally an accent alternation between weak and strong forms, the accent alternation must in some way be caused by the particular endings. The strong endings are somehow different from the weak endings, and this difference causes accent alternation. It has been suggested in the literature that this difference is that weak endings are underlyingly accented and strong endings are not (see §1.1). I will argue that this is not enough to explain the accent alternations – it will also be necessary for strong endings to be *dominant* (see §1.2, §1.4, and chapter 4).

The fact that there are four different accent patterns is a result of the morphology of the stem – of the possible combinations of root and suffix that create the stem of the noun (which is then inflected by an ending). The roots and suffixes can have a small set of lexical specifications with regard to accent; roots can be unaccented, accented, or post-accenting, and suffixes can be unaccented or accented, yielding six possible combinations given one root and one suffix per stem. The particular accent pattern of a noun is the product of what type of root combines with what type of suffix. For example, the combination of accented root and accented suffix yields an acrostatic noun, where stress always surfaces on the root, while the combination of unaccented root and accented suffix yields a proterokinetic noun where stress surfaces on the suffix in weak cases but on the root in strong cases as dictated by the dominant inflectional ending (even though this means that underlying accent is not realized and stress occurs where there is no underlying accent).

I will thus argue in this paper for a morphologically based account of accent in PIE athematic nouns. Specifically, there are six possible stem types given the lexical specifications for roots and suffixes listed above (and assuming, in accordance with Richness of the Base, that the language can impose no restrictions on what type of root can combine with what type of suffix). These stems are inflected by the same set of endings – some of which are dominant and some of which are not dominant (i.e. recessive). The dominant affixes are responsible for the accent alternations. Just what type of accent alternation occurs is determined by the stem type. There are four types of accent alternation, and so it will be shown that two of these types can each be created by two different types of stems. I will furthermore argue that dominance is enforced via antifaithfulness, as based on Alderete (1999). However, it will be necessary to amend the theory of Transderivational Antifaithfulness (TAF) so that it can apply to members of an inflectional paradigm. This paper will thus present evidence not only for antifaithfulness constraints, but also for a new type of antifaithfulness constraint that can compare the stem of an output that was formed with a dominant affix to the stem of an output that was formed with a recessive affix. These new constraints will be termed ¬OP constraints and are based on McCarthy's Optimal Paradigms model (2005).

This is of course a small piece of the puzzle – athematic noun accent is part of a larger system of accent. Furthermore, the athematic nouns are also subject to ablaut patterns that are perhaps even more perplexing than the accent patterns (though they are considered to be related to the accent patterns (see §2.3 and §5.1)). A thorough analysis of ablaut or of the entire accentual system of PIE is beyond the scope of this paper, and so I will limit lengthy discussion to the analysis of accent in just the athematic nouns, though I hope to shed some light on the ablaut that is closely linked to accent.

1.1 Previous Analysis and Description

The literature on the phonology of stress in PIE includes detailed description (most notably Kiparsky and Halle 1977 and Halle 1997) and one thorough analysis (Kim 2002). The first two works provide general descriptive statements about the phonology of stress in

PIE, including assumptions about underlying representations, accentual categorizations for morphemes, and rules for changing underlying form. They reserve analysis however for select attested daughter languages. Kim (2002) provides the only detailed analysis of these four accent classes in PIE itself, but his analysis relies on unwarranted modifications to standardly accepted morphological reconstruction. All of these works have laid the foundation for an analysis, but none of them has successfully accounted for the four different accent classes as existing in a synchronic state of PIE. In this section I will outline the parts of these proposals that are most relevant here, discussing what advances have been made and what amendments need to be made.

Kiparsky and Halle (1977) do not actually analyze the PIE athematic nouns. Instead, they discuss aspects of the "accentual systems of Slavic, Lithuanian, Vedic, and Classical Greek, …which are to be reconstructed also for Proto-Indo-European (p. 209)." They express the insight that surface accent in PIE does not necessarily match underlying accent. While all words surface with one and only one accent, underlying representations may contain more than one accent or none. A crucial proposal of theirs is the Basic Accentuation Principle (BAP: p. 209), which says that there is preference for stressing the leftmost morpheme possible. Specifically, if there is no stress in the underlying representation, stress will surface on the initial syllable/morpheme; if there is more than one stressed morpheme in the underlyingly representation, stress will surface on the leftmost of these morphemes. For example, the BAP predicts that if the root (the initial morpheme) is stressed in the underlying form, it will always surface as stressed. These proposals will be integrated into the analysis presented here. It will be especially convenient to refer to the BAP as it describes the preference of PIE for leftmost stress. In this paper I will thus use the BAP as a descriptive tool, but the reader should note that the BAP is not a part of my analysis. There are instances where the leftmost underlying accent does not surface, and these occasions as well as the ones in which the BAP makes the correct predictions will be explained by a constraint ranking.

Kiparsky and Halle also claim that certain morphemes can trigger a "deaccentuation" rule, which causes a deletion of accent somewhere in the stem. The designation of a morpheme as deaccenting is "in part specified in its lexical entry, and in part predictable morphologically (p. 210)." It is never made explicit just how deaccentuation can be predicted morphologically or just what morphemes have such a specification in their lexical entry. In the following section, I will argue that the process of deaccentuation is the result of dominant affixes. This is essentially the claim being made by Kiparsky and Halle (the term *dominant* had not yet been applied to affixes at this time), however the analysis here will specify which morphemes are dominant, provide evidence for their dominance, and capture the result of this dominance with an OT constraint ranking.

While Halle (1997) is more focused on the analysis of accent in PIE's daughter languages, he presents some important claims about the types of stems that create each specific accent pattern, especially with regard to acrostatic and amphikinetic nouns. The acrostatic nouns must have a root with inherent accent. For this reason they always surface with a stressed root in accord with the BAP. The amphikinetic nouns do not have underlying accent anywhere in the stem. In the strong cases the root is stressed because there is no underlying accent, and so again the BAP predicts initial stress. In the weak cases of these nouns, stress in on the ending, which means that the weak endings must have underlying accent. The ending is not competing for accent with any other morphemes and so it is stressed in the output. Assuming accented weak endings is not problematic for acrostatic nouns, because root stress will always win over ending stress.

Kim's (2002) dissertation is the only work whose primary focus is the analysis of accent in a synchronic state of PIE. Using "metrical bracket theory" as developed by Idsardi (1992), Kim successfully accounts for two types of accent patterns in athematic nouns as well as the surface accent of root nouns. His analysis makes use of the proposals made by Halle (1997) with regard to underlying accent in stems associated with certain accent classes as well as the BAP.

The problematic features of Halle's (1997) and Kim's (2002) analyses lie in their treatments of the proterokinetic and hysterokinetic nouns. Halle (1997: 309) proposes that there is an "accent retraction" rule that can be triggered by certain morphemes to account for the proterokinetic weak cases. However, this rule seems to operate only when descriptively necessary, i.e. there is no clear phonological or morphological motivation for its use. More troubling is the analysis of the hysterokinetic nouns which says that the suffix is rendered non-stress-bearing in weak cases by a certain rule. However, this goes against the BAP and again the rule is triggered by descriptive need – it is not triggered by specific morphemes or phonological contexts.

Kim's approach to proterokinetic and hysterokinetic nouns is quite different. He found that the rules for PIE stress (using metrical bracket theory) did not allow for such accent patterns. For this reason, he suggested different morphological compositions. Specifically, it was proposed that in proterokinetic nouns the suffix and ending had been reanalyzed by the speakers as one morpheme. This is not plausible given that endings are the same no matter what stems they attach to or what accent class the inflected noun belongs to.

Furthermore, the endings undergo changes in Hittite that could not be explained if the speakers did not recognize them as distinct morphemes. For example, the suffix *ew followed by the genitive singular inflectional ending *s should have become, according to regular sound laws, *aw-s* in Anatolian. However, this sequence of morphemes becomes *aw-as*. The second *a* is inserted by analogy with other inflectional endings that have this vowel (Weitenberg 1984). If this sequence was not recognized as two different morphemes by speakers, there would no way to explain the epenthetic *a*. If Anatolian speakers could recognize the morpheme boundary, there is no reason to suppose that PIE speakers could not.

For hysterokinetic nouns, Kim suggests that the root and suffix had been fused into one morpheme. For the example that he gives, *ph_2ter- 'father' (p. 45), this could be the case, as well as with the other family relation terms that are hysterokinetic. However, other hysterokinetic nouns exist in which such morpheme reanalysis is not tenable. For example, the hysterokinetic stem *dh_3-ter- 'giver' is composed of the verb root for 'give' (*deh_3) and a suffix that creates animate agent nouns (*ter) (Tichy 1995). The root is clearly a morpheme as it exists in verbal and nominal forms and the suffix is used with the same meaning in many other reconstructed words. Morpheme reanalysis is simply not a solution to the puzzling behavior of proterokinetic and hysterokinetic nouns.

1.2 A New Approach: Dominant Affixes

Work on the morphology-phonology interface has shown that affixes can cause a change in the stem to which they attach that is not attributable to any phonological content in the stem or affix. More specifically, there are affixes whose attachment results in the deletion of structure from the stem. Such affixes have long been termed *dominant* (Inkelas (1996) credits an unpublished manuscript by Kiparsky (1982c) as the first case where the term “dominant” was applied to affixes). These contrast with *recessive* affixes that cause no deletion or mutation in the stem.

It is most common in the literature for affixes to be labeled as dominant when they cause a deletion of accent from the base. Alderete (2001:204-5) notes, though, that there exists a wide variety of phonological phenomena that can be explained by referring to dominance, such as deletion, ablaut/consonant mutation, spreading, metathesis, and exchange (i.e. long vowels replace short vowels and vice versa due to affixation). Taking these diverse processes into consideration, we can define *dominance* as a lexical specification associated with a morpheme that causes a base mutation (Alderete 2001: 224). Any affix that does not bear such a specification is, by default, recessive. I will thus use the terms “recessive” and “not dominant” interchangeably.

A classic example of dominance in the literature comes from Tokyo Japanese. In this language the affix –*kko* deletes any accent that occurs in the base. The affix itself is unaccented, so resulting outputs are devoid of pitch accent.

(1) Dominance in Tokyo Japanese (Alderete 1999, after Poser 1984, McCawley 1968)

/edo + kko/	→	edo-kko	‘native of Tokyo’
/kóobe + kko/	→	koobe-kko	‘native of Kobe’

In the above example, the only way to explain the absence of pitch accent in *koobekko* is to assume that the affix triggers some sort of accent-deletion process. Similarly, I will argue that the only way to explain stress on the root in proterokinetic nouns in PIE is if the strong endings are dominant and thus trigger constraints that require a change in stress as compared to a noun inflected with weak endings. Dominant endings will not be necessary to explain accent alternation in the other three accent classes, but they will be compatible with the outputs expected of those classes and will be useful in explaining the ablaut in acrostatic nouns (see §5.1).

1.3 Theoretical Framework: Optimality Theory

The analysis presented in this paper will make use of the theoretical framework provided by Optimality Theory (OT). The reader is referred to Prince and Smolensky (1993) and McCarthy (2002) for thorough discussion of OT, but I will describe a few basic and important concepts here. The reader with an understanding of OT may skip this section including its subsections.

The grammar in OT consists of a ranking of constraints that evaluate the well-formedness of possible outputs. Constraints can express the desire for an output to have a certain form, such as the desire for syllables not to have codas. These are *markedness* constraints. Or constraints can express the desire for an output to be identical to the input in some way, such as the desire not to insert segments into the output that do not exist in the input. These are *faithfulness* constraints. The list of constraints is universal, such that the grammar of any language is defined with the same set of constraints. The property of universality means that OT constraints are violable. A violation of a constraint is tolerated by a language if a higher-ranking constraint is satisfied. In this way, the ranking of constraints creates the grammar of a language.

The optimal output of a language is thus decided through competition among possible outputs, which are called *candidates*. The constraints assign violation-marks ('*') to each possible output by comparing the output to the input (in the case of faithfulness constraints) or by judging the form of the output (in the case of markedness constraints). All losing candidates must violate a higher-ranking constraint than the winning candidate (the output) or they must be harmonically-bounded by the winning candidate, which means that the violation-marks incurred by the winning output is a subset of the violation-marks incurred by the losing candidate.

These ideas will be illustrated by looking at two OT constraints and how their ranking predicts two different grammars. This discussion will also illustrate how an OT grammar is formalized by using a tableau. Some languages require syllables to have onsets. This linguistic fact is represented by a constraint ONSET that penalizes syllables that don't have onsets. A constraint that can conflict with ONSET is a faithfulness constraint that penalizes the insertion of a segment from input to output – IO-DEP.

(2) ONSET (McCarthy and Prince 1993a)
Syllables do not have onsets.
Assign a * for each syllable that does not start with a consonant.

(3) IO-DEP (McCarthy and Prince 1999)
Do not insert segments. Every output segment s_o should have an input correspondent s_i.
Assign a * for each s_o that has no correspondent.

Given just these two constraints, two possible grammars can be created. In one grammar, ONSET dominates IO-DEP (this relationship between the two constraints is expressed in shorthand form as ONSET » IO-DEP). This grammar is illustrated with the tableau in (4). This ranking means that the language prefers to have onsets, even if an onset has to be created through epenthesis. In this tableau, the winning candidate (a) satisfies the higher-ranking constraint as compared to candidate (b). The possible candidate (c) is harmonically bounded by the winner. It is a loser regardless of the constraint ranking.

(4) Mini-Grammar: ONSET » IO-DEP

	/ata/	ONSET	IO-DEP
a	☞ ʔata		*
b	ata	*!	
c	ataʔ	*!	*

Another possible grammar given these two constraints is one in which IO-DEP dominates ONSET. As shown in the tableau in (5), this language tolerates onsetless syllables in order to satisfy the constraint against epenthesis. Candidate (a) violates the higher-ranking constraint and thus loses.

(5) Mini-Grammar: IO-DEP » ONSET

	/ata/	IO-DEP	ONSET
a	ʔata	*!	
b	☞ ata		*

The solid line in the above tableaux shows that the constraint to the left dominates the constraint to the right. If two constraints next to each in a tableau are unranked with respect to each other, they will be separated by a dashed line. An exclamation mark denotes a fatal violation; if more than one violation could potentially be fatal, this will be indicated with exclamation marks in parentheses.

The concept of competition that is central to OT makes it the ideal framework for analyzing the PIE athematic nouns. Consider the case of acrostatic nouns in weak cases. In one type of acrostatic noun (see table 2.9 for underlying representations associated with each accent class), when a weak ending is added to the stem, both the root and the ending have underlying accent. Assuming only faithfulness constraints that tell the output to be like the input, and markedness constraints that express cross-linguistic metrical preferences (such as culminativity and rhymicity (Hayes 1995)), there are several possible candidates that satisfy one more of these constraints. If there is no change made to the underlying form, i.e. all faithfulness constraints are satisfied, the surface form would have two accented syllables. However, there is a markedness constraint that assigns violation-marks to a word with two accents (see §3.1.1). This markedness constraint could be satisfied with a surface form with accent on the root only or a surface form with accent on the ending only. Each of these (and more) possible surface forms compete against each other, and the winner, i.e. the actual output, is determined by the constraint ranking. Because we know which candidate wins, the goal of this thesis is to determine the constraint ranking that correctly predicts the winner for any possible input.

1.3.1 Correspondence Theory

The faithfulness constraint defined in the previous section compares outputs to inputs. However, it is not always the case that an output is expected to be faithful to an input, and there are phonological phenomena that be explained by faithfulness that is not a product of comparing an output to an input. For this reason, faithfulness constraints can be expressed on different *correspondence relations*.

(6) Correspondence (McCarthy and Prince 1995)

> Given two related strings S_1 and S_2 (underlying and surface), correspondence is a relation $\Re$ from the elements of S_1 to those of S_2. An element $\alpha \in S_1$ and any element $\beta \in S_2$ are referred to as *correspondents* of one another when $\alpha \Re \beta$.

One of the key insights of correspondence theory is that S_1 and S_2 as defined above do not necessarily have to signify underlying form and surface form respectively. For example, in addition to the input-output (IO) correspondence relation, faithfulness constraints are also proposed to operate on the base-reduplicant (BR) (McCarthy and Prince 1995) and output-output (OO) (Benua 1997) correspondence relation. Thus, for each faithfulness constraint, there are separately rankable faithfulness constraints that operate on different correspondence relations. If a faithfulness constraint is operational on the IO correspondence relation, the IO prefix will be dropped in the abbreviated names, i.e. DEP is an IO constraint, while OO-DEP is an OO constraint.

Because the output-output correspondence relation will be discussed in this a paper, a few words on the topic are relevant at this time. Derived words can display similarities to the base from which they were derived that are not expected given a ranking of markedness and IO-faithfulness constraints. Pre-OT analyses of such phenomena often appealed to cyclicity – a process whereby phonological rules apply to a base, then an affix is added, and then (possibly different) phonological rules apply to the derivative. OO correspondence is able to account for similarities between related words without using cycles or levels in the phonology. A derived word is compared to the output of its base through OO-faithfulness constraints and to the input through IO-faithfulness constraints simultaneously. If an OO-faithfulness constraint dominates the appropriate markedness constraints, the derived word will mimic the base even if this leads to a marked structure. If an OO-faithfulness constraint dominates the corresponding IO-faithfulness constraint, the derived word will be faithful to the base even if this means being unfaithful to the input. Allowing for multiple types of correspondence has been instrumental in preserving parallelism in OT. That is, in its purest form, there are no cyclic levels and no re-ranking of constraints allowed in OT; all candidates are evaluated in parallel and compared to the input as well as the output of the base (if applicable) in one pass through the system.

Throughout this paper, correspondence theory as defined by McCarthy and Prince (1995) will be used in defining faithfulness constraints. One type of faithfulness constraint that will be used multiple times is the IDENT constraint, as defined in (7). When introducing new IO-IDENT constraints, a formal definition will not be given, as the schema for all such constraints is given below.

(7) IDENT[F] [ID-[F]](McCarthy and Prince 1995: 16)
Corresponding segments agree with regard to feature [F]. If x$\Re$y and x is [γF], then y is [γF].
Assign a * if this is not the case.

1.3.2 Alignment

This paper will also make reference to an important type of markedness constraint – the alignment constraint. Alignment constraints express a preference for the specified edges (right or left) of prosodic or grammatical categories to coincide and will be defined using the schema given in (8).

(8) Alignment Constraint (McCarthy and Prince 1993b)

ALIGN(Cat1, Edge1, Cat2, Edge2) =
∀ Cat1 ∃ Cat2 such that Edge1 of Cat1 and Edge2 of Cat2 coincide

1.4 A New Approach to Dominance: Antifaithfulness in Inflectional Paradigms

Dominance has been a difficult concept to formalize. Alderete (1999, 2001) explores this issue in detail and concludes that a constraint set of just markedness and faithfulness constraints is insufficient to account for dominance effects. The result of attaching a dominant affix to a stem is often an output that violates faithfulness constraints without satisfying some higher-ranking markedness constraint. Referring back to the Japanese example in (1), the output of /koobe-kko/ is unfaithful in that an accent has been deleted but there is no high-ranking markedness constraint telling it to be devoid of surface pitch accent. Neither a ranking of markedness over faithfulness nor of faithfulness over markedness could yield the actual output. Alderete's solution to this problem is the creation of a new type of constraint – the antifaithfulness constraint. This constraint is satisfied by an output which violates a corresponding faithfulness constraint. For example, the antifaithfulness constraint ¬DEP is satisfied by an output that has an inserted segment.

An important aspect of Alderete's antifaithfulness constraints is that they are only operational on the output-output correspondence relation. Thus the base in which a violation of a faithfulness constraint is forced by an antifaithfulness constraint must itself be an output in the language. This poses a theoretical problem for PIE, because the inflectional affixes that I am claiming are dominant are attached to stems that are not outputs, and thus the antifaithfulness constraints cannot account for dominance in PIE because there is no base output for the inflected nouns to be unfaithful to. I will therefore turn to a theory that is designed to evaluate inflectional paradigms, Optimal Paradigms (OP: McCarthy 2005), which is used to explain similarities among members of an inflectional paradigm. Such similarities could not have been explained with OO-faithfulness constraints because, again, there is often no output for the paradigm members to be faithful to. In order to formalize dominance effects in an inflectional paradigm, like those of the PIE athematic nouns, I will use the background provided by Alderete (1999) and McCarthy (2005) to propose a new type of antifaithfulness constraint that operates within the guidelines of the optimal paradigms model.

1.5 Outline

This paper will proceed in the following manner. In chapter 2, I will present an outline of PIE phonology and morphology with regard to athematic nouns and accent. The athematic nouns will be discussed in detail and sample data will be given. For a list of athematic nouns that have solid reconstructions and are thought to be primary derivations, see Appendix A. All nouns that will presented as data in this paper are listed in Appendix A.

The analysis of athematic nouns will follow in chapters 3 and 4. Because the weak endings are recessive, their analysis will be presented first (in chapter 3), for two reasons. First, ranking of markedness and faithfulness constraints will account for weak cases, whereas an additional type of constraint will be needed to account for the strong cases. Second, the behavior of words that contain dominant affixes is *grammar-dependent*, in that it is dependent "on the larger constraint system governing accent" (Alderete 2001: 245). The constraint-ranking that derives weak cases will need to remain intact for the analysis of strong cases. In other words, the constraint-ranking defined for weak cases cannot be rearranged in order to describe the strong cases. Thus, chapter 3 will provide insight into the general grammar of accentuation in PIE.

Nouns formed with strong endings will be analyzed in chapter 4. At this point it will be necessary to define antifaithfulness constraints that are able to operate by comparing members of an inflectional paradigm. By using the OP-antifaithfulness constraints, the four accent classes of PIE athematic nouns will be captured with a constraint ranking. No changes to proposed reconstructions will be made.

The remaining issues dealing with accent in PIE athematic nouns will be discussed in chapter 5, such as the ablaut of acrostatic nouns, the process of internal derivation whereby a noun changes accent class along with a change in meaning, and implications for future work in both the fields of IE linguistics and general phonology. This chapter will end with final conclusions.

Chapter Two

Linguistic Description of Proto-Indo-European

Before proceeding to an analysis of the PIE athematic noun accentuation patterns, some basic description of the reconstructed language will be useful. This chapter will first provide a general outline of the relevant information concerning PIE phonology in §2.1 and §2.2 and morphology in §2.3. This is not meant to be an exhaustive discussion (for thorough exposition see Meier-Brügger 2003 and Fortson 2004), but rather the goal of these sections is twofold. First, the reader with no background in (P)IE linguistics will be given general information about the phonemic inventory, pertinent phonological processes, and basic morphological structure of the word. This introduction to the language is designed to provide enough background before delving into the phenomenon of PIE athematic nouns, which are then described in §2.4. The second goal is made with the IE specialist in mind. Any statement about the linguistics of PIE naturally involves choosing some proposed reconstruction over another, and so this chapter will present one version of a synchronic state of PIE – the version that will supply the data that I will analyze in the remaining chapters. For the most part, highly debated intricacies of PIE, such as the phonemic inventory or the segmental make-up of certain morphemes, will not be important to the study of accent. In such cases, controversies will be handled by referring to Meier-Brügger (2003) without further defense. The athematic nominal data is in agreement with Schindler (1972, 1975a, 1975b) unless stated otherwise in Appendix A. Finally, this chapter concludes with a summary of relevant facts concerning the placement of accent in athematic nouns in §2.5.

2.1 Segmental Phonology

There is some agreement on a PIE phonemic inventory as shown in table 2.1, which will be the inventory used here. As is standard with reconstructed languages, the phonemes in table 2.1 are not necessarily the exact values of the sounds in the once spoken language. For this reason, and also for the convenience of comparing this paper with other sources, I will continue to use the standard orthography employed by Indo-Europeanists, which differs from the IPA in a few regards: [k̂/ĝ] represent palatal stops (which could correspond to IPA [c/ɟ]), [y] is the equivalent of IPA [j], and the lowered-circle diacritic is used to mark syllabification of sonorants, i.e. [m̥]. It should furthermore be noted that the actual phonetic content of the "laryngeals" is highly debated. The symbols h_1, h_2, and h_3 simply represent three distinct sounds that, based on their phonotactics within the language and treatment in daughter languages, are likely sonorant and/or pharyngeal sounds. The term laryngeal is a historical inaccuracy. Due to common usage, it is unlikely to be replaced, even if new terminology would be more precise. I will deviate from common IE orthography in one way, and that is the marking of vowel length. Indo-Europeanists mark long vowels with a superimposed bar, i.e. [ē]. I will use the IPA diacritic, i.e. [eː], to avoid confusion when long vowels are accented, such as [éː].

Table 2.1: Phonemic Inventory (Meier-Brügger 2003: 71)

consonants		labial	dental/ alveolar	palatal	velar	labiovelar
stops	voiceless	p	t	k̂	k	k^w
	voiced	b	d	ĝ	g	g^w
	voiced aspirated	b^h	d^h	$\hat{g}^h$	g^h	g^{wh}
	fricative		s			
	nasal	m	n			
	liquid		l r			
	glide			y		w
	"laryngeals"	h_1, h_2, h_3				

vowels[1]

i/iː		u/uː
e/eː		o/oː
	a/aː	

It will be important to mark one phonetic aspect of PIE words: the syllabification of sonorants. Nasals, liquids, and glides alternate with their syllabic counterparts in a predictable way. Such syllabification is not phonemic, but it is traditionally a feature of PIE reconstructions, although these are otherwise phonemic representations. Thus syllable nuclei will be marked in all data sets, such that the symbols [i], [u], [m̥], [n̥], [r̥], [l̥] denote nuclei, and the symbols [y], [w], [m], [n], [r], [l] denote consonants (segments not syllabified as nuclei). The rule governing the syllabification of sonorants can be seen in (9). There are other rules that syllabify [y, w] in PIE, notably Sievers' law (Collinge 1985) and Lindeman's law (Lindeman 1965), but such rules will not be relevant to the data presented here.

[1] There are diphthongs in PIE, but their occurrence is predictable based on the Basic PIE Syllabification Rule in (9). If [y] or [w] occurs after a vowel, the vowel-glide sequence will be realized as a diphthong (and not as two syllables); if one of these sounds occurs before a vowel, it is considered to be an onset.

(9) Basic PIE Syllabification Rule (Schindler 1977)
operating iteratively from right to left:
[+son, -syll]→[+syll]/{[-syll], #}___{[-syll], #}
"sonorants become syllabic when between any combination of two nonsyllabics and word boundaries"

The syllabification rule is easily handled by a constraint-based system such as OT. A formal OT analysis is not necessary here, but there is one crucial ranking that brings insight to the rule as stated in (9). Existing constraints predict that the rule should operate from right to left and not from left to right. The constraint NoCoda bans consonants from occurring in coda position, and the direction of syllabification stipulated in (9) – right to left – operates in such a way that onsets are created and not codas. For example, assuming the hypothetical underlying representation /prn/, the syllabified form [prn̥] (and not [pr̥n]) is the predicted outcome according to the basic syllabification rule. This output satisfies NoCoda, while the form [pr̥n] incurs one violation of this constraint. Each output is unfaithful (by changing [-syllabic] to [+syllabic]) to an underlying segment. If the underlying representation is /pr̥n/ the form [prn̥] would still win assuming the ranking of NoCoda » Ident[syll] because this output does not incur a violation of the dominating constraint. Thus, the existence of NoCoda (and the lack of a motivated constraint penalizing open syllables) suggests that no language would utilize a rule like (9) that operates from left to right.

(10) NoCoda (McCarthy and Prince 1993a)
Syllables must not have coda consonants.
Assign a * for every syllable that ends in a consonant.

2.2 Prosody

PIE is classified as a "pitch accent" language by Kiparsky and Halle (1977), by which it is meant that accent was realized as a high tone, with unaccented syllables having a low tone by default. Evidence for this comes from Slavic, Lithuanian, Vedic Sanskrit, and

Classical Greek. The Sanskrit evidence is particularly important and is discussed at length by Lubotsky (1988). Pāṇini describes the main accent of the word as *udātta-*, meaning 'raised'. Furthermore, a syllable that follows the main accent is called *svarita-* and is described as a combination of *udātta-* and *anudātta-* 'not raised'. This syllable is thus pronounced with falling tone, which is an intrinsic property of the syllable, though it can become phonemic due to contraction, i.e. *súvar*→*svàr* (which could potentially contrast with *svár*). The contrast of falling tone with high tone is clearly a post-Vedic development that is not present in the Rigveda, and thus not reconstructable to PIE.

The only tonal contrast in PIE is thus due to the placement of stress, and so I will continue to refer to stress and not to tone. To avoid confusion, I will adopt the terminology used by Kim (2002), such that *accent* will refer to an underlying property of a syllable/morpheme and *stress* will refer to the surface realization of an accented syllable (which is high tone). The root *péd- 'foot' and the ending *-és *gen sg* are accented, but the word *péds 'foot' *gen sg* has one stressed syllable, the root (the disappearance of the [e] from the ending will be explained below in §2.4). Such a realization of stress is consistent with the fact that PIE had a phonemic vowel-length distinction. Two of the main correlates of stress – length and pitch – can be utilized by languages for purposes other than to signal stress, i.e. words can be distinguished by both length ([ta] vs. [taa]) and tone ([tá] vs. [tà]) (Hayes 1995). Accordingly, a language such as PIE with phonemic length is less likely to use length as an indication of stress (and thus more likely to use pitch).

The phonology of stress in PIE is typologically sound[2] in that it is definable given known properties of stress and is not cross-linguistically unique. First, it is culminative.

[2] The typology of stress as discussed here is presented in Hayes (1995).

Each word is realized with a single prosodic peak, i.e. there is one stressed syllable per word. The data presented here will only contain words with one or two syllables, and so it is hard to determine if PIE had a bounded or unbounded stress system. Because in theory a word of any length would be realized with one and only one stressed syllable, I believe we can classify PIE constituents as unbounded with respect to stress (which is the claim made by Halle and Vergnaud (1987: 72) with reference to Kiparsky and Halle (1977)). Furthermore, there is no evidence for secondary stress at the word level – when compounds are formed they have one stressed syllable, even though the outputs of the members of the compound would naturally each be stressed (Meier-Brügger 2003: 291). PIE also has a morphological (and not a rhythmic) stress system. Surface accent is determined by the interplay of morphemes (those with or without underlying accent, post-accenting roots, and dominant affixes) and is not determined by the creation of foot structure. There will thus be only one further reference to feet in this paper. In §3.1.2 I will discuss the syncope of unstressed non-high vowels with reference to a constraint that is foot-sensitive. Because PIE is unbounded, a word will be shown to contain one and only one foot.

2.3 Morphology[3]

In general, PIE nouns and verbs are inflected by adding an ending to a stem. This stem conveys the basic meaning of the word and is composed of a bound root plus suffix(es). Thus, nouns and verbs contain a root followed by suffix(es) followed by an ending, as abbreviated in (11). Though an exact meaning is not always easy to determine, each root and suffix reconstructed for PIE has a semantics, such that suffixes systematically derive a different meaning from the root, and roots can surface in different derived forms. While technically speaking both suffix and ending are suffixes, the standard terminology of suffix

[3] Unless otherwise noted, information in this section on PIE morphology is from Meier-Brügger (2003).

and ending will be helpful to avoid confusion: a *suffix* is a derivational morpheme, an *ending* is an inflectional morpheme. This distinction will be important when it is time to advance to an analysis, because it will be shown that the inflectional affixes are subcategorized as either dominant or recessive, while there is no such distinction made for derivational affixes.

(11) $R + (S_n) + E$

Notable exceptions to the typical R+S+E pattern are the *root nouns* and the verbal *root presents* and *root aorists*, which do not have an overt derivational suffix, meaning the root is a monomorphemic stem to which the ending is added. This fact of PIE morphology is expressed by the parentheses around the S in (11).

The first suffix added to a root is considered a *primary derivation* (unless the root is already an existing stem in PIE, i.e. a root noun). If additional suffixes are used or if a suffix is added to a root noun, this constitutes a *secondary derivation*. This distinction will be important because the only data I will consider here are nouns that are formed through primary derivations or root nouns. As will be explained in more detail in §2.4.8, the process of secondary derivation can result in the shifting of a noun from one accent class to another, and thus secondary derivatives are not ideal pieces of data.

Nouns, pronouns, and adjectives are all subject to the system of PIE nominal inflection, which inflects for number, gender, and case. PIE is hypothesized to inflect for three numbers (singular, dual, and plural, with a subdivision in the plural of collective versus count plurals), two genders (animate and inanimate (or neuter))[4], and eight cases (nominative, vocative, accusative, genitive, ablative, dative, instrumental, and locative). The

[4] There is debate about whether or not masculine and feminine were distinct genders at the time of PIE. It is clear that at one point PIE had 2 genders, animate and inanimate. Within the animate gender, a relatively recent (i.e. not long before the breakup of PIE, or possibly after proto-Anatolian split off) distinction was made between masculine and feminine. The difference between these two gender systems will not have an impact on the analysis presented here.

data presented here will primarily refer to the nominative (nom), accusative (acc) and genitive (gen) cases in the singular (sg). Gender will not play a role.

In traditional PIE description, nominal stems were classified by the last sound of the stem, creating such categories as i- stems[5] or r-stems, etc. However, since the relatively recent understanding of accent in PIE nouns, such classifications are considered fairly unimportant, with one notable exception[6]. A significant distinction is made between thematic and athematic nouns. Thematic nouns are composed of a stem that ends in the thematic vowel -e/o-, while the athematic noun stems end in any other sound. The athematic nouns are considered more archaic and are moribund in the daughter languages. The thematic nouns are not subject to the variety of accent pattern that the athematic nouns are. Specifically, thematic nouns have fixed stress and do not ablaut (Kim 2002).

2.4 Athematic Nouns

Athematic nouns are built from a stem that does not end in the thematic vowel -e/o-. The theoretical difficulty presented by athematic nouns comes from the four accent patterns that they can follow[7]. These nouns can also follow four ablaut patterns, which correlate with the accent pattern. I will henceforth use the term *accent class* to refer to a group of nouns with the same accent pattern. Referring to *ablaut class* will, for the most part, be unnecessary, as this is always related to the accent class. Traditionally, the accent classes are

[5] Remember that [i] and [u] are allophonic variants of [y] and [w] respectively. This means that i-stems can end in [i] or [y] and u-stems can end in [u] or [w].

[6] It will also be useful to classify nouns by stem-final sound because this will tell us something about the suffix. See (§2.4.1) for further discussion of this point.

[7] A fifth accent class – the *mesostatic* (to keep the terminology consistent) – has been proposed (Rix 1976: 123, termed *mesodynamic*). This class consists of words with fixed accent on the suffix. The example given by Rix (*k^woy-néh$_2$-Ø *nom sg*/*k^woy-néh$_2$-s *gen sg* 'penalty' > Greek ποινή/ποινῆς) can be considered a secondary derivation as is thus not evidence for a primarily derived accent class with fixed accent on the root. Furthermore, my analysis will predict that such an accent class could not have existed - the grammar that will be defined here could not turn any set of inputs from a paradigm into outputs with fixed stress on the suffix (see §4.3.3).

termed acrostatic, proterokinetic, hysterokinetic, and amphikinetic (or holokinetic)[8]. Other literature may refer to acro-, protero-, hystero-, amphi-, and holodynamic. I will consistently use the -static/-kinetic terminology, as it is the most informative with regard to accent (with *static* denoting fixed accent and *kinetic* denoting movable accent).

Every root and suffix and some endings undergo ablaut in PIE, which is a morphologically conditioned process in which a vowel can be lengthened/shortened, undergo a change in quality (i.e. [e] ↔ [o]), or be deleted. All of the [-high] vowels – [a, e, o] – can potentially undergo ablaut (though only [e] and [o] can alternate with respect to vowel quality). All PIE roots and suffixes are reconstructed with one of these vowels, but the vowel's surface realization is a consequence of morphology. It is assumed that at one point ablaut was a phonologically conditioned process, but this is not evident from what is reconstructable to a synchronic state of PIE. The vowel quality and length present in a morpheme is referred to as its *grade*. For example, the root *ped 'foot' has *full e-grade*, while the root *ye:k^w 'liver' has *lengthened e-grade.* When a morpheme is realized without a [-high] vowel, it is said to have *Ø-grade* (*zero-grade*). In such cases, the morpheme may have no nucleus (i.e. be attached as on onset to a following morpheme or attached as a coda to a preceding morpheme or both), or it may have a nucleus that is [u], [i], or one of the syllabic sonorants.

Because of the close relationship between ablaut and accent, vowel quality/length in each morpheme is predictable given the accent class of a stem. Acrostatic stems have fixed stress on the root, with an ablaut distinction between strong (é: or ó) and weak (é). The other three accent classes are distinguished by alternating stress, such that when a noun is inflected

[8] The difference between amphikinetic and holokinetic will be discussed in (§2.4.7).

for a *weak* case, stress occurs on a morpheme that is to the right of where it would occur if the noun was inflected for a *strong* case. For all four accent classes, any root or stem that does not bear stress is realized with Ø-grade, with the one exception of o-grade for the suffix in the strong cases with amphikinetic nouns, which will be discussed in §2.4.7. The strong cases are the nominative and vocative (for all numbers) and the accusative for singular and dual (and possibly plural) (Kim 2002). The surface patterns of the four accent/ablaut classes are summarized in table 2.2 and will be explained in detail in §2.4.3-7 below.

Table 2.2: Accent Classes for Athematic Nouns (Fortson 2004: 108)

		R	S	E		
acrostatic	strong	ó/éː	ø	ø	nom sg: *nók^{w}-t-s	‘evening’
	weak	é	ø	ø	gen sg: *nék^{w}-t-s	
proterokinetic	strong	é	ø	ø	nom sg: *mén-ti-s	‘thought’
	weak	ø	é	ø	gen sg: *mn̥-téy-s	
hysterokinetic	strong	ø	é	ø	nom sg: *ph$_2$-téːr	‘father’
	weak	ø	ø	é	gen sg: *ph$_2$-tr-és	
amphikinetic	strong	é	o	ø	nom sg: *d^{h}ég^{h}-oːm	‘earth’
	weak	ø	ø	é	gen sg: *d^{h}g^{h}-m-és	

A phonological rule that operated before the reconstructable state of PIE accounts for the nom sg forms shown above for ‘father’ and ‘earth’, such that *ph$_2$téːr < **ph$_2$térs and *d^{h}ég^{h}oːm < **d^{h}ég^{h}oms. When the nom sg ending *s was added to a nasal-stem, a liquid-stem or an s-stem, the ending was deleted and compensatory lengthening resulted, known as Szemerényi’s law (Szemerényi 1970: 109). Because this was not a synchronic rule of PIE, data sets will only show the end result, i.e. lengthened grade of the suffix and no overt nom sg ending.

2.4.1 Suffixes

As shown above in table 2.2, suffixes are either realized with accented e-grade, with

Ø-grade, or even with unaccented o-grade in the amphikinetic accent class. All suffixes are reconstructed with an [e] (as part of the underlying representation), even in cases where this [e] never surfaces. For the determination of what suffix is a part of the stem, the traditional classification of athematic nouns by stem-final sound will be useful. For example, t-stems contain the suffix *et. Sometimes more than one suffix ends in the same sound, such that an n-stem could contain the suffix *en or the suffix *men. For cases like these, a distinction can be made between n-stems and men-stems, where the entire suffix is named in the later classification. For some suffixes, in addition to any ablaut change that may occur due to accent class, there is also a change in stem-final consonant between strong and weak forms. Such suffixes are called *heteroclitics* and can usually be evidenced by a change from [r] in the strong cases to [n] in the weak cases, called r/n-stems. There are also archaic heteroclitics that do not change from [r] to [n], but these will not be relevant here.

Table 2.3 presents the suffixes that will occur in the data under analysis in this paper. One important fact that is presented in this table is that suffixes are associated with a certain accent class, which will prove relevant to the analysis.

Table 2.3: Suffixes Used for Formation of Athematic Nouns

suffix	accent class	type of noun created	source
er/n	acrostatic	neuter fundamental concrete nouns	Schindler (1975a)
et		animate result nouns	Fortson (2004: 112)
ew		neuter abstract nouns	Watkins 1982
ey		animate nouns – unproductive suffixes	
eh_2	amphi-kinetic		
em			
es	protero-kinetic	neuter abstract nouns	Schindler (1975b)
men		neuter action/result nouns	Fortson (2004: 111)
tew		animate action nouns	Meier-Brügger (2003: 288)
tey		animate action nouns	Meier-Brügger (2003: 288)
wer/n		neuter verbal action nouns	Schindler (1975a)
en	hystero-kinetic	animate agent nouns	Oettinger (2005)
ter		animate agent nouns	Tichy (1995)

An exception to the syllabification rule in (9) is presented when the accusative ending *m (see table 2.4) is attached to i- and u-stems (i.e. stems that contain the suffix *ew, *ey, *tew, or *tey). In these accusative forms, the rule predicts syllabification with the [m] as the nucleus, i.e. word-final [ym̥] or [wm̥], but it is the glide that forms the nucleus, i.e. [im] or [um]. This is likely due to an avoidance of allomorphy (and will be discussed in brief in §5.3). For example, consider the nominative singular form *g^{w}émtus 'coming'. The accusative form *g^{w}émtum has the same realization for the stem as the nominative form, while the non-occurring form *g^{w}émtwm̥ does not.

2.4.2 Endings

Although it is believed that PIE inflected for three numbers (singular, dual, and plural), the reconstructions are the most solid for the singular and there is some doubt that PIE inflected for all cases in the dual (Meier-Brügger 2003:191). Because all data presented in this paper will be inflected for the singular, these are the only case endings that will concern us, and they are shown in table 2.4. While all roots and endings are necessarily ablauting, only a minority of PIE endings ablaut. For example, the nom sg *s and acc sg *m always display Ø-grade, and the dat sg *ey is always realized with e-grade. The two notable examples of endings that ablaut are the instr sg *e/oh$_1$ and the gen sg *e/os[9].

Table 2.4: Athematic Noun Endings (Meier-Brügger 2003:196)

	singular	
voc	-Ø	strong/dominant
nom (anim)	-s, -Ø	
acc (anim)	-m	
nom/acc (nt)	-Ø	
instr	-h$_1$, -e/oh$_1$	weak/recessive
dat	-ey	
abl	-e/os, -s	
gen		
loc	-i, -Ø	

A comma separates alternative morphemes; a slash indicates an ablauting vowel.
Shading denotes endings that will used in the data presented here.

The lack of consistent ablaut in endings is another factor that suggests endings are formally quite different from suffixes in PIE. In summary of the suffix/ending distinction: suffixes are derivational, always undergo ablaut, and are non-final morphemes; endings are inflectional, may or may not undergo ablaut, and are word-final morphemes.

It is noteworthy that none of the strong endings are reconstructed with a vowel. This is expected given that strong endings never receive stress and thus no vowel would ever surface even if one existed underlyingly. Previous literature has assumed that the strong endings are unaccented, and there is certainly no data that would contradict this claim. However, I will show in §4.3.2 that my analysis would still work even if strong endings have an underlying accented vowel. I will continue to assume that strong endings are unaccented,

[9] The origin of the o-grade of the gen sg ending is unknown. For simplicity, when the gen sg ending appears in full-grade, I will represent it with *e* vocalism.

because this is the most harmonic underlying representation (and thus the one the PIE language learner would likely construct). Nevertheless, the important distinction between strong and weak endings is not one of accent (i.e. they could both be accented), but one of dominance. This will be discussed more thoroughly in chapter 4.

2.4.3 Root Nouns

Root nouns are those nouns consisting of only a root and inflectional ending. No derivational suffix is used in their formation. Root nouns display two different accent patterns. They can be acrostatic, with fixed stress on the root. In such cases, these nouns have been classified with other acrostatic nouns that do contain a suffix. Other root nouns do not have fixed stress, but rather show alternating stress between the root in the strong forms and the ending in the weak forms. Though this pattern resembles the amphikinetic one, these nouns have traditionally defied categorization. For the most part, they are simply referred to as "root nouns with alternating stress" (Kim 2002). My analysis will show that these root nouns are related to the amphikinetic nouns in the same way that the fixed-accent root nouns are related to the acrostatic nouns. For this reason, I will classify root nouns with alternating stress as amphikinetic, which was also proposed by Tichy (2000: 74). Thus, root nouns with fixed stress will be discussed simultaneously with acrostatic nouns, and root nouns with alternating stress will be discussed simultaneously with amphikinetic nouns.

2.4.4 Acrostatic Nouns

The acrostatic accent class is distinguished by fixed stress on the root. This is the only accent class in which stress is always on the same morpheme, regardless of case. Suffixes and endings are thus always realized with Ø-grade. The strong and weak cases are distinguished by ablaut: the strong with full o-grade or lengthened e-grade, and the weak with full e-grade. Many root nouns and r/n- stems belong to this accent class (Kim 2002, Schindler 1975a). A sample data set is shown in table 2.5 (see Appendix A for a full list of the athematic nouns referenced in this paper and sources). Underlyingly, the stem of an acrostatic noun contains an accented root (Halle 1997) and either an accented or unaccented suffix (ŔŚ or ŔS) (or no suffix at all if it is a root noun).

Table 2.5: Acrostatic Nouns

gloss	‘foot’	‘flesh’	‘water’	‘liver’
nom sg (strong)	*pód-s	*mé:ms-s[10]	*wód-r̥-Ø	*yé:k^w-r̥-Ø
acc sg (strong)	*pód-m̥	*mé:ms-m̥	*wód-r̥-Ø	*yé:k^w-r̥-Ø
gen sg (weak)	*péd-s	*méms-s	*wéd-n̥-s	*yék^w-n̥-s

2.4.5 Proterokinetic Nouns

There is a stress alternation between root (strong cases) and suffix (weak cases) in the proterokinetic accent class, as shown in table 2.6). Accented morphemes are realized with full e-grade, and unaccented are realized with Ø-grade. Words that commonly belong to this class include i- and u-stems, neuter wer/wen-stems, and neuter s-stems (Kim 2002). Proterokinetic nouns can result from a stem that contains an underlyingly accented suffix (Halle 1997) and either an unaccented or post-accenting root (RŚ or R_{PoA}Ś).

Table 2.6: Proterokinetic Nouns

gloss	‘thought’	‘fire’	‘coming’
nom sg (strong)	*mén-ti-s	*péh_2-wr̥-Ø	*g^wém-tu-s
acc sg (strong)	*mén-ti-m	*péh_2-wr̥-Ø	*g^wém-tu-m
gen sg (weak)	*mn̥-téy-s	*ph_2-wén-s	*g^wm̥-téw-s

[10] PIE had a synchronic rule that reduced a geminate [s] to a singleton (Mayrhofer 1986: 120). Thus, the outcome of ‘flesh’ *nom sg* is really *mé:ms and *gen sg* is *méms. Because this is a synchronic rule, I have shown the noun forms before its operation. This is different from my treatment of Szemerényi’s law, which was not operational in PIE, and so words to which this law applied are only shown in PIE form, i.e. after the application of the rule.

2.4.6 Hysterokinetic Nouns

The hysterokinetic accent class displays an accent difference between suffix (strong) and ending (weak), meaning the root is always in Ø-grade. A smaller set of words belongs to this class, which are all of the animate gender. A sample data set is shown in table 2.7. It is notable that most of the suffixes that participate in this accent class end in sonorants, which means the nom sg forms show lengthened-grade and no overt ending. The stem of these nouns must contain an underlyingly post-accenting root (Halle 1997) and unaccented suffix ($R_{PoA}S$).

Table 2.7: Hysterokinetic Nouns

gloss	'father'	'male'
nom sg (strong)	*ph$_2$-téːr	*h$_2$r̥s-éːn
acc sg (strong)	*ph$_2$-tér-m̥	*h$_2$r̥s-én-m̥
gen sg (weak)	*ph$_2$-tr-és	*h$_2$r̥s-n-és

2.4.7 Amphikinetic/Holokinetic Nouns

Stress alternates between root (strong) and ending (weak) in the amphikinetic accent class, and thus the suffix is realized with Ø-grade in weak forms (and mysteriously with o-grade in strong forms), as shown in table 2.8. As stated above, it will be assumed that root nouns with alternating stress are amphikinetic. The root and suffix (if there is one) of an amphikinetic noun must be underlyingly unaccented (RS) (Halle 1997). This accent class is complicated by certain locative singular forms, which are inflected with a null ending: *-Ø. With such words, as demonstrated by *d^{h}ĝ^h-ém below, the accent, which necessarily cannot fall on the ending, falls on the suffix instead. Words displaying this pattern are referred to as holokinetic because there are words in the paradigm with stress on the root, suffix, or ending. Naturally, there are no root nouns that are holokinetic. I will continue to refer to the amphikinetic accent class even if it is in reference to a noun that displays the holokinetic pattern of having a stressed suffix in the loc sg. The reason for this choice of terminology is very similar to the reason for calling root nouns with alternating stress amphikinetic. As will be argued below, the accent class of a noun is determined by the morphology of the stem. The odd behavior of the loc sg form of holokinetic nouns is determined by that particular loc sg ending. Thus, the stem morphology of alternating root nouns, amphikinetic nouns, and holokinetic nouns is the same with respect to accent (all morphemes that compose the stem are underlyingly unaccented) and will be termed *amphikinetic*. Holokinetic nouns can be considered a subclass of amphikinetic that are differentiated by behavior induced by the loc sg null ending.

Table 2.8: Amphikinetic Nouns

	Suffixed Nouns		Root Noun
gloss	‘earth’ (*holokinetic*)	‘path’	‘male’
nom sg (strong)	*d^{h}éĝ^{h}-oːm	*pént-oh$_2$-s	*h$_2$néːr
acc sg (strong)	*d^{h}éĝ^{h}-oːm	*pent-oh$_2$-m̥	*h$_2$nér-m̥
gen sg (weak)	*d^{h}ĝ^{h}-m-és	*pn̥t-h$_2$-és	*h$_2$n̥r-és
loc sg (weak)	*d^{h}ĝ^{h}-ém		

2.4.8 Internal Derivation

It is believed that a process of internal derivation existed in PIE such that a noun could change its meaning (in a predictable way) by changing accent classes (for a thorough discussion of the phenomenon, see Widmer (2004: 62-70)). For example, neuter acrostatic nouns formed with the suffix *ew (i.e. u-stems) could become adjectives simply by becoming proterokinetic, e.g. the neuter noun ‘good’ *wós-u-Ø *nom/acc sg*/ *wés-u-s *gen sg* → the adjective ‘good’ *wés-u-s *nom sg*/ *us-éw-s *gen sg* (Watkins 1982). Furthermore, neuter s-stem proterokinetic nouns can be made animate by becoming hysterokinetic, e.g. the neuter noun ‘growth’ *ḱérh$_1$-s-Ø *nom sg*/ *ḱr̥h$_1$-és-s *gen sg* (> Hittite kar(a)š ‘grain’) → the animate noun ‘producing growth’ *ḱr̥h$_1$-és-s *nom sg*/ *ḱr̥h$_1$-s-és *gen sg* (> Latin Cerēs ‘grain goddess’) (Schindler 1975c: 63). Any accent class can become amphikinetic through internal derivation. Neuter acrostatic r/n stems become collectives by becoming amphikinetic, e.g. ‘excrement’ *sóḱ-r̥-Ø *nom/acc sg*/ *séḱ-n̥-s *gen sg* → *séḱ-oːr *nom/acc sg*/ *sḱ-n-és *gen sg* (Schindler 1975a: 4). A well known case of a proterokinetic noun becoming amphikinetic is when the name for the ‘Seed God’ is derived from the word for ‘seed’: *séh$_1$-mn̥-Ø *nom/acc sg*/ *sh$_1$-mén-s *gen sg* → *séh$_1$-moːn *nom sg*/ *sh$_1$-m̥n-és *gen sg* (Schindler 1975c: 63). An amphikinetic noun can be derived from a hysterokinetic noun to mean “one who possesses X”, e.g. Greek ‘father’ πατήρ → ‘of good lineage’ εὐπάτωρ (Widmer 2004: 70).

It is notable in the above examples that when hysterokinetic is derived from proterokinetic and when proterokinetic is derived from acrostatic, the original weak stem becomes the strong stem of the derived word. This does not apply to derivation that results in an amphikinetic accent pattern. For this reason, and because any noun can become amphikinetic through internal derivation, the amphikinetic accent class is considered to be a sort of default class. The derivation processes are summarized in (12), which shows the hierarchical nature of internal derivation – an accent class can be derived from an accent class to its left in the diagram, but derivation doesn’t go the other way. The consequences of the analysis presented here for internal derivation will be discussed in §5.2.1.

(12) acrostatic → proterokinetic → hysterokinetic → amphikinetic

2.5 Summary

Based on the above discussion, we can summarize the relevant facts about PIE athematic nouns as the following:

(13) Description of PIE Athematic Noun Accent

a. Every noun has one and only one stressed syllable/morpheme.
b. All unstressed [-high] vowels in roots and suffixes are deleted from the underlying representation and do not surface (with the exception of amphikinetic suffixes in strong forms).
c. Acrostatic nouns always have stress on the root, while hysterokinetic nouns never have stress on the root.
d. The ending can only bear stress in weak cases (in the amphi- and hysterokinetic accent classes).
e. Strong and weak cases are always distinguished by differences in the stem: by accent, vowel quality, or vowel length.

Some of the above facts have been explained in the previous literature, but no one has been able to account for all of them satisfactorily. Halle (1997) claims that acrostatic stems are inherently accented, hysterokinetic stems are post-accenting, and proterokinetic and amphikinetic stems are unaccented, while strong case endings are unaccented and weak case endings are accented. I will argue that all of these statements are true, but that they alone cannot explain the intricate accent patterns found in PIE.

While Halle describes a three way distinction of accented, unaccented, and post-accenting *stems*, I will argue that this is the proper way to classify *roots*. Suffixes are subject to a two way distinction: accented versus unaccented. The assignment of a noun to an accent class is a predictable property of what type of root is combined with what type of suffix, as demonstrated in table 2.9. No matter what accent class a noun belongs to, it takes the same inflectional endings as any other noun (ignoring unpredictable variations already discussed such as the loc sg *-Ø). These inflectional endings are vital for the creation of the accent classes, or, more specifically, the endings are the reason there is alternating accent in all but the acrostatic accent class. I will show that the strong case endings must be dominant, while the weak case endings are not dominant (and accented). The dominant case endings require a change in accent (or ablaut) in the stem as compared to a stem inflected with a weak ending.

This fact was recognized by Kiparsky and Halle (1977: 210), who claimed that certain morphemes must trigger a “deaccentuation rule”.

Table 2.9: Possible Morpheme Combinations and Resulting Accent Class
(+ = *accented; - = unaccented;* PoA = *post-accenting*)

root	suffix	accent class	type of stem	→	strong output,	weak output
+	+	acrostatic	ŔŚ	→	ŔSE,	ŔSE
+	-	acrostatic	ŔS	→	ŔSE,	ŔSE
-	+	proterokinetic	RŚ	→	ŔSE,	RŚE
-	-	amphikinetic	RS	→	ŔSE,	RSÉ
PoA	+	proterokinetic	R_{PoA}Ś	→	ŔSE,	RŚE
PoA	-	hysterokinetic	R_{PoA}S	→	RŚE,	RSÉ

In the following chapters, an analysis will be developed that accounts for the above description of accent in athematic nouns and shows how the possible root and suffix combinations yield the four accent classes as predicted in table 2.9. In brief, it will be argued that (13a) and (13b) are the result of undominated constraints. It will be necessary for acrostatic roots to be underlyingly accented and for hysterokinetic roots to be post-accenting to account for (13c) and for weak endings to be underlyingly accented to account for (13d). The fact in (13e) can be explained if the endings in the strong cases are dominant.

Chapter Three

General Analysis: Regular Phonological Phenomena and Nouns Inflected with Weak Endings

In the last chapter, five facts were given that describe the distribution of stress in PIE athematic nouns. In this and the following chapter these facts will be accounted for using ranked OT constraints. We will be able to derive a well-motivated constraint ranking that successfully accounts for all the accent classes without assuming any changes to proposed reconstructions. A grammar will first be developed to account for nouns inflected for weak cases. Assuming weak endings are recessive (i.e. not dominant), their outcome is determined straightforwardly by the grammar – by the ranking of markedness and faithfulness constraints.

This chapter will proceed as follows. I will first discuss aspects of PIE phonology that regularly apply to all inputs in §3.1, such as the general aspects of PIE grammar mentioned in (13a&b) above: one stress per word and the deletion of non-high vowels. I will then proceed to analysis of nouns inflected with weak endings in §3.2. A summary will follow in §3.3.

3.1 Markedness and Its Role in General PIE Phonology

Before looking at stress variation among the PIE nouns, I will present a brief analysis of two consistent aspects of the PIE phonology that are stress-related. In §3.1.1, the fact that

PIE words always have one and only one stressed syllable will be explained with reference to an undominated markedness constraint. In §3.1.2, the fact that (almost) all underlying non-high vowels are deleted if they do not bear stress will be explained with a ranking that utilizes a constraint penalizing high-sonority vowels appearing in the margin of a foot. Because the markedness constraints that are responsible for the phenomena accounted for in both subsections (CULMINATIVITY (see 14) and *MARGIN$_{foot}$/[e, o] (see 21)) are never violated in PIE outputs, it will then be unnecessary in the future to consider output candidates that have less than (or more than) one stressed syllable or that contain unstressed non-high vowels (unless one is reconstructed for the output).

3.1.1 Culminativity

There is one and only one stressed syllable per word in PIE, as stated above in (13a). This fact is easily accounted for by assuming the constraint CULMINATIVITY[11] is undominated.

(14) CULMINATIVITY [CULMIN][12] (Hayes 1995, Alderete 1999)
A prosodic word (PrWd) has one and only one prosodic peak.
Assign a * if this is not the case.

The tableaux in (15) and (16) explicitly show that CULMIN dominates MAX(A)[13] and DEP(A)[14], as stated in (17), which means that is more important for a word to have one and only one stress than to be completely faithful to underlying accent. The tableau in (15) shows that if both the root and ending are accented, only one will bear stress. This situation

[11] It is possible that two constraints are needed to do the work of CULMIN: one that penalizes having no stress and another that penalizes have more than one stress. Either constraint set is consistent with the analysis presented here, so I am using one constraint for simplicity.

[12] The abbreviated name for a constraint used in this paper will always occur in brackets after the full name.

[13] MAX(A) penalizes deletion of an accent. A formal definition will be given in §3.3.

[14] DEP(A) penalizes insertion of an accent. A formal definition will be given in §3.3.

is applicable to acrostatic root nouns in weak cases. The tableau in (16) shows that if given no underlying accent, the word will still have stress, which is the situation presented by amphikinetic root nouns in strong cases. The appearance of stress on the root (instead of the ending) in both winning outputs is predicted by the BAP (Basic Accentuation Principle: preference for leftmost stress), and will be explained with a constraint-ranking in §3.2.

The inputs in these tableaux represent generic root nouns. For the sake of simplicity, specific input forms with phonemic content are not necessary. This step towards simplification will be repeated in future tableaux, if the appropriate point can be made without using concrete inputs. Summary tableaux are presented at the end of this chapter in which segmentally specified inputs and outputs are used.

(15) acrostatic root noun with weak ending

/ŔÉ/	CULMIN	MAX(A)
a ☞ ŔE		*
b ŔÉ	*!	

(16) amphikinetic root noun with strong ending

/RE/	CULMIN	DEP(A)
a ☞ ŔE		*
b RE	*!	

(17) CULMIN » MAX(A), DEP(A)

3.1.2 Syncope

The deletion of unstressed non-high vowels from roots, suffixes, and ablauting endings is an interesting case of ablaut because the high-sonority vowels are deleted but low-sonority vowels are not. The situation is compounded by the fact that suffixes in amphikinetic strong cases surface with o-grade and are thus the only exception to the rule. In this section, I will present an analysis of the phenomenon that will account for such deletion through an OT constraint ranking that utilizes previously motivated constraints. The exceptions will necessarily result from lexical specifications or historical derivations, and so they will not be accounted for here.

There are languages that prefer to assign stress to more sonorous vowels (see Kenstowicz 1994 for discussion of Mordwin, Kobon, Chuckee, Aljutor, and Mari). While the assignment of stress in PIE is not sonority sensitive, the constraints motivated for analyzing languages in which sonority is a factor in stress assignment are relevant here. Kenstowicz (1994) explains this high-sonority preference by introducing a new formulation of the *PEAK and *MARGIN constraints of Prince and Smolensky (1993). These constraints were first introduced to penalize less sonorous segments that occur in a syllable nucleus (*P) and more sonorous segments that occur in a syllable margin (*M), i.e. as an onset or coda segment. Thus the *P constraints, each one associated with a segment of a certain sonority level, exist in a fixed ranking such that *P/*x* » *P/*y* if *x* is less sonorous than *y*. The reverse is true of the *M constraints: *M/*x* » *M/*y* if *x* is more sonorous than *y*. Formal definitions of these constraints are given in (18) and (19), each illustrating the highest ranking version of the constraint.

(18) *PEAK$_{syll}$/voiceless stop [*P/*x*] (Prince and Smolensky 1993)
A voiceless stop should not be a syllable nucleus.
Assign a * for each voiceless stop that heads a syllable.

(19) *MARGIN$_{syll}$/[a] [*M/*x*] (Prince and Smolensky 1993)
The sound [a] should not be in a syllable onset or coda.
Assign a * for each [a] that does not head a syllable.

The above constraints are altered by changing the domain of operation from the syllable to the foot. The new constraints - *P$_{foot}$ and *M$_{foot}$ – penalize a nucleus of the specified sonority level for either being the peak (heading the foot) or in the margin (not heading a foot). These constraints again follow the sonority scale in a fixed ranking and are illustrated below with the highest ranking version.

(20) *PEAK$_{foot}$/[ə] (Kenstowicz 1994)
The sound [ə] sound not be the head of a foot.
Assign a * for each [ə] that heads a foot.

(21) *MARGIN$_{foot}$/[a] (Kenstowicz 1994)[15]
The sound [a] should head a foot.
Assign a * for each [a] that does not head a foot.

The *M$_{foot}$ constraints will be helpful in explaining the disappearance of non-high vowels, because potential outputs with unstressed high-sonority vowels in PIE incur fatal violations. Thus PIE strongly disfavors having non-high vowels that do not head a foot, as predicted by high-ranking *M$_{foot}$/[e,o] (and thus higher-ranking *M$_{foot}$/[a][16]). A violation of *M$_{foot}$/[e,o] could potentially be fixed in a variety of ways. Stress could be assigned to the vowel or the height specification of the vowel could be changed. The former is not an option for PIE due to high-ranking CULMIN. Furthermore, PIE does not tolerate changing the specification of the feature [±high] in order to avoid a *M$_{foot}$ violation. The deletion of non-high vowels is thus a result of *M$_{foot}$/[e, o] and IDENT[high] dominating MAX, as shown in (24).

(22) IO-MAX (McCarthy and Prince 1999)
Do not delete segments; every segment s_i should have a correspondent s_o.
Assign a * for every s_i that has no such correspondent.

[15] The name of this constraint suggests that it should assign violation-marks when the specified segment occurs in the margin of a afoot. However, I have reworded the constraint to assign violation-marks when the specified segment does not head a foot. (Note that Kenstowicz (1994) does not give an explicit definition for assigning violation-marks.) Because PIE is unbounded, the tableaux in (23) and (25) show candidates with on foot and any remaining syllables are unfooted. For this reason, the *M$_{foot}$ constraints can only explain the PIE data if they are formalized as in (21).

[16] The [a] is deleted in the strong forms of the amphikinetic root noun 'nose': i.e. *gen sg* */nas-és/→*[n̥sés].

(23) ‘night’ *gen sg*, acrostatic[17]

	/nék^w-ét-és/	*M_{foot}/[e, o]	ID[high]	MAX
a	☞ (nék^wts)			**
b	(nék^we)tes	**!		
c	(nék^wi)tis		**!	

(24) *M_{foot}/[e, o], ID[high] » MAX

Importantly, MAX dominates *M_{foot}/[i, u] (and hence any *M_{foot} constraints that are lower on the scale), as demonstrated in (25). The rankings motivated in this section are summarized in (26).

(25) ‘bird’ *nom sg*, proterokinetic

	/$h_2$ew-éy-s/	MAX	*M_{foot}/[i, u]
a	☞ ($h_2$éwis)		*
b	($h_2$éws)	*!	

(26) Rankings motivated in this section:

*M_{foot}/[a]

*M_{foot}/[e, o]   ID[high]

MAX

*M_{foot}/[i, u]

The deletion of non-high vowels is thus accounted for with the ranking in (26). The lexical idiosyncrasies have not been explained, however, such as the lack of ablaut in certain endings. Additionally, the appearance of o-grade in unstressed suffixes in amphikinetic strong forms reflects the fact that this class originates as a secondary derivational type (see §2.3.8), and so it is due to the historical development of the amphikinetic accent class. These

[17] Because acrostatic nouns can have accented or unaccented suffixes, there is no way to determine the lexical specification with regard to accent of a suffix that only forms acrostatic nouns. Thus, I am not making a claim that the suffix *et is underlyingly accented, but simply that it could be. The tableau shows that, even given an input with three accents and three vowels, only one vowel surfaces – the one that receives stress. If *et is unaccented, the expected output would still win.

exceptions are clearly not phonologically conditioned and must be explained with lexical specifications or diachronic development. I will not attempt a formalism of what these specifications should be, as this is beyond the scope of this paper. In future tableaux, the above ranking will be assumed and no candidates will be presented in which unstressed non-high vowels surface unless there is a vowel known to surface due to a lexical/historical idiosyncrasy.

3.2 Analysis of Weak Cases: Faithfulness and Alignment

There are three faithfulness constraints that will be relevant when dealing with accent: IO-MAX(ACCENT) penalizes deletion of accent from input to output, IO-DEP(ACCENT) penalizes insertion of accent from input to output, and IO-NOFLOP(ACCENT) penalizes the movement of accent from one segment in the input to a non-corresponding segment in the output. These three constraints are formalized below, using correspondence theory as defined by McCarthy and Prince (1995) and extended to accent by Alderete (1999).

(27) IO-MAX(ACCENT) [MAX(A)] (Alderete 1999)
Do not delete accent; every accent a_i should have a correspondent a_o.
Assign a * for every a_i that has no such correspondent.

(28) IO-DEP(ACCENT) [DEP(A)] (Alderete 1999)
Do not insert accent; every accent a_o should have a correspondent a_i.
Assign a * for every a_o that has no such correspondent.

(29) IO-NOFLOP(ACCENT) [NOFL(A)] (Alderete 1999)
Do not shift accent; for every accent a_i that is linked to a segment s_i, if $a_i\Re a_o$ and a_o is linked to s_o, then $s_i\Re s_o$.
Assign a * for every a_i where this is not the case.

The above faithfulness constraints interact with three different alignment constraints to yield the outputs of the weak cases. The constraint ALIGNL expresses a preference for leftmost stress, which is the original insight of the BAP. However, stress is not always aligned with the leftmost morpheme of a word in PIE, and this will be explained by the exact ranking of ALIGNL. In the final ranking (given in (82)), ALIGNL will be shown to be crucially dominated by several faithfulness constraints, such that if none of the dominating faithfulness constraints can be satisfied, ALIGNL dictates the default position for stress: leftmost.

(30) ALIGN-LEFT (σ́, PrWd) [ALIGNL]
For every stressed syllable, align its left edge with the left edge of some prosodic word.
Assign a * for each stressed syllable that is not leftmost in the PrWd.

Note that the formalism of this alignment constraint is that of a categorical constraint: one violation mark is assigned per faulty structure. The constraint is violated equally by the candidates [tatatá] and [tatáta]. It has been proposed that all OT constraints should be categorical (McCarthy 2003). Following this stipulation for constraint formalism will have interesting implications for the analysis, as will be explained below in §3.2.3.

3.2.1 Amphikinetic Nouns: Faithfulness to Underlying Accent

Stress is not always leftmost in PIE athematic nouns because ALIGNL is dominated by certain faithfulness constraints. As shown in the tableau in (31), if the input is the type expected of a weak amphikinetic noun (type RS), stress is realized as it is in underlying form. It is more important for the language to realize underlying accent than to have initial stress. We can thus derive the rankings in (32) from the tableau in (31).

(31) amphikinetic noun with weak ending[18]

/RSÉ^{1}/	MAX(A)	DEP(A)	NOFL(A)	ALIGNL
a Ŕ^{2}SE	*(!)	*(!)		
b Ŕ^{1}SE			*!	
c ☞ RSÉ				*

(32) NOFL(A) » ALIGNL
{MAX(A), DEP(A)} » ALIGNL

3.2.2 Acrostatic Nouns: Privileged Faithfulness to Roots

There is evidence that underlying accent on roots is favored over accent elsewhere. For example, if the underlying form contains three accented morphemes, as in weak forms of acrostatic nouns (type ŔŚ), the root surfaces with accent. Furthermore, the only accent class that does not show alternating stress in strong and weak forms is acrostatic. This class is essentially defined by roots with underlying accent – no other accent classes have such roots. In PIE, if the root is underlyingly accented, it will always surface as stressed. This is not true of suffixes or endings. At this point it seems possible to explain the privileged status of roots with reference to the ALIGNL constraint. However, there is another account that will not only explain why acrostatic nouns maintain root stress, but will also be helpful in explaining the surface stress of nouns in strong cases. Additionally, the rankings demonstrated throughout this and the next chapter will show that ALIGNL is dominated by a number of constraints, meaning it is ranked too low to be responsible for the privileged status of roots.

Previous work in phonology has expressed the need for faithfulness constraints that are specific to certain morphological classes. McCarthy and Prince (1995) supply the meta-

[18] This tableau represents the correspondence relation between accents by using a superscript numeral after the accented segment. Thus the input contains an accent labeled with 1. Candidate (b) also has an accent with the same label, though the accent is linked to a different morpheme, and so we know that the accent has been flopped. Candidate (a) has an accent with a different label. Thus we know that the accent in the input has been deleted and a new accent has been inserted. This notation will be used throughout this paper when it is necessary to label accents as corresponding or non-corresponding.

constraint seen in (33), which says that faithfulness constraints linked to roots dominate faithfulness constraints linked to affixes.

(33) Root-Affix Faithfulness (McCarthy and Prince 1995)

$\mathbb{F}_{root} \gg \mathbb{F}_{affix}$

Beckman (1997) goes beyond the meta-constraint by establishing a set of *positional faithfulness* constraints that are sensitive to "those positions which are phonetically or psycholinguisitically equipped to convey a wide range of marked features (p. 4)." Thus, any faithfulness constraint may specifically be linked to a root, as this is a highly salient part of the word. Importantly, there are no specific faithfulness constraints linked to positions which are not especially prominent. This provides a different picture from the meta-constraint: there is root-faith and there is general faith (applicable to segments in any position in the word), but there is no faith specified for less privileged positions, such as the affix. Having these two separately rankable types of faithfulness constraints allows for roots to display more contrasts and thus more marked structures by the ranking of root-faith » markedness » faith. In this case, roots may contain marked structures that are forbidden elsewhere in the word.

Given that there are positional and general faithfulness constraints, some statements need to be made about the "initial state" of the language learner that will be applicable to the constraint-ranking motivated here. It has been proposed that the language learner must start with a ranking of all markedness constraints dominating all faithfulness constraints, with markedness constraints unranked with respected to each other and similarly for faithfulness constraints (Smolensky 1996). Any other initial ranking would lead to the Subset Problem (Berwick 1985, Wexler and Manzini 1987), where outputs permitted by the correct grammar are a subset of the outputs permitted by an incorrect grammar that the language learner has created. The language learner in this case has constructed a more permissible grammar but would never encounter evidence that their grammar is incorrect. This is also a problem if positional faithfulness and general faithfulness constraints are unranked with respect to each other in the initial state. The only way to avoid the dilemma is if the positional faithfulness constraints dominate general faithfulness constraints in the initial state (Smith 2000, Prince and Tesar 1999). If the language learner realizes that the ranking of markedness over positional faithfulness over faithfulness is incorrect in some way, constraints are demoted in the ranking as necessary in order to reach the correct grammar. Thus, the initial state for the learner of PIE is that of root-faith over general faith. There will never be need for the root-faith constraints to be demoted, and so it will be assumed that PIE has a fixed ranking for all faithfulness constraints as shown in (34).

(34) Fixed ranking for PIE = initial state

$\mathbb{F}_{root} \gg \mathbb{F}$

It will thus be assumed that for every faithfulness constraint (such as those in (27-29)), there are two such faithfulness constraints, one that is general (i.e. assign a * for a violation incurred by any part of the word) and one that is indexed to roots (i.e. only assign a * for a violation is incurred by the root). The one indexed to roots will always dominate the general constraint.

The tableaux in (35) and (36), which show the two possible underlying representations associated with acrostatic nouns (types ŔŚ and ŔS) in weak cases, make use of the indexed faithfulness constraints. The winning candidates have stressed roots, and thus prefer to realize underlying accent in the root over underlying accent elsewhere in the word.

However, in both of these tableaux, if we ignored the MAX(A)$_{root}$ constraints and assumed only general faithfulness, the appropriate candidate ((a) in both cases) would still win because it is the only one not to incur a violation of ALIGNL. I will have to defer evidence that it is MAX(A)$_{root}$ that is significant here and not ALIGNL to chapter 4. In the meantime, the reader should note that the utilization of the positional faithfulness constraint MAX(A)$_{root}$ is consistent with acrostatic nouns with weak endings.

(35) acrostatic noun with weak ending

	/ŔSÉ/	MAX(A)$_{root}$	MAX(A)	ALIGNL
a	☞ ŔSE		*	
b	RSÉ	*(!)	*	*(!)

(36) acrostatic noun with weak ending

	/ŔŚÉ/	MAX(A)$_{root}$	MAX(A)	ALIGNL
a	☞ ŔSE		**	
b	RŚE	*(!)	**	*(!)
c	RSÉ	*(!)	**	*(!)

3.2.3 Proterokinetic Nouns: Privileged Faithfulness to Derivational Affixes

There is one type of input not involving a post-accenting root that has yet to be discussed – the proterokinetic type RŚ. Analysis of such nouns will motivate a further distinction in faithfulness constraints in addition to root-faith. In weak cases for these nouns, two accents exist in the underlying representation – one on the suffix and one on the ending – and the one on the suffix surfaces. Why does a candidate with stress on the ending lose? Both candidates – one with a stressed suffix and one with a stressed ending – incur one violation of the categorical ALIGNL and one violation of MAX(A). At this point, the implications of a categorical ALIGNL are clear. If the constraint was gradient, the candidate with a stressed suffix would incur fewer violations than the candidate with a stressed ending because the suffix is closer to the left edge of the word than the ending. Because the constraint is categorical, however, the decision between these two candidates must be decided by another constraint.

The appropriate candidate, the one with a stressed suffix, is predicted to win if a positional faithfulness constraint is defined for derivational affixes, as shown in the tableau in (37).

(37) proterokinetic noun with weak ending

/ŔŚÉ/	MAX(A)$_{deriv}$	MAX(A)	ALIGNL
a ☞ ŔŚE		*	*
b RSÉ	*!	*	*

Derivational affix-faith is likely a particular instantiation of positional faith – that of *head faith* as defined by Revithiadou (1999). Her claim (p. 6) is that the dominance of root faith over affix faith (as proposed by McCarthy and Prince (1995)) is actually a case of *head dominance* as formalized in (38). Again, the ranking in (38) is what is necessarily occurs in the initial state in order to avoid the subset problem.

(38) Head Faithfulness (Revithiadou 1999)

$\mathbb{F}_{head} \gg \mathbb{F}$

This theory says that faithfulness constraints are subcategorized in such a way that a faithfulness constraint linked to a morphological head will dominate a general faithfulness constraint. As Revithiadou points out, the dominance of head-faith makes the same predictions as the dominance of root-faith when the root is the head of the word. However, this is not always the case, and she specifically cites derivational suffixes as having head properties (1999: 6), suggesting that derivational affix faith can dominate root faith. While this is not the case for PIE because roots actually do take priority over derivational affixes, Revithiadou's work does motivate a distinction among root and derivational affix faithfulness.

There is thus a three way distinction among faithfulness constraints as applicable to PIE, such that there are general faithful constraints as well as positional faithfulness constraints indexed for roots and derivational affixes. Given these types of faithfulness constraints, the tableaux in (31) and (36) should be reevaluated. First, for the amphikinetic nouns, we see that the fatal violation incurred by the losing candidate (a) could potentially come from three different constraints instead of two, as shown in (39).

(39) amphikinetic noun with weak ending

	/RSÉ[1]/	NoFl(A)	Max(A)	Dep(A)$_{root}$	Dep(A)	AlignL
a	Ŕ[2]SE		*(!)	*(!)	*(!)	
b	Ŕ[1]SE	*!				
c	☞ RSÉ					*

(40) {Max(A), Dep(A)$_{root}$, Dep(A)} » AlignL

Second, for the acrostatic nouns (type ŔŚ), we see that (assuming AlignL is not in a position to assign the fatal violation, which will be demonstrated in §4.3), root-faith dominates derivational affix-faith in PIE, as stated in (42).

(41) acrostatic nouns with weak ending

	/ŔŚÉ/	Max(A)$_{root}$	Max(A)$_{deriv}$	Max(A)	AlignL
a	☞ ŔSE		*	**	
b	RŚE	*(!)		**	*(!)
c	RSÉ	*(!)	*	**	*(!)

(42) Faithfulness Constraints in PIE: fixed ranking

$\mathbb{F}_{root} \gg \mathbb{F}_{deriv} \gg \mathbb{F}$

Thus, the ranking in (42) is proposed for PIE only (and not as a cross-linguistic principle). This ranking is founded on the insight that derivational suffixes can posses head properties, and the ranking follows the idea of “headmost wins” (Revithiadou 1999). The athematic nominal data supports this ranking because roots with underlying accent never lose that accent, i.e. through high-ranking MAX(A)$_{root}$ or NOFLOP(A)$_{root}$, and derivational affixes with underlying accent win over inflectional endings with underlying accent. This indexing and ranking thus applies to MAX(A), DEP(A), and NOFLOP(A). Note that with NOFLOP(A), if a penalty is incurred, it is incurred because the segment in the input s_i linked to the accent a_i does not have a correspondent that is linked to a_o (though the output does have a correspondent of a_i). This means that NOFLOP(A)$_{root}$ penalizes the flopping of accent that is on the root in the input and NOFLOP(A)$_{deriv}$ penalizes the flopping of accent that is on the derivational suffix in the input.

The privileged status of derivational affixes in PIE (as opposed to inflectional affixes) provides further evidence for the separation of suffix (derivational affix) and ending (inflectional affix). These two types of affixes were distinguished in chapter 2 for many reasons, including the fact that all suffixes undergo ablaut though only a few of the endings do. The fact that suffixes have privileged faithfulness is another difference between the two. A further distinction will be developed in chapter 4, where it will be shown that endings can be dominant (and thus all endings are classified as dominant or recessive), but that suffixes do not have such a specification.

3.2.4 Proterokinetic and Hysterokinetic Nouns: Post-Accenting Roots

The concept of a post-accenting root goes against the claims made by Alderete (1999) with respect to post- and pre-accenting morphemes, specifically that post- and pre-accentuation is always base-mutating (p. 191) and should thus be handled with OO-antifaithfulness constraints. Under this approach, there should be no such thing a post- or pre-accenting root. However, the PIE data presents an argument against this claim. In hysterokinetic nouns, the root is never stressed, and this is the only accent class in which the root is never stressed. As has been explained in this chapter and will be demonstrated more thoroughly in chapter 4, there is strong preference for root stress in PIE – underlying root accent is never deleted and ALIGNL dictates the root as the default position for stress. If hysterokinetic roots were accented, they should behave like acrostatic nouns; if they were unaccented, they should behave like proterokinetic or amphikinetic nouns (depending on the specification of the suffix). In any case, the result would be a stressed root in strong cases, but this is not what happens. Labeling the roots as post-accenting allows us to explain their odd behavior, and we will see in chapter 4 how this lexical specification accounts for the presence of stress on the suffix in strong forms of hysterokinetic nouns (even though it is the ending that is stressed in weak forms).

Halle (1997: 280-1) claims that some roots in Russian are post-accenting and accounts for them using metrical bracket theory. There are certain roots in Russian (such as *korol* 'king' – *korolú* in dat sg and *korolám* in dat pl) that always appear in forms in which the suffix following the root bears accent. If the root were accented, it should be stressed in all outputs. If the root were unaccented, it should exist both in outputs where it receives stress and also in outputs where the suffix receives stress (depending on whether or not the particular suffix is accented or unaccented). Thus, it appears that roots such as *korol* place stress on the suffix, i.e. they are *post-accenting*. Halle accounts for these roots by claiming they place a left parenthesis after the last asterisk associated with the root on line 0 of the metrical grid. This left parenthesis results in the syllable to its left (the post-stem syllable) bearing stress.

Post-accenting roots should trigger an alignment constraint, as defined in (43). POSTACCENT is satisfied when the morpheme immediately following a post-accenting morpheme bears stress. If the input does not have a post-accenting morpheme, the constraint is vacuously satisfied. This type of alignment constraint is based on how post-accenting roots in Russian are handled by Halle (1997). His approach within metrical bracket theory is tantamount to the approach I am using with the POSTACCENT constraint within Optimality Theory. This approach is also well-motivated given that alignment constraints have been previously proposed that refer to specific lexical entries, such the Tagalog constraint on *um*-infixation (McCarthy and Prince 1993b: 22)

(43) ALIGN (PoAMorph, R, AccMorph, L) [POSTACCENT]
For every post-accenting morpheme, align its right edge with the left edge of some stressed morpheme.
Assign a * if stress does not occur on the morpheme immediately following a post-accenting morpheme.

Alderete (1999) uses a different strategy for explaining why the suffix is always stressed in Russian words like those formed with the root *korol*. His claim is that there is constraint demanding that the left edge of an accented syllable must be aligned with the right edge of a stem (POST-STEM-PROM, p. 70). This constraint is dominated by MAX(A), so that if the root has underlying accent, this accent is realized as the expense of POST-STEM-PROM. POST-STEM-PROM is nearly identical to POSTACCENT except that POSTACCENT is only triggered by certain morphemes (and thus does not reflect a general preference of the language) and places the accent in a stem-internal position instead of a post-stem position. It is clear that PIE does not have a general preference for post-stem or post-root stress because all but the hysterokinetic nouns have root stress in strong forms, whether the root is underlyingly stressed or not. Furthermore, it is only possible to claim that Russian has a general preference for post-stem stress if a certain type of noun is ignored. There are Russian nouns that display alternating stress, such as 'beard': *borod-á* (nom sg)/ *bórod-i* (nom pl) (Alderete 1999: 68). Alderete claims these nouns are lexical exceptions because they only represent less than one percent of the nominal lexicon. However, as Halle (1997: 281) points out, these nouns may compose a small percentage of the lexicon, but they tend to be commonly used words and undergo regular phonological rules. If these words are not ignored, it is clear that Russian does not have a general preference for post-stem stress. It is possible that even for Russian the appropriate constraint is one like POSTACCENT that is only triggered by lexically specified roots such as *korol*. Halle (1997) proposes that Russian has accented, unaccented, and post-accenting roots (like what I have proposed for PIE). Accented roots are always stressed in the output, in agreement with Alderete. Unaccented roots yield paradigms with alternating stress, and post-accenting roots yield paradigms with stress on the inflectional suffix. This system for Russian as proposed by Halle is very similar to the system that I am proposing for PIE and provides motivation for POSTACCENT from an attested language.

Words with post-accenting roots do not always bear stress on the suffix, as evidenced by stress on the ending in hysterokinetic nouns in weak form, and so this will again be explained by the exact ranking of the alignment constraint. When the underlying noun contains a post-accenting root, an unaccented suffix, and an accented recessive ending, as is the case for hysterokinetic nouns (type $R_{PoA}S$), stress surfaces on the ending, as shown in (44). Underlying accent is not shifted in order to avoid a POSTACCENT violation, nor is it deleted from the ending and inserted onto the suffix, as shown by the ranking in (45).

(44) hysterokinetic noun with weak ending

/R_{PA}SÉ[1]/	MAX(A)	NOFL(A)	POSTACC	ALIGNL	DEP(A)$_{deriv}$	DEP(A)
a RŚ[2]E	*(!)			*	*(!)	*(!)
b RŚ[1]E		*!		*		
c ☞ RSÉ			*	*		

(45) NOFLOP(A), {MAX(A), DEP(A), DEP(A)$_{deriv}$} » POSTACCENT

In (46), where the underlying representation contains a post-accenting root and an accented suffix and ending, in accord with certain proterokinetic nouns (type R_{PoA}Ś), the suffix receives stress. In this case candidate (b) is harmonically bounded by the winner.

(46) proterokinetic noun with weak ending

/R_{PA}ŚÉ/	MAX(A)$_{deriv}$	MAX(A)	POSTACC	ALIGNL
a ☞ RŚE		*		*
b RSÉ	*(!)	*	*(!)	*

In the above tableaux, POSTACCENT does not actually do any work. However, this constraint will be necessary to explain why hysterokinetic nouns do not receive stress on the root in strong cases (like every other type of noun does). Because it will be needed to explain hysterokinetic nouns, it was introduced in this section along with the types of nouns that have post-accenting roots. Again, we see that satisfying alignment constraints in PIE is not as important as realizing underlying accent.

3.2.5 Holokinetic Nouns: the Locative Singular *-Ø

It is appropriate to handle the troublesome locative singular null ending, which results in the creation of the holokinetic accent class, at this time because this ending is recessive. However, the odd behavior created by the addition of the ending is due to a difference in accent specification. All of the other recessive endings are underlyingly accented. The holokinetic locative singular forms are explained if the *-Ø ending is pre-accenting and recessive. A pre-accenting morpheme triggers an alignment constraint just as a post-accenting morpheme does. The constraint in (47) is satisfied when the morpheme to the left of a pre-accenting morpheme bears stress; it is vacuously satisfied when no morpheme in the input is pre-accenting.

(47) ALIGN (PrAMorph, L, AccMorph, R) [PREACCENT]
For every pre-accenting morpheme, align its left edge with the right edge of a stressed morpheme.
Assign a * if stress does not occur on the morpheme immediately preceding a pre-accenting morpheme.

The alignment constraint triggered by the pre-accenting morpheme must dominate the general ALIGNL, as shown in the tableau in (48) and the ranking in (49). This ranking is dependent on ranking of ALIGNL » DEP(A)$_{root}$, which will be demonstrated in §4.3. It is thus more important for stress to occur immediately before a pre-accenting morpheme than to occur on the leftmost morpheme.

(48) amphikinetic noun with null loc sg ending

/RSØ$_{PrA}$/	PREACCENT	ALIGNL	DEP(A)$_{root}$	DEP(A)$_{deriv}$	DEP(A)
a ☞ RŚ		*		*	*
b ŔS	*!		*		*

(49) PREACCENT » ALIGNL

3.3 Summary of Weak Case Analysis

In order to summarize the results of this chapter, I will consider only the rankings motivated by the consideration of nouns inflected with weak endings, with two exceptions. The ranking given in (49) of PREACCENT » ALIGNL made reference to a ranking not demonstrated in this chapter (ALIGNL » DEP(A)$_{root}$). Because there will be no further discussion of pre-accenting morphemes (there are no such affixes in the strong cases), I will propose the ranking as one motivated in this chapter. Also, the direct evidence for

MAX(A)$_{root}$ » MAX(A)$_{deriv}$ made reference to a ranking not demonstrated in this chapter, but, as the MAX(A) ranking is also a result of theoretical considerations, it is presented here as well. The tableaux in this chapter have thus given evidence for the rankings shown in Table 3.1.

<u>Table 3.1: Constraint Rankings Motivated in Chapter 3</u>

a.	MAX(A)$_{root}$ » MAX(A)$_{deriv}$ » MAX(A) DEP(A)$_{root}$ » DEP(A)$_{deriv}$ » DEP(A) NOFLOP(A)$_{root}$ » NOFLOP(A)$_{deriv}$ » NOFLOP(A)	theoretical discussion §3.2
b.	NOFLOP(A) » ALIGNL	tableau (31)
c.	{MAX(A), DEP(A)$_{root}$, DEP(A)} » ALIGNL	tableau (39)
d.	NOFLOP(A) » POSTACCENT	tableau (44)
e.	{MAX(A), DEP(A)$_{deriv}$, DEP(A)} » POSTACCENT	tableau (44)
f.	PREACCENT » ALIGNL	tableau (48)

Because the rankings in (c) and (e) above are not specific (one constraint or another dominates another constraint), they are not represented in the diagram below. Therefore, the solid rankings that have been demonstrated in this chapter are shown in (50). These rankings reflect a grammar that prefers to be faithful to roots over derivational affixes (but that also gives preference to the headlike properties of derivational affixes), that will not flop an underlying accent in order to satisfy the general preference for leftmost stress or the constraint triggered by a post-accenting morpheme, and that will satisfy the constraint triggered by a pre-accenting morpheme over the general preference for leftmost stress.

(50) rankings motivated in chapter 3

a. PreAccent NoFlop(A)

AlignL PostAccent

b. $\mathbb{F}_{root}$

|

$\mathbb{F}_{deriv}$

|

$\mathbb{F}$

The rankings in (50a) are demonstrated by the summary tableau in (51). This tableau considers candidates for three different inputs. The input in (a) is for the locative singular form of ‘earth’. The loser in (c) incurs a fatal violation of PreAccent (though it satisfies AlignL). The input in (d) is for the genitive singular form of ‘earth’. The loser in (e) incurs a fatal violation of NoFlop(A) (though it satisfies AlignL). Finally, the input in (g) is for the genitive singular form of ‘male’. The loser in (h) incurs a fatal violation of NoFlop(A) (though it satisfies PostAccent).

(51) Summary Tableau for rankings in (50a)

		PreAccent	NoFlop(A)	AlignL	PostAccent
a	/d^{h}eg^h-em-Ø$_{PrA}$/	PreAccent	NoFlop(A)	AlignL	PostAccent
b	☞ d^{h}g^h-ém			*	
c	d^{h}ég^h-m̥	*!			
d	/ d^{h}eg^h-em-é^{1}s/	PreAccent	NoFlop(A)	AlignL	PostAccent
e	d^{h}é^{1}g^h-m̥-s		*!		
f	☞ d^{h}g^h-m-é^{1}s			*	
g	/h$_2$ers$_{PoA}$-en-é^{1}s/	PreAccent	NoFlop(A)	AlignL	PostAccent
h	h$_2$r̥s-é^{1}n-s		*!		
i	☞ h$_2$r̥s-n-é^{1}s				*

The ranking of root-faith over derivational-affix faith is demonstrated in the tableau below (assuming that AlignL is not in a position to rule out candidate (b), as will be demonstrated in §4.3). In this case all the morphemes are underlyingly accented, but it is the root that receives surface stress.

(52) Summary Tableau for ranking in (50b), input: 'water' gen sg[19]

	/wéd-én-és/	MAX(A)$_{root}$	MAX(A)$_{deriv}$	MAX(A)	ALIGNL
a	☞ wéd-n̥-s		*	**	
b	ud-én-s	*!		**	*

In conclusion, though only a few rankings have been unquestionably motivated in this chapter, many aspects of the PIE grammar are clear. Though three alignment constraints are important for the realization of PIE stress, in general, it is more important to realize underlying accent than to satisfy the alignment constraints. Thus, alignment acts as a default – given no underlying accent, alignment constraints are able to determine the position of stress. This will be clarified in §4.3 where the amphikinetic (type RS) strong forms, which have no underlying accent, are discussed. Another important aspect of PIE phonology is the preference given to roots and derivational affixes. Given an input with multiple accented morphemes, if the root is accented it will receive stress, and if the root is not accented but the suffix is, the suffix will receive stress. This fact will be important in motivating the need for dominant affixes, as discussed in §4.1.

[19] No claim is being made that the suffix *er/n is underlyingly accented (see footnote 17).

Chapter Four

Dominance in Optimality Theory: Nouns Inflected with Strong Endings and the Case for ¬OP Antifaithfulness Constraints

The last chapter provided an analysis of the four accent classes (created by six different types of stems) as inflected with weak endings. The claim was made that these endings are recessive, which means that they are not dominant, i.e. they do not trigger any mutations in the base. In this chapter, I will present an analysis of the strong cases after motivating the need for labeling the strong inflectional endings as dominant. This chapter will proceed as follows. In §4.1, I will return to the discussion of dominance in morphology that began in chapter 1 and motivate the need for dominant affixes in the strong cases with specific reference to the proterokinetic nouns. I will then discuss how to handle dominance in OT with regard to inflectional paradigms in §4.2. At this time I will propose a new type of antifaithfulness constraint that is triggered by dominant inflectional affixes and works within the model of Optimal Paradigms (McCarthy 2005). An analysis will be presented in §4.3 that makes use of the new antifaithfulness constraints, and a summary will be given in §4.4.

4.1 Dominance in Morphology

The PIE athematic nominal paradigms show evidence of dominance. This was originally recognized as a "deaccentuation" rule (Kiparsky and Halle 1977) that was triggered by certain morphemes, but this rule was never specifically associated with strong endings. Instead, the main difference between strong and weak endings that has been cited in the literature is that strong endings are unaccented and weak endings are accented (Halle 1997: 309, Kim 2002). Excepting acrostatic nouns, accent always surfaces in a different position in strong cases than in weak cases. Such accent alternations cannot simply be explained by a difference in underlying accent in strong and weak case endings. Certain assumptions have been made about the lexical specifications of morphemes with regard to accent and what types of morphemes can exist in the stems of each accent class. These assumptions (and citations for original sources when applicable) were given at the end of chapter 2 in table 2.9 and are repeated below in (53). In chapter three, the output for each possible type of input combined with a recessive (weak) affix was predicted through a constraint ranking. A set of constraints consisting only of markedness and IO-faithfulness was able to account for the weak forms of these nouns.

(53)

root	suffix	accent class	strong output	weak output
+	+	acrostatic	ŔSE	ŔSE
+	-	acrostatic	ŔSE	ŔSE
-	+	proterokinetic	ŔSE	RŚE
-	-	amphikinetic	ŔSE	RSÉ
PoA	+	proterokinetic	ŔSE	RŚE
PoA	-	hysterokinetic	RŚE	RSÉ

We will continue with the hypothesis that the predictions made in (53) are correct – that the types of morphemes in the combinations given yield the accent classes as listed. The rankings motivated in the previous chapter express a preference for realizing the leftmost (headmost) underlying accent (in agreement with the BAP (Basic Accentuation Principle)) and for realizing some underlying accent over satisfying alignment constraints. The other part of the BAP – that given no underlying accent, stress will appear on the root – will be demonstrated with a ranking in (71).

Taking these facts and hypotheses into consideration and assuming that the difference between strong and weak endings is only one of accent specification, there are two predictions made in (53) that cannot be accounted for with a ranking that involves only faithfulness and markedness constraints. Specifically, one accent class (proterokinetic) cannot be explained and outputs that don't belong to any of the accent classes are predicted to exist[20], as shown in table 4.1. In this table, the possible stem types (assuming three types of roots (accented, unaccented, and post-accenting) and two types of suffixes (accented and unaccented)) are combined with the accented weak endings and the unaccented strong endings. The outputs given for each input are computed based on the constraint rankings shown in table 3.1 and the BAP. The accent class that I have proposed should result from each type of stem is listed next to the output. As shown in the final column, the strong outputs of (c) and (e) are not what are predicted of proterokinetic nouns.

[20] It is interesting that the outputs predicted by the inputs in (c) and (e) match Rix's mesostatic accent class as discussed in §2.3. The argument against the existence of such a class was that the example of a mesostatic noun was really a secondary derivative, as so it is not the type of athematic noun that is the focus of this thesis. It is quite possible that secondary derivatives were not always inflected with dominant affixes, and thus "columnar" (fixed) stress is what is expected of them.

Table 4.1: Expected Outputs Assuming no Dominance Effects

		input		output	proposed accent class	does the output agree with the proposed accent class?
a.	*strong*	/ŔŚE/	→	[ŔSE]	acrostatic	yes
	weak	/ŔŚÉ/	→	[ŔSE]		yes
b.	*strong*	/ŔSE/	→	[ŔSE]	acrostatic	yes
	weak	/ŔSÉ/	→	[ŔSE]		yes
c.	*strong*	/RŚE/	→	[RŚE]	proterokinetic	no (cf. ŔSE)
	weak	/RŚÉ/	→	[RŚE]		yes
d.	*strong*	/RSE/	→	[ŔSE]	amphikinetic	yes
	weak	/RSÉ/	→	[RSÉ]		yes
e.	*strong*	/R_{PoA}ŚE/	→	[RŚE]	proterokinetic	no (cf. ŔSE)
	weak	/R_{PoA}ŚÉ/	→	[RŚE]		yes
f.	*strong*	/R_{PoA}SE/	→	[RŚE]	hysterokinetic	yes
	weak	/R_{PoA}SÉ/	→	[RSÉ]		yes

Given what has been presented about the realization of stress in PIE, there is no way to explain why stress falls on the root in the strong forms of proterokinetic nouns, and not on the suffix as it appears in table 4.1. When proterokinetic nouns are formed with the stem type RŚ or the stem type R_{PoA}Ś and an unaccented strong ending is attached, the BAP and the rankings given in table 3.1 predict the appearance of suffix stress. An explanation for the mysterious behavior of these nouns in strong form can be found by appealing to dominance. If the strong endings are dominant, they have the ability to produce otherwise unexpected results in the stem to which they attach, as demonstrated in §1.2 by the Tokyo Japanese affix that deletes underlying accent from stem, resulting in words without surface pitch accent, when underlying pitch accent is not normally deleted.

It is clear that the weak endings are recessive, because nouns inflected with weak endings are straightforwardly accounted for by the ranking of markedness and faithfulness constraints. All of the outputs for weak cases match the predicted weak form of the associated accent class. For example, in (c) and (e), even though the outputs do not correspond with the predicted accent class, the weak forms do correspond with what is expected of weak forms for proterokinetic nouns. It is the outcome of a stem and a strong ending that is not predicted by the same ranking of markedness and faithfulness constraints, and so in this chapter I will demonstrate how dominant affixes can be utilized to account for all four of the PIE accent classes.

4.1.1 Dominance in Optimality Theory

Dominance has been handled by a variety of ways in the literature. Pre-OT analyses have appealed to cyclicity (Halle and Vergnaud 1987a, b) or to ordered phonological levels (Halle and Mohanan 1985). Within OT, there are also varied approaches to dominance, including antifaithfulness constraints (Alderete 1999) and cophonologies (Inkelas 1996). Transderivational Antifaithfulness Theory (TAF) as created and defined by Alderete (1999) provides a powerful and compelling framework for handling dominance that maintains the parallelism of OT.

One of the major premises behind TAF is that dominance effects cannot be handled by the ranking of markedness and faithfulness constraints alone, suggesting that another type of constraint is needed. The fact that limiting CON (the universal set of constraints) to markedness and faithfulness constraints means that certain functions are non-computable (certain grammars cannot be created) is nothing new to the theoretical discussion surrounding OT (see Moreton 2004). In some ways, correspondence theory, which allows for independently rankable faithfulness constraints that compare strings on different correspondence relations, has been successful in allowing OT to define types of grammars that are known to exist (and cannot be defined with markedness and IO-faithfulness constraints alone). For example, with the addition of OO-faithfulness constraints, derived words can have marked structures and be unfaithful to the input in order to be faithful to the base from which they were derived.

Expanding the grammar from markedness and IO-faithfulness constraints to include faithfulness constraints on different correspondence strings is still not enough to be able to capture dominance effects. In summary, dominant affixes seem to defy faithfulness in that they specifically require the stem to which they attach to be unfaithful to a certain property. This is the insight behind Alderete's antifaithfulness constraints. An antifaithfulness constraint is satisfied when the output has (at least) one violation of the corresponding faithfulness constraint. Importantly, the antifaithfulness constraints operate on surface-surface correspondence relations (such as OO and Base-Reduplicant) and specifically not on the IO correspondence relation (Alderete 1999:134). The argument against the possibility of IO-antifaithfulness constraints appeals to typology – cross-linguistically, affixes are known to cause mutations in stems but roots do not cause the same types of mutations in affixes[21] (Alderete 1999, Inkelas 1996). By defining antifaithfulness on the OO correspondence relation, the prediction is made that dominance effects can only be manifested as a mutation in the base due to affixation (which is the premise of *strict base mutation* (Alderete 1999:

[21] It is certainly true that roots can condition certain changes in affixes, such as vowel harmony that is conditioned by the root. This type of change is different from a *mutation* in that it is motivated by markedness constraints. A mutation (as discussed in this section) is not motivated by markedness and often leads to a marked structure. The claim is thus that roots do not cause affixes to be realized unfaithfully unless this leads to the satisfaction of a higher-ranking markedness constraint. Dominant affixes, however, do cause roots to be realized unfaithfully even when unfaithfulness results in a marked structure.

150)). Moreton (2004) also presents evidence in favor of this argument. He predicts that, given certain limitations on the components and properties of the OT grammar, circular and infinite chain shifts should not exist as purely phonological phenomena because they cannot be computed by the OT grammar. Some examples of such chain shifts (specifically symmetrical metathesis and segmental exchange rules) are claimed by Alderete (1999) to exist as the result of antifaithfulness due to dominant morphology. Thus, if a circular chain shift does occur synchronically (i.e. /bad/→[bat] and /bat/→[bad]) it is always the result of morphology and never entirely phonological, suggesting antifaithfulness constraints should operation on the surface-to-surface correspondence relations (which are morphology-sensitive) but not the IO correspondence relation.

Descriptively, the strong cases of the PIE athematic nouns could result from antifaithfulness triggered by the dominant endings. A constraint that requires the deletion of accent from the stem, along the lines of Alderete's (1999: 9) ¬OO-MAX(Accent)[22], would explain the position of accent in the strong cases. For example, if a dominant affix could delete the accent on the suffix in proterokinetic nouns (underlying form = /RŚ/), surface stress would appear on the root, as predicted by ALIGNL, and as seen in the strong forms for proterokinetic nouns.

(54) ¬OO-MAX(Accent)
An output has (at least) one accent a_o that has no correspondent a_b in the base.
Assign a * if every a_o has a correspondent.

Theoretically, however, TAF is incompatible with accent in PIE nouns because the antifaithfulness constraints (like the one defined in (54)) are unable to operate on the IO correspondence relation. In PIE nouns, inflectional endings are added to a stem which is

[22] The symbol used in logic for *not* (¬) is used to denote an antifaithfulness constraint. Thus, OO-MAX(Accent) is a faithfulness constraint and ¬OO-MAX(Accent) is the corresponding antifaithfulness constraint.

never a well-formed word, i.e. an output. For this reason, OO antifaithfulness constraints cannot be invoked to explain the accent alternations that appear between strong and weak forms because there is no output from which an accent can be deleted. It is also not desirable to say that the dominant affixes trigger a deletion of underlying structure through antifaithfulness constraints, as this would assume the existence of IO antifaithfulness constraints.

There is a promising theoretical framework in which members of an inflectional paradigm stand in a correspondence relation with one another. According to Optimal Paradigms theory (OP) (McCarthy 2005) all members of an inflectional paradigm are evaluated simultaneously as candidate sets and a new correspondence relation is defined that compares every paradigm member to every other paradigm member. Specifically, the stem of each member of an inflectional paradigm is compared to every other stem via OP faithfulness constraints. McCarthy furthermore notes that OP is one of many theories designed "to account for surface resemblances among morphologically related words (p. 170)," which makes OP a theory that can account for *paradigm leveling* (see Morris 2005 for application of OP to leveling in Old Spanish). OP is thus appealing in its use of a correspondence relation that compares members of an inflectional paradigm (like the PIE athematic nouns) but was not developed with intention of explaining (and is thus not equipped to explain) differences among members of such a paradigm that are attributable to the inflectional affixes.

4.2 The ¬OP Model

I would like to remedy the theoretical problems just discussed by proposing a new type of antifaithfulness constraint: the ¬OP constraint. The ¬OP constraints are based on

McCarthy's OP model and Alderete's insight that dominance is manifested through forcing a violation of a particular faithfulness constraint. The OP model as defined by McCarthy is shown in the table below, along side the new ¬OP model. Explanation and discussion follows.

Table 4.2: OP and ¬OP Models for Inflectional Paradigms

OP model (McCarthy 2005:173-4)	¬OP model
"a. Candidates consist of entire inflectional paradigms, where an inflectional paradigm contains all and only the words based on a single lexeme.	a'. same as (a)
"b. Markedness and input-output faithfulness constraints evaluate all members of the candidate paradigm. The violation-marks incurred by each paradigm member are added to those incurred by all the others.	b'. same as (b)
"c. The stem (output form of the shared lexeme) in each paradigm member is in a correspondence relation $\Re_{OP}$ with the stem in every other paradigm member.	c'. The stem in each paradigm member that is formed with a dominant affix is in a correspondence relation $\Re_{\neg OP}$ with the stem in each paradigm member that is formed with a recessive affix.
"d. There is a set of output-output faithfulness constraints on the $\Re_{OP}$ correspondence relation."	d'. For every faithfulness constraint on the $\Re_{OP}$ correspondence relation, there is a corresponding antifaithfulness constraint on the $\Re_{\neg OP}$ correspondence relation.

One of the important innovations of OP is that multiple candidates are generated simultaneously, as stated in (a). The input consists of a stem (shared lexeme(s)[23]) plus any affix that inflects that stem. Candidates are then generated for each stem + affix combination. Because multiple candidates are evaluated simultaneously, markedness and faithfulness constraints evaluate each member with any incurred violations being added

[23] In McCarthy (2005), the term lexeme is never used in the plural form. However, because the PIE stem is composed of more that one morpheme, it is applicable to use the plural here. I do not think that this goes against any theoretical claims made by Optimal Paradigms theory, but rather that the singular *lexeme* was consistently used because the stems that were considered in that paper were monomorphemic. Thus, it is unproblematic if stems consist of more than one lexeme, as most do in PIE. Note, though, that any stem-internal morphological processes are considered derivational and are thus not analyzable with the OP/¬OP model.

together (point (b)). A new correspondence relation is then defined in (c), which relates each stem to every other stem. Any faithfulness constraints can then apply to the OP correspondence relation (point (d)), which compares the *output* of each stem to the *output* of every other stem. The OP correspondence relation differs from the OO correspondence relation in that uninflected stems of inflectional paradigms need not be outputs in the language. For example, if a language contains the two inflected forms [petuni] and [petulo] that each share the lexeme /petu/ and [petu] is not an output in the language, there is nothing for [petuni] and [petulo] to stand in an OO correspondence relationship with. However, the stem – [petu] – of both outputs does stand in a bidirectional OP correspondence relationship.

It is also important that the OP model is defined for the process of inflection, and is thus not applicable to derivation. Inflected words that have the same stem form paradigms. As McCarthy argues (2005:174), every member of the paradigm is on equal footing as compared to every other member – no member is more basic than another member and thus no member serves as the base for another member. Transderivational Correspondence Theory, with its base-priority, is still a preferred framework for handling derivation, where there is a hierarchical relationship between a derived word and its base. Once again the distinction between suffixes and endings in PIE is made clear through formalisms. Suffixes are derivational and do not attach to stems that can be compared through OP constraints. Furthermore, because suffixes attach to bound roots, primarily derived stems cannot be compared to the base (the root) through OO constraints (because the root is not an output), nor can derivational suffixes trigger antifaithfulness constraints (on the OO or OP correspondence relation). Nothing in the data under discussion here contradicts these predictions. Inflectional endings, on the other hand, attach to stems that are organized into paradigms, and thus the outputs of these members are able to influence each other.

Before discussing the ¬OP model, I will illustrate the OP constraints with two hypothetical mini-grammars, each consisting of the ranking ONSET » IO-DEP[24], a ranking that generally ensures syllables will have onsets even if a segment has to be epenthesized to create the onset. In the grammar of language A, as demonstrated in (56), the constraint requiring syllables to have onsets – ONSET – dominates the OP constraint against epenthesis – OP-DEP. This results in a language with allomorphy, where a segment is inserted in order to avoid syllables without onsets. In the grammar of language B (shown in (57)), OP-DEP dominates ONSET. This language rules out allomorphy at the expense of onsetless syllables, even though the language would generally prefer epenthesis over onsetless syllables. Thus, through the reduction of allomorphy, OP constraints, when ranked highly enough to do work in a language, successfully explain similarities among morphologically related words. The ranking of markedness and IO-faithfulness alone would not be able to produce language B – a language with epenthesis to fix an ONSET violation unless the epenthesis would result in allomorphy in an inflectional paradigm. Furthermore, OO-faithfulness constraints would not be able to account for language B because there would be no output [ta] for the inflected outputs to be faithful to.

(55) OP-DEP
Do not insert segments into any member of an inflectional paradigm.
Every segment s_n in a member of an inflectional paradigm should have a correspondent in every other member.
Assign a * for each s_n that has no correspondent in any particular member of an inflectional paradigm.

[24] ONSET and IO-DEP are defined in (2) and (3).

(56) Language A

	/ta/ + {a, te, i, na}	ONSET	OP-DEP	IO-DEP
a	☞ ‹taʔa, tate, taʔi, tana›		****	**
b	‹ta.a, tate, ta.i, tana›	**!		

(57) Language B

	/ta/ + {a, te, i, na}	OP-DEP	ONSET	IO-DEP
a	☞ ‹ta.a, tate, ta.i, tana›		**	
b	‹taʔa, tate, taʔi, tana›	****!		**

Just as the OP faithfulness constraints explain otherwise inexplicable similarities among members of an inflections paradigm, the newly proposed ¬OP antifaithfulness constraints will explain otherwise inexplicable alternations between two specific sets of members in an inflectional paradigm – those members inflected with a dominant affix and those members inflected with a recessive affix.

The innovations of the ¬OP model (as defined in table 4.2) are the definition of a new correspondence relation and the creation of antifaithfulness constraints applicable to that correspondence relation. Point (c) of the OP model sets up a bidirectional correspondence relation between each and every member of an inflectional paradigm, as illustrated below in (58a). The ¬OP correspondence relation is unidirectional, as shown in (58b). It relates an output that was created with an inflectional affix that is lexically specified as dominant to the outputs that share the same stem but were formed with an inflectional affix that is not lexically specified as dominant (i.e. a recessive affix). One of the advantages of the OP constraints being bidirectional (and thus one of the major innovations of the OP model) is that there is no priority given to any member of the inflectional paradigm. Other output-output constraints (i.e. OO constraints) give priority to the base – the base can affect derivatives but derivatives cannot affect the base. Base-priority is a well-motivated aspect of

Benua's (1997: 37) Transderivational Correspondence Theory (TCT), but it is not applicable to inflectional paradigms where it is hard to identify a base, i.e. an output form that is primary or basic in some way.

(58) a. OP correspondence relation

$$\begin{tikzcd}
\underline{\text{stem}}\text{-aff}_{\text{dom}} \arrow[r, leftrightarrow] \arrow[d, leftrightarrow] \arrow[dr, leftrightarrow] & \underline{\text{stem}}\text{-aff}_{\text{dom}} \arrow[d, leftrightarrow] \arrow[dl, leftrightarrow] \\
\underline{\text{stem}}\text{-aff}_{\text{rec}} \arrow[r, leftrightarrow] & \underline{\text{stem}}\text{-aff}_{\text{rec}}
\end{tikzcd}$$

b. ¬OP correspondence relation

$$\begin{tikzcd}
\underline{\text{stem}}\text{-aff}_{\text{dom}} \arrow[d] \arrow[dr] & \underline{\text{stem}}\text{-aff}_{\text{dom}} \arrow[d] \arrow[dl] \\
\underline{\text{stem}}\text{-aff}_{\text{rec}} & \underline{\text{stem}}\text{-aff}_{\text{rec}}
\end{tikzcd}$$

However, ¬OP constraints do give priority to specific stems – those that are inflected with recessive affixes. The antifaithfulness constraints could not be formulated any other way because they are only triggered by lexically specified morphemes. The nature of antifaithfulness constraints is that they require a violation of a faithfulness constraint, and such a violation is only required when certain morphemes exist in the input. If antifaithfulness constraints were bidirectional, there would be no way for the lexicon to specify which morphemes trigger the constraints. For example, suppose a language has an inflectional paradigm with the inputs used above in (56&57), such that the stem /ta/ is combined with the affixes /a/, /te/, /i/ and /na/. Furthermore, suppose that one of the affixes (/i/) is lexically specified as dominant and thus triggers the constraint ¬OP-DEP, which requires the insertion of a segment and which dominates OP-DEP, yielding the outputs [ta.a], [tate], [taʔi], [tana]. With a bidirectional ¬OP constraint, the competing outputs [taʔa], [tate], [ta.i], and [tana] tie the predicted winners, because this type of ¬OP constraint is not sensitive to the lexical indication of dominance (which is the original motivating factor for ¬OP constraints).

(59) ¬OP constraint applied to bidirectional correspondence relation

	/ta/ + {a, te, i_{dom}, na}	¬OP-DEP	OP-DEP
a	‹ta.a, tate, taʔi, tana›	***	***
b	‹taʔa, tate, ta.i, tana›	***	***

The problem introduced by the above tableau is solved when the ¬OP constraints work as specified in table 4.2, operating unidirectionally, only triggered by dominant affixes, and giving preference to outputs formed without dominant affixes, as shown in (60)

(60) ¬OP constraint on unidirectional correspondence relation

	/ta/ + {a, te, i_{dom}, na}	¬OP-DEP	OP-DEP
a	☞ ‹ta.a, tate, taʔi, tana›		***
b	‹taʔa, tate, ta.i, tana›	*!	***
c	‹ta.a, tate, ta.i, tana›	*!	

(61) ¬OP-DEP » OP-DEP

As the tableau in (60) demonstrates, ¬OP-DEP must dominate OP-DEP in order to produce visible dominance effects in a language. Thus it is the case that any ¬OP constraint that does work in a language must dominate the corresponding OP constraint. This is also the case with antifaithfulness constraints on the OO correspondence string – they must dominate corresponding OO-faithfulness constraints (Alderete 1999).

The above tableau also demonstrates that ¬OP constraints can successfully explain dissimilarities in inflectional paradigms. Given only markedness and faithfulness constraints, the grammar represented in (60) could not be produced. If OP- and IO-DEP dominated ONSET, the winning candidates would be ‹ta.a, tate, ta.i, tana›. If ONSET dominated the faithfulness constraints, the winning candidates would be ‹taʔa, tate, taʔi, tana›. The best way to explain the appearance of the glottal stop (or any other epenthesized consonant) in the one candidate in the winning set in the tableau in (60) is through a dominant affix.

4.3 Analysis of Strong Cases

It will now be necessary to define and discuss ¬OP constraints and their relevance for the strong forms if PIE athematic nouns. Each of the faithfulness constraints defined for the IO correspondence relation in §3.2 are defined for the OP and ¬OP correspondence relation below. There are thus three ¬OP constraints that could potentially account for the appearance of stress on the root in strong forms of proterokinetic nouns. They are ¬OP-DEP(A), which requires the stem of a dominant form to have an accent that is not present in the stems of recessive forms, ¬OP-MAX(A), which requires the stem of a dominant form to be lacking an accent that is present in the stems of the recessive forms, and ¬OP-NOFLOP(A), which requires the stem of a dominant form to contain an accent that does have a correspondent in the recessive forms such that the segment linked to the accent in the dominant form is not a correspondent of the segment linked to the accent in the recessive forms. These constraints are defined below, following the definition of the corresponding OP constraint. The OP constraints compare each member of the paradigm to each other member and assign violation-marks as directed. The ¬OP constraints compare each member inflected with a dominant affix to each member inflected with a recessive affix and assign violation-marks as directed.

(62) OP-DEP(A)
Do not insert an accent into any member of an inflectional paradigm.
Every accent a_n in a member of an inflectional paradigm should have a correspondent in every other member.
Assign a * for each a_n that has no correspondent in any particular member of an inflectional paradigm.

(63) ¬OP-DEP(A)
Insert an accent into the stem of a member of an inflectional paradigm that is created with a dominant affix (as compared to a member of the same paradigm formed with a recessive affix).
There should be one accent a_n in the stem of a word inflected with a dominant affix that does not have a correspondent in the stems of words inflected with recessive affixes.
Assign a * if this is not the case.

(64) OP-MAX(A)[25]
Do not delete an accent from any member of an inflectional paradigm.
Every accent a_n in a member of an inflectional paradigm should have a correspondent in every other member.
Assign a * for each a_n that has no correspondent in any particular member of an inflectional paradigm.

(65) ¬OP-MAX(A)
Delete an accent from the stem of a member of an inflectional paradigm that is created with a dominant affix (as compared to a member of the same paradigm formed with a recessive affix).
There should be one accent a_n in the stem of words inflected with recessive affixes that does not have a correspondent in the stem of a words inflected with dominant affix.
Assign a * if this is not the case.

(66) OP-NOFLOP(A)
Do not shift accent in any member of an inflectional paradigm.
For every accent a_n in a member of an inflectional paradigm that is linked to a segment s_n, if a_n has a correspondent, this correspondent should be linked to the correspondent of s_n in any other member of the inflectional paradigm.
Assign a * if this is not the case.

(67) ¬OP-NOFLOP(A)
Shift accent in some member of an inflectional paradigm.
There should be one accent a_n such that a_n has a correspondent and that a_n and its correspondent are linked to non-corresponding segments.
Assign a * if this is not the case.

Because OP and ¬OP constraints, by definition, only relate stems to other stems, I will not give them the subcategorizations of root-faith and derivational-faith as with the IO-

[25] It is interesting that OP-DEP(A) and OP-MAX(A) assign violation-marks in the same way – to any accent that does not have a correspondent. This is a result of the bidirectional correspondence relation. If one member of the candidate set has an inserted accent, an accent has necessarily been deleted from another member. Despite the fact that these two faithfulness constraints are identical, the corresponding antifaithfulness constraints are not identical.

faithfulness constraints. I do not at this point rule out the theoretical possibility that these constraints could need these distinctions, but this will not be necessary or considered in more detail here.

4.3.1 Proterokinetic Nouns: Dominant Affixes Cause Mutation in Stem

We know that the surface forms of the proterokinetic paradigm have stress on the root in the strong forms and stress on the suffix in the weak forms. We also know that the antifaithfulness constraints will be necessary to explain why strong forms receive root stress, because, assuming the only difference between strong and weak endings is one of accent specification, the grammar of markedness and faithfulness constraints predicts suffix stress. There are two different structures that could correspond to the surface forms of these nouns in strong cases. It is possible that the inherent accent on the suffix is deleted and a new accent is inserted on the root in strong forms, which would create an output that satisfies ¬OP-DEP and ¬OP-MAX. It is also possible that the inherent accent on the suffix is flopped to the root in strong forms, and this would create an output that satisfies ¬OP-NOFLOP. There is actually no way to tell which strategy applies to the PIE nouns – both are consistent with the outcomes of the four accent classes. For this reason I will first present an analysis in which the key constraint is ¬OP-NOFLOP. I will then show how the analysis that makes use of ¬OP-NOFLOP can easily be amended if the important constraints are ¬OP-DEP and ¬OP-MAX.

The tableau below shows a winning candidate set in which the accent has flopped from the suffix to the root in strong forms and remains on the suffix in weak forms when given an input of the proterokinetic type RŚ. In order for this candidate set to win, ¬OP-NOFLOP(A) must dominate any NOFLOP(A) faithfulness constraint, as stated in (69). This is the type of ranking that is expected whenever antifaithfulness constraints do work in a language – the particular antifaithfulness constraint must dominate all corresponding general faithfulness constraints, but not all corresponding positional faithfulness constraints. Additionally, the other ¬OP constraints – ¬OP-DEP(A) and ¬OP-MAX(A) – must be dominated by either ¬OP-NOFLOP(A) or one of the DEP(A) or MAX(A) faithfulness constraints. Any antifaithfulness constraint that doesn't do work in a language must be crucially dominated – by at least one corresponding faithfulness constraint or by another antifaithfulness constraint. This yields a grammar in which dominance can be realized through the satisfaction of the high-ranking antifaithfulness constraint, in this case – ¬OP-NOFLOP(A).

(68) proterokinetic noun (type RŚ): 'thought' *nom, acc, gen sg* (stems are underlined and strong forms are in bold)

	/men-té^{1}y/ + {s$_{dom}$, m$_{dom}$, és$_{rec}$ …}	¬OP-NOFLOP(A)	OP-NOFLOP(A)	¬OP-DEP(A)	OP-DEP(A)	¬OP-MAX(A)	OP-MAX(A)	NOFLOP(A)$_{deriv}$	NOFLOP(A)	MAX(A)$_{deriv}$	MAX(A)	ALIGNL	DEP(A)$_{root}$	DEP(A)
a	☞ <**mé^{1}ntis**, **mé^{1}ntim**, mn̥té^{1}ys>		** **	**		**		**	**			*		
b	<**mn̥té^{1}ys**, **mn̥té^{1}ym̥**, mn̥té^{1}ys>	** !		**		**						***		
c	<**mé^{2}ntis**, **mé^{2}ntim**, mn̥té^{1}ys>	** (!)			** (!)		** (!)			** (!)	** (!)	*	** (!)	** (!)

(69) candidate (b): ¬OP-NOFLOP(A) » OP-NOFLOP(A), NOFLOP(A)$_{deriv}$
candidate (c): {¬OP-NOFLOP(A), OP-DEP(A), OP-MAX(A), MAX(A)$_{deriv}$, MAX(A), DEP(A)$_{root}$, DEP(A)} » ¬OP-DEP(A)
{¬OP-NOFLOP(A), OP-DEP(A), OP-MAX(A), MAX(A)$_{deriv}$, MAX(A), DEP(A)$_{root}$, DEP(A)} » ¬OP-MAX(A)

The above tableau demonstrates how the OP and ¬OP constraints work when candidates are evaluated simultaneously for all members of the inflectional paradigm (though only three members of the paradigm are shown in the tableau). This type of evaluation creates a more complex tableau that risks obscuring important information. For this reason, and because the necessary constraints for our purposes are the ¬OP constraints, which relate only one candidate to other output forms, I will ignore the OP constraints in future tableaux and consider candidates for only one input at a time. I believe the above tableau is sufficient for the purposes of showing how ¬OP and OP constraints work with multiple candidate evaluation and that a ¬OP constraint that produces visible effects in a language must dominate its corresponding OP constraint. At this point, it is more important that the information presented in a tableau is easily accessible than to illustrate the evaluation of multiple candidates. The output of the stem in weak form, i.e. the winner in a tableau in chapter 3, will be shown in the bottom left block of each tableau as a representation of the recessive candidates that the dominant candidates are being compared to through the ¬OP constraints.

The tableau in (70) shows how the grammar works for proterokinetic nouns of type R_{PoA}Ś. No new rankings are motivated in this tableau. Even with the post-accenting root, this type of noun behaves just like the other type of proterokinetic noun – the high-ranking ¬OP- NOFLOP(A) forces the accent to move to the root.

(70) proterokinetic noun (type $R_{PoA}\acute{S}$)

		$/R_{PoA}\acute{S}^1E_{dom}/$	¬OP-NOFL(A)	¬OP-MAX(A)	¬OP-DEP(A)	MAX $(A)_{deriv}$	MAX(A)	NOFL$(A)_{deriv}$	NOFL(A)	POSTACC	ALIGNL	DEP $(A)_{root}$	DEP (A)
$R\acute{S}^1$	a	☞ $\acute{R}^1SE$		*	*			*	*	*			
	b	$R\acute{S}^1E$	*!	*	*						*		
	c	$\acute{R}^2SE$	*(!)			*(!)	*(!)			*		*(!)	*(!)

4.3.2 Amphikinetic and Hysterokinetic Nouns: Alignment Constraints Control Placement of Stress

It will now be important to consider how the grammar with a high-ranking ¬OP-NOFLOP(A) will work for inputs associated with accent classes in which dominance is not necessary to account for the expected outputs. While dominance is not necessary, it will have to be compatible. That is, given a high-ranking antifaithfulness constraint, these outputs will either need to satisfy this constraint or satisfy a higher-ranking constraint. Another possible scenario, as discussed below, occurs when there is no way to satisfy the high-ranking ¬OP constraint, and so all potential candidates will equally violate it.

The amphikinetic (type RS) nouns in strong cases are the only inflected nouns in which there is no underlying accent and no post- or pre-accenting morphemes. We know that, even given an underlying representation with no accent, the PIE output will need to have stress somewhere. This means a DEP(A) violation is necessary if given an input with no underlying accent, as shown in the following tableau in (71). What is interesting here is that the highest-ranking DEP(A) constraint – DEP$(A)_{root}$ – incurs a violation in the winning candidate. Thus, the losing candidate must violate a higher-ranking constraint. This constraint is ALIGNL, and the behavior of amphikinetic nouns in strong cases motivates this as a constraint that does work in PIE. Recall that while the winning candidate for any acrostatic noun in weak form satisfies this constraint, it was not necessary to account for the weak acrostatic nouns (as discussed in §3.2)

(71) amphikinetic noun (type RS)

		/RSE$_{dom}$/	¬OP-NoFlop(A)	¬OP-Max(A)	¬OP-Dep(A)	AlignL	Dep(A)$_{root}$	Dep(A)$_{deriv}$	Dep(A)
RS	a	☞ ŔSE	*	*			*		*
	b	RŚE	*	*		*!		*	*
	c	RSÉ	*	*	*(!)	*(!)			*

(72) candidate (b): AlignL » Dep(A)$_{root}$

The above tableau is very important for the ranking it motivates, as seen in (72). In chapter 3, the tableau in (39) told us that Dep(A), Dep(A)$_{root}$ or Max(A) must dominate AlignL. Now that the ranking of AlignL » Dep(A)$_{root}$ has been motivated, the weak amphikinetic nouns can only be explained by the ranking of Max(A) » AlignL » Dep(A)$_{root}$. Also note in the above tableau that, given the stems of the weak forms with no accent, there is no possible candidate that will satisfy ¬OP-NoFlop(A). This means that, even if the antifaithfulness constraint is undominated, its use to explain the proterokinetic nouns is still compatible with the outputs of amphikinetic nouns.

There is another important ranking that can be motivated by looking at the hysterokinetic nouns (type R$_{PoA}$S). Again, the output of these nouns is not dependent on antifaithfulness and the stem of the weak form is devoid of stress, meaning there is no way for a candidate to satisfy ¬OP-NoFlop(A). Candidate (b) yields the ranking shown in (74).

(73) hysterokinetic noun (type $R_{PoA}S$)

		/$R_{PoA}SE_{dom}$/	¬OP-DEP(A)	¬OP-MAX(A)	¬OP-NOFL(A)	POSTACC	ALIGNL	DEP(A)$_{root}$	DEP(A)$_{deriv}$	DEP(A)
RS	a	☞ RŚE		*	*		*		*	*
	b	ŔSE		*	*	*!		*		*
	c	RSÉ	*(!)	*	*	*(!)	*			*

(74) candidate (b): POSTACCENT » ALIGNL

This ranking allows for a significant expansion of the known rankings that were presented at the end of chapter 3, as demonstrated below in (75). The constraints OP-NOFLOP(A), ¬OP-MAX(A), and ¬OP-DEP(A) are minimally dominated by ¬OP-NOFLOP(A), which is demonstrated by the dashed line. This constraint-ranking expresses a grammar in which dominance is realized by the flopping of accent, at the expense of constraints against flopping. Furthermore, deletion and flopping are never tolerated in order to satisfy alignment constraints (though insertion is). It is more important to place stress as dictated by pre- and post-accenting morphemes than to have leftmost stress.

(75)

MAX(A)$_{root}$ NOFLOP(A)$_{root}$ ¬OP-NOFLOP(A)

MAX(A)$_{deriv}$ NOFLOP(A)$_{deriv}$ OP-NOFLOP(A), ¬OP-MAX(A), ¬OP-DEP(A)

MAX(A) NOFLOP(A)

PREACCENT POSTACCENT

ALIGNL

DEP(A)$_{root}$

DEP(A)$_{deriv}$

DEP(A)

A brief digression is appropriate at this time. The tableaux presented in this chapter so far have assumed unaccented strong endings. As discussed in §2.4.2, there is no reason to suppose that strong endings are underlyingly accented (and the underlying representations of strong endings likely do not contain a segment capable of bearing stress). However, if any strong endings are indeed underlyingly accented, this would not detract from my analysis. Consider the tableau below, which, like (71), represents amphikinetic nouns, but, unlike (71), assumes an accented ending. The appropriate candidate still wins, though there is no way to determine if accent has been flopped from the ending or deleted from the ending and inserted onto the root. If (a) is the true winner, ¬OP-DEP(A) must dominate NOFLOP(A), and if (b) wins, ¬OP-DEP(A) must dominate MAX(A).

(76) amphikinetic noun (type RS), assuming an accented dominant ending

		/RSÉ$^1_{dom}$/	¬OP-NoFlop(A)	¬OP-Max(A)	¬OP-Dep(A)	NoFlop(A)	Max(A)	AlignL	Dep(A)$_{root}$
RS	a	☞ Ŕ^{1}SE	*	*		*			
	b	☞ Ŕ^{2}SE	*	*			*		*
	c	RSÉ^1	*	*	*!			*	

(77) if candidate (a) wins: ¬OP-Dep(A) » NoFlop(A)
if candidate (b) wins: ¬OP-Dep(A) » Max(A)

Thus if any strong endings are indeed underlyingly accented, they will still never surface with stress, given the ranking in (77). I will continue to assume unaccented strong endings for simplicity, and because this yields the most harmonic underlying representation. Note, though, that in theory PIE can have accented dominant, unaccented dominant, and accented recessive endings. It is clear that athematic nouns are not inflected with any unaccented recessive endings, and this must be considered a lexical gap.

4.3.3 Acrostatic Nouns: Underlying Root Accent Always Surfaces

The amphikinetic and hysterokinetic nouns are unable to satisfy ¬OP-NoFlop(A) because there is no stress on the stem of the weak forms. The acrostatic nouns are unique that there is stress on the stem (specifically on the root) in the weak forms, and there is also stress on the root in strong forms. These nouns thus present the only case where a constraint must dominate ¬OP-NoFlop(A) in order to explain the surface forms of the strong cases. As shown in the tableau in (78) and (80), these nouns can be accounted for through the positional faithfulness constraints that are linked to roots. If NoFlop(A)$_{root}$ dominates ¬OP-NoFlop(A)as shown in (79), accent is never flopped from the root even in strong forms. It is thus more important to realize root accent than to realize a dominant affix. The tableau in (81) explicitly shows that MAX(A)$_{root}$ dominates MAX(A)$_{deriv}$, which was assumed in chapter 3 as a result of theoretical discussion, but is now demonstrated with a direct ranking. This tableau also tells us that ¬OP-MAX(A) and ¬OP- DEP(A) are minimally dominated by MAX(A)$_{deriv}$, meaning they are ranked lower than was shown in (77) above.

(78) acrostatic noun (type ŔS)

		/Ŕ^{1}SE$_{dom}$/	MAX(A)$_{root}$	NOFL(A)$_{root}$	¬OP- NOFL(A)	¬OP-MAX(A)	¬OP- DEP(A)	NOFL(A)$_{deriv}$	NOFL(A)	MAX(A)$_{deriv}$	MAX(A)	ALIGNL	DEP(A)$_{deriv}$	DEP(A)
	a	☞ Ŕ^{1}SE			*	*	*							
ŔS	b	RŚ^{1}E		*!		*	*	*	*			*		
	c	RŚ^{2}E	*(!)		*					*(!)	*(!)	*	*	*

(79) candidate (b): NOFL(A)$_{root}$ » ¬OP- NOFL(A)

(80) acrostatic noun (type ŔŚ)

		/ Ŕ^{1}Ś^{2}E$_{dom}$/	MAX(A)$_{root}$	¬OP-DEP(A)	¬OP-MAX(A)	¬OP-NOFL(A)	MAX(A)$_{deriv}$	MAX(A)	ALIGNL
Ŕ^{1}S	a	☞ Ŕ^{1}SE		*	*	*	*	*	
	b	RŚ^{2}E	*!			*		*	*

(81) MAX(A)$_{root}$ » MAX(A)$_{deriv}$
{MAX(A)$_{root}$, ALIGNL} » ¬OP-DEP(A)
{MAX(A)$_{root}$, ALIGNL} » ¬OP-MAX(A)

The constraint ranking with respect to accent in athematic nouns is now fully developed. The above tableaux have supplied the missing pieces by indicating the privileged status of roots. The only time the important antifaithfulness constraint is violated (when there are possible candidates that could satisfy it) is when its satisfaction would lead to flopping root accent. This yields a constraint-ranking as shown in (82) (OP-NoFlop(A), ¬OP-Max(A), and ¬OP-Dep(A) are not shown as no specific ranking can be determined for them – they are minimally dominated by ¬OP-NoFlop(A)). Because the root is the only position that is privileged enough demand faithfulness, even at the cost of not realizing dominance with respect to accent, this is the only position in which a paradigm can have fixed stress. Given the ranking in (82), there is no input that would yield outputs with fixed stress on the suffix (i.e. *mesostatic*) or on the ending.

(82)

		NoFlop(A)$_{root}$
	Max(A)$_{root}$	¬OP-NoFlop(A)
	Max(A)$_{deriv}$	NoFlop(A)$_{deriv}$
	Max(A)	NoFlop(A)
PreAccent	PostAccent	
	AlignL	
	Dep(A)$_{root}$	
	Dep(A)$_{deriv}$	
	Dep(A)	

As stated above, there is no way to determine if dominance is realized through flopping or through deletion/insertion. The above analysis has assumed that dominance is realized through flopping. If this is not the case, and dominance is realized through deletion/insertion (i.e. the constraint ¬OP-Max(A) or ¬OP-Dep(A) is responsible for the dominance effects), the general framework of the above ranking remains unchanged.

Essentially, either ¬OP-MAX(A) or ¬OP-DEP(A) dominate $\text{MAX(A)}_{\text{deriv}}$ and are dominated by $\text{MAX(A)}_{\text{root}}$. The antifaithfulness constraint ¬OP-NOFLOP(A) must be dominated by some corresponding faithfulness constraint, and of course OP-MAX(A) and OP-DEP(A) are dominated by the corresponding antifaithfulness constraints. The tableaux that demonstrate this are in shown in Appendix B, but there is no need to run through them here. The conclusion is that no matter what antifaithfulness constraint is responsible for the accent alternations in proterokinetic nouns, this constraint must dominate a positional faithfulness constraint for derivational affixes and it must be dominated by a positional faithfulness constraint for roots.

4.4 Summary

In the last two chapters, each of the four accent classes has been accounted for with a constraint ranking that utilizes a new type of constraint – the ¬OP constraint – in order to capture dominance effects.

The acrostatic nouns display consistent root stress because the roots are underlyingly accented and the grammar does not tolerate the deletion or flopping of root accent. For this reason, the suffixes of acrostatic nouns can either be accented or unaccented, which means that given no other evidence, there is no way to tell if a specific suffix that occurs in an acrostatic noun is accented or unaccented. If a root noun is underlyingly accented, it will always display stress on the root as well, and thus both root nouns and derived nouns can be considered acrostatic if the root is underlyingly accented.

The amphikinetic nouns are formed with stems that have no underlying accent. Thus, when an accented recessive ending is added, it receives stress. When an unaccented dominant ending is added, stress falls on the root in accord with ALIGNL, which dictates the default position for stress. When an amphikinetic noun takes the null locative singular that creates the holokinetic accent class, stress occurs on the suffix. This is explained by the alignment constraint that is triggered by the pre-accenting null suffix. Holokinetic nouns are thus a subset of amphikinetic nouns that are created by the existence of a pre-accenting ending. Root nouns with alternating stress are also to be considered amphikinetic because the stress alternation results from the lack of underlying accent on the root. Thus, amphikinetic nouns are defined by stems (either a root plus suffix or just a root) that are composed of unaccented morphemes.

It is necessary for the hysterokinetic nouns to have post-accenting roots because these are the only nouns in which stress never falls on the root. The hysterokinetic nouns are formed with unaccented suffixes, which means that in a sense they are like the amphikinetic nouns – devoid of underlying accent in the stem. The difference between these two accent classes is that the post-accenting root of the hysterokinetic noun prevents stress from occurring on the root in strong form.

It was mentioned in §1.1 that Kim (2002) accounts for the hysterokinetic nouns through morpheme reanalysis. Though this is not a tenable solution for all hysterokinetic nouns, there are some nouns of this type where the root and suffix may not have been separate morphemes during the synchronic state of PIE that I am analyzing. The analysis presented here is still compatible with words such as 'father' *ph$_2$ter- where it is quite possible that the root and suffix had fused into one morpheme. In such cases, the word can no longer be said to be composed of a post-accenting root and unaccented suffix. Instead, it seems that these words behave like amphikinetic root nouns. The stem is a monomorphemic unit that is underlyingly unaccented. There is no reason to posit an underlying representation with two vowels (i.e. peh$_2$ter) because the first vowel (which never appears in surface forms of the noun) would likely not occur in an underlying representation after the reanalysis took place. Thus, the dimorphemic combination *peh$_2$-ter- becomes the monomorphemic *ph$_2$ter. Since this new "root" is underlyingly unaccented, the root vowel (i.e. *ph$_2$t<u>e</u>r) receives stress in the strong forms and the ending receives stress in the weak forms just like amphikinetic root nouns.

The proterokinetic nouns are formed with stressed suffixes. Their roots are either unaccented or post-accenting. The suffix receives stress in weak cases because it is more important to realize accent that is associated with a morpheme that possesses head properties (the suffix) than one that doesn't (the ending). The dominant strong endings require an accent flop (or an accent insertion/deletion) in the stem, which is why the suffix is not stressed in the strong forms.

Chapter Five

Discussion and Conclusions

In this chapter I will discuss the remaining issues associated with the topic of accent in PIE athematic nouns, implications for future work in the study of IE linguistics and general phonology, and present final conclusions. In §5.1, I will first discuss how ablaut in acrostatic nouns can be linked to dominance. I will then explain how the analysis presented here will be important for future work on the subject of accent in IE languages in §5.2. This section will include discussion on the topic of internal derivation in athematic nouns, the general system of accent in PIE, and the evolution of accent in daughter languages. I will discuss the implications of this analysis for the field of phonology in §5.3 and provide final conclusions in §5.4.

5.1 Ablaut and Dominance

In §2.3, it was stated that ablaut in athematic nouns is a directly related to accent. The alternation between full and zero-grade is certainly conditioned by accent. Due to the ranking shown in (26) in §3.1.2, when non-high vowels do not receive stress, they are deleted. Thus, this type of ablaut is predictable and is based on accent class. Another type of ablaut – the alternation between o-grade and e-grade or between full-grade ([e]) and lengthened-grade ([e:]) – seems to be predictable based on accent class as well because it only occurs in roots in acrostatic nouns. In this section I will argue that dominance can also account for this type of ablaut as it is found in acrostatic nouns.

There are two ¬OP constraints that would predict this type of ablaut to occur. The constraint ¬OP-ID[back] is satisfied when a member of an inflectional paradigm that is inflected with a dominant affix has some vowel that has a different value for the feature [±back] than its correspondent. The constraint ¬OP-ID[long] is satisfied when a member of an inflectional paradigm that is inflected with a dominant affix has some vowel that disagrees with its correspondent in terms of length.

(83) ¬OP-IDENT[back]
A segment in a member of an inflectional paradigm that is created with a dominant affix does not agree with its correspondent with respect to the feature [±bk]
There should be one segment s_n in the stem of a word inflected with a dominant affix such that if s_n is [λback], there is a correspondent of s_n that is [-λback].
Assign a * if this is not the case.

(84) ¬OP-IDENT[long][26]
A vowel in a member of an inflectional paradigm that is created with a dominant affix does not agree with its correspondent with respect length.
There should be one segment s_n in the stem of a word inflected with a dominant affix such that if s_n is [λlong], there is a correspondent of s_n that is [-λlong].
Assign a * if this is not the case.

It is possible that these constraints can account for the ablaut demonstrated by the acrostatic roots. I will discuss this option by looking at acrostatic nouns that display o-grade in the strong forms. Such ablaut is explained if ¬OP-ID[back] dominates ID[back], as shown in (85). The winner also violates ID[round] because the vowel not only changes from its underlying specification for backness but also for roundness. However, the language does not allow the unrounded mid back vowel [ɤ], and so it can be assumed this marked vowel is ruled out by a high-ranking markedness constraint against the co-occurrence of the features [+back], [-round], and [-low]. This exemplifies how the antifaithfulness constraints are

[26] There are various ways to formalize a faithfulness constraint that expressed the desire for short vowels to remain short and long vowels to remain long. The exact formalism of such a constraint is not important here, and so I have written the antifaithfulness constraint as an IDENT constraint for simplicity. No matter what the formalism of the faithfulness constraint is, what is important is that the antifaithfulness constraint requires one pair of corresponding vowels to disagree with respect to length.

grammar dependent. The constraint ¬OP-ID[back] only forces a backness violation – how that violation is realized is dictated by the rest of the grammar.

(85) acrostatic noun 'night' *nom sg*

/ nék^w-ét-s$_{dom}$/		¬OP-ID[back]	ID[back]
nék^{w}t-	a ☞ nók^{w}ts		*
	b nék^{w}ts	*!	

(86) ¬OP-ID[back] » ID[back]

This type of ablaut is not present in the other accent classes, but this is expected due to the deletion of unstressed non-high vowels in the language. When ¬OP-ID[back] is dominated by *M$_{foot}$/[e, o] (the constraint that penalizes mid vowels that do not head a foot) and by ¬OP-NoFl(A), as shown in (87),¬OP-ID[back] cannot be satisfied because the higher-ranking constraints insure that the vowel in the strong stem has no correspondent in the weak stem. If this vowel (méntis) becomes [o] (i.e. móntis), as it does in candidate (d), it does not satisfy ¬OP-ID[back] and incurs a violation of ID[back].

(87)[27] proterokinetic noun 'thought' *nom sg*

/ men-téy-s$_{dom}$/		*M$_{foot}$/[e, o]	¬OP-NoFl(A)	¬OP-ID[back]	ID[back]
mn̥téy-	a ☞ méntis			*	
	b méntoys	*!			*
	c mn̥tóys		*!		*
	d móntis			*	*!

(88) *M$_{foot}$/[e, o], ¬OP-NoFl(A) » ¬OP-ID[back]

A summary ranking that makes use of the rankings determined in §3.1.2 and in the above tableaux is presented in (89). This ranking reflects a grammar in which it is highly

[27] It seems, according to the tableau in (87), that the constraint ¬OP-ID[back] can only be satisfied by a change in a non-high vowel, because the [y] in the weak form has a corresponding [i] in the strong form. It would not be problematic to rewrite the ¬OP constraints in (83) and (84) such that they specifically refer to non-high vowels.

important to be faithful to height, to not have non-high vowels in the margin of a foot, and to flop accent from where it appears in recessive forms to a different position in strong forms. Because of this, deletion of non-high vowels is preferred over their appearance outside of the head of a foot. More interestingly, the language also expresses a preference for dominance to be realized through a change in vowel quality (or length). However, this preference can only be manifested in acrostatic forms because these are the only nouns in which a vowel in a strong form has a correspondent, due to the higher ranking constraints *M_{foot}/[e, o] and ¬OP-NoFl(A).

(89) Ident[high] *M_{foot}/[e, o] ¬OP-NoFl(A)

Max ¬OP-ID[back]

*M_{foot}/[i, u] Ident[back]

The real dilemma presented by this type of ablaut is that it can be realized in two different ways – by changing [e] to [o] or by changing [e] to [eː]. For the later, ¬OP-ID[long] would fit into the constraint ranking in the same position as ¬OP-ID[back] (and it would dominate ID[long] instead of ID[back]. There seems to be no phonological explanation, however, for whether an acrostatic noun satisfies ¬OP-ID[back] or ¬OP-ID[long]. This is something that is likely handled by the lexicon, and so will not be discussed further here. In conclusion, dominant strong affixes are not only instrumental in determining the surface realization of proterokinetic nouns – they also determine the vowel quality of roots in acrostatic nouns.

5.2 Implications for Future Work in Indo-European Linguistics

The accentual patterns of athematic nouns are certainly interesting and more complex than other accent-related phenomena in PIE, but they are of course only a piece of the larger system of accent. It will thus be important to test the analysis presented here, i.e. the constraint ranking and proposed underlying specifications, by looking at the general properties of accent in PIE and how stress is realized in relation to other parts of the lexicon, specifically verbs and thematic nouns. It will also be important to see if this analysis can be used to explain the process of internal derivation and the development of accent in daughter languages.

5.2.1 The Accentual System of PIE

Some roots occur in both verbal and nominal forms. In this paper, I have made certain claims about the lexical specifications of roots and suffixes. Specifically, I have predicted that accent class is function of what types of roots and suffixes combine to make a stem. It will be important in testing this analysis to see of the lexical specification I have associated with any particular root can also be associated with that root when it forms a verb. For example, if a root creates an acrostatic noun, my system predicts that this root must be underlyingly accented. The question is then if this lexical specification can be associated with the same root when it forms a verb. Similarly, if a root creates an amphikinetic noun, this root is unaccented according to my system. Thus, when such a root forms a verb, it should behave as an unaccented root is predicted to according to the constraint ranking derived here. The roots of proterokinetic nouns cannot be associated with one particular specification – they can either be unaccented or post-accenting. It is possible that if such roots occur in other words, these words could provide evidence that could determine the lexical specification of the root. For example, if a root that forms a proterokinetic noun appears in a verb whose surface stress suggests that the root is unaccented, we can then determine that the root is unaccented in the proterokinetic noun formation as well. Even if it is determined that roots in verbs have different lexical specifications than the same roots in athematic nouns, there is one possibility for amending the problem that does not requiring revamping the entire system proposed here. The same root could have two different lexical entries – one for the creation of a noun and one for the verb.

Another way to test the analysis proposed here is through a more thorough look at the suffixes that derive athematic nouns. Suffixes that form acrostatic nouns are the only suffixes that can either be accented or unaccented. This means that a suffix in a acrostatic noun can also appear in any other accent class, and which accent class it appears in should tell you what the underlying specification of the suffix is. In this way it can be determined whether certain suffixes in acrostatic nouns are accented or unaccented. However, because suffixes that create proterokinetic nouns must be accented and suffixes that create hysterokinetic or amphikinetic nouns must be unaccented, the same suffix should not appear in both a primarily derived proterokinetic noun and a primarily derived amphikinetic or hysterokinetic noun. The system as a whole can then be examined more carefully by looking for suffixes that appear in different accent classes and then checking if the different accent classes make different predictions about the underlying specification for the suffix.

5.2.2 Internal Derivation Revisited

The process of internal derivation was discussed in §2.3.8. Essentially, a noun can change its meaning by changing its accent class, by moving along the paths indicated in (90).

(90) acrostatic → proterokinetic → hysterokinetic → amphikinetic

Using the system developed here, there does not seem to be one uniform account of these internal derivation processes. However, all but one of the paths above can be derived by taking the underlying form of a stem and deleting one accent. For example, acrostatic nouns of the type $\acute{R}\acute{S}$ can become proterokinetic nouns of the type $R\acute{S}$ by deleting the accent from the root. Proterokinetic nouns of the type $R_{PoA}\acute{S}$ can become hysterokinetic nouns by deleting an accent from the suffix. The six types of derivation are given in (91), where the simplest change in underlying representation is assumed to be associated with the type of internal derivation. The only time derivation does not involve deletion of accent is when hysterokinetic becomes amphikinetic. In this case, there is no accent to delete, and the post-accenting specification is deleted from the root.

(91) possible changes in underlying representation associated with internal derivation

acrostatic → proterokinetic:	$\acute{R}\acute{S} \rightarrow R_{PoA}\acute{S}$
proterokinetic → hysterokinetic:	$R_{PoA}\acute{S} \rightarrow R_{PoA}S$
acrostatic → amphikinetic:	$\acute{R}S \rightarrow RS$
proterokinetic → amphikinetic:	$R\acute{S} \rightarrow RS$
hysterokinetic → amphikinetic:	$R_{PoA}S \rightarrow RS$

An interesting feature of derivation processes as given in (91) is that the accent classes that can be created with two different types of stems (acrostatic and proterokinetic) undergo two different types of internal derivational processes, with each one starting from a different stem type. Thus it could be possible to use instances of internal derivation to predict what stem type forms a certain acrostatic or proterokinetic word. For example, because the acrostatic u-stems become proterokinetic when they become adjectives, perhaps this process tells us that these nouns are composed of an accented root and accented suffix (instead of the other possibility for acrostatic nouns – an accented root and unaccented suffix). When they become adjectives, the root becomes unaccented and no change is made to the suffix. In this way, the processes of internal derivation might make predictions about the underlying specifications of certain morphemes that could then be used to test the system that I have proposed.

5.2.3 The Accentual System of PIE's Daughter Languages

The daughter languages that have contributed heavily to the reconstruction of PIE accent – the Slavic languages, Lithuanian, Vedic Sanskrit, and Classical Greek – have all been analyzed in the literature (Kiparsky and Halle 1977, Halle 1997, Kim 2002, also see Alderete for an OT analysis of Russian 1999). In order to understand this analysis in the context of the bigger picture (the diachronic progression of PIE into its daughter languages), it is important to see what changes need to be made to the constraint ranking presented here in order to account for the daughter languages that are the least innovative in terms of stress. Within OT diachronic change is manifested as a change in constraint ranking from parent to daughter language.

The differences between the constraint ranking that accounts for, say, Vedic Sanskrit (see next section) and the ranking for PIE would need to be natural if this analysis for PIE is to gain support. By natural, I mean that it should be conceivable, that given a synchronic state of PIE, the language learner could reanalyze the language in such a way as to construct a new and different constraint ranking that describes the daughter language. Obviously, these changes would not take place in one generation, and there is no way to determine exactly how much time passed between the state of PIE I am analyzing here and any daughter language. There would likely be intermediate grammars that would be different than the grammar for PIE and the grammar for a daughter language, such that determining if the changes to the constraint ranking are natural is no trivial matter.

5.3 Implications for Future Work in Phonology

This paper makes a strong claim, through the creation of ¬OP constraints, that dominance effects should be found in members of an inflectional paradigm. Essentially, any dominance effect that is predicted by ¬OO-antifaithfulness constraints to exist in derived words is predicted by ¬OP-antifaithfulness constraints to exist in inflectional paradigms. The ¬OP constraints provide Optimality Theory with the necessary tools to analyze such effects.

Another prediction made by the formalism of the ¬OP constraints is that if a language has dominant inflectional affixes, it necessarily has recessive ones. The ¬OP constraints can only work by comparing a stem inflected with a dominant affix to a stem inflected with a recessive affix. The recessive affixes are thus necessary for the satisfaction of the ¬OP constraints. This predictions is not made by the ¬OO constraints, which only need a base for comparison and make no reference to non-dominant affixes. Thus, given the formalisms for ¬OP and ¬OO constraints, it is predicted that a language could have all dominant derivational affixes (and no recessive ones) but not all dominant inflectional affixes (there must be some recessive ones).

It will be important to find evidence of ¬OP constraints doing work in attested languages. One likely candidate for study is Vedic Sanskrit. The term "dominant affix" was first applied in discussing this language (Kiparsky 1982c). In Vedic the vocative case form is stressless, unless it is clause-initial. At the beginning of a clause it receives initial stress, which is considered to be sentence-stress and not word-stress (Meier-Brügger 2003: 265). This means the vocative is always devoid of stress at the word level.

(92) Vocative in Vedic Sanskrit (Meier-Brügger 2003: 265)

sentence-initial: Rigveda 3, 25, 4

ágna	*indrás*	*ca*
Agni-*voc*	Indra-*nom*	and

"Oh Agni and Indra."

non-initial: Rigveda 1, 184, 2

asmé	*ū*	*ṣú*	*vr̥ṣaṇā*	*mādayethām*
us-*loc*	*particle*	well	two heroes-*voc*	enjoy-*optative*-2^{nd}-*dual*

"Enjoy yourselves nicely, you two heroes, in our company."

Kiparsky and Halle (1977: 211) suggest that the vocative case in this language is subject to the same "deaccentuation" rule used for the description of PIE. If this claim can be reanalyzed as an effect of dominance, then ¬OP constraints are ideal for such analysis because the vocative is clearly a member of an inflectional paradigm. Such analysis would be interesting because there is only one ¬OP constraint that could account for the lack of surface word-stress on the vocative: ¬OP-MAX(A). Underlying accent is not realized and CULMINATIVITY (see §3.1.1) is violated in the vocative. These faithfulness and markedness violations are tolerated in order to satisfy an antifaithfulness constraint triggered by the vocative null ending (which must therefore be dominant). The only constraint that is satisfied by a stressless output is ¬OP-MAX(A) (given that the stems of outputs formed with recessive endings bear stress). If this constraint is shown to be high-ranking in Vedic Sanskrit, it would be worthwhile to test the hypothesis that this is the antifaithfulness constraint that was active in PIE.

The PIE athematic nouns also show evidence of high-ranking OP constraints. In §2.3.1 an exception to the basic syllabification rule in (9) was presented that promotes a reduction of allomorphy (at the expense of an otherwise marked structure in the language). When proterokinetic u- and i-stems take the accusative singular ending *m, the syllabification rule predicts that the [m] should become a nucleus, resulting a word final [wm̥] or [ym̥] sequence. But instead the glide becomes the nucleus, which reduces allomorphy[28]. Thus, the reconstructed paradigm for 'coming' is *g^{w}émtus *nom sg*, *g^{w}émtum *acc sg*, and *g^{w}m̥téws *gen sg*. If the syllabification rule worked as predicted the paradigm would be *g^{w}émtus *nom sg*, g^{w}émtwm̥ *acc sg*, and g^{w}m̥téws *gen sg*, with three stem allomorphs (g^{w}émtu, g^{w}émtw, and g^{w}m̥téw) instead of two. A full analysis is complex and not necessary here, but the desire for the reduction of allomorphy at the cost of marked structures is clear and predicted by the existence of OP constraints. Thus PIE presents evidence for both OP and ¬OP constraints as an analysis of this language is not possible without a way to explain similarities and dissimilarities in the stems of members of an inflectional paradigm. IO and OO faithfulness and OO antifaithfulness constraints are inadequate to account for such phenomena, while OP and ¬OP constraints can account for this behavior and predict its occurrence in inflectional paradigms in other languages.

5.4 Conclusions

This paper has presented a phonological analysis of accent alternations in PIE athematic nouns, which had not yet been successfully accounted for in the literature. There are six stem types that an athematic noun can have. Each of these stem types produces a specific type of accent alternation (with two accent classes being created by two different stem types and two other accent classes being created by only one stem type). The stem thus predicts the accent class of a noun. The causes of accent alternations in three accent classes are the dominant endings. These endings trigger antifaithfulness constraints that can only be satisfied when the stem of a dominant form disagrees with the stem of a recessive form in

[28] There is no evidence elsewhere in the language of the syllabification rule being overridden by a preference for a higher sonority nucleus.

terms of accent. For the acrostatic nouns, where there is no accent alternation, dominant affixes are realized by a change in vowel quality or quantity. Because a phonological analysis is possible, there is no reason to question the reconstructions of these nouns based on purely phonological or typological concerns. In fact, such accent alternations are predicted to exist by a factorial typology that uses previously motivated constraints and a new type of antifaithfulness constraint that will likely find motivation in attested languages such as Vedic Sanskrit.

The primary contribution that this paper makes to phonological theory is the existence of antifaithfulness constraints that are not operational on the OO correspondence relation. The ¬OP constraints still compare outputs to outputs, but they compare stems that exist in outputs that include inflectional affixes. It is thus still important that antifaithfulness is only operational on a surface-surface correspondence relation, and not on the IO correspondence relation. It is now necessary for future work to look for evidence of these ¬OP constraints in attested languages. This paper makes the prediction that dominant affixes can be inflectional (and not just derivational) and provides the tools for analyzing dominant inflectional affixes.

Appendix A:
Athematic Nominal Data

	gloss	root	suffix	nom	acc	gen	loc	source
acrostatic	foot	ped		póds	pódm̥	péds		Schindler (1975a: 4)
	meat	mems		méːms	méːmsm̥	méms		Ringe (1996)
	water	wed	er/n	wódr̥	wódr̥	wédn̥s		Schindler (1975a: 4)
	liver	yek	er/n	yeːk^{w}r̥	yeːk^{w}r̥	yeːk^{w}n̥s		Schindler (1975a)
	sheep	h$_2$ew	ey	h$_2$ówis	h$_2$ówim	h$_2$éwis		Kim (2002: 29)
	good	wes	ew	wósu	wósu	wésus		Watkins (1982)
	night	nek^{w}	et	nók^{w}ts	nók^{w}tm̥	nék^{w}ts		Schindler (1975a: 4)
amphikinetic	earth	d^{h}eg^{h}	em	d^{h}ég^{h}oːm	d^{h}ég^{h}oːm	d^{h}g^{h}més	d^{h}g^{h}ém	Schindler (1975b: 263)
	path	pent	eh$_2$	péntoh$_2$s	péntoh$_2$m̥	pn̥th$_2$és		Fortson (2004: 208)
	male	h$_2$ner		h$_2$néːr	h$_2$nérm̥	h$_2$nrés		Schindler (1972: 36)
	nose	nas		naːs	nasm̥	n̥sés		Schindler (1972: 37)
proterokinetic	coming	g^{w}em	tew	g^{w}émtus	g^{w}émtum	g^{w}m̥téws		Kim (2002: 37)
	fire	peh$_2$	wer/n	péh$_2$wr̥	péh$_2$wr̥	ph$_2$wéns		Schindler (1975a: 2)
	burden, load	b^{h}er	men	b^{h}érmn̥	b^{h}érmn̥	b^{h}r̥méns		Kim (2002: 37)
	thought	men	tey	méntis	méntim	mn̥téys		Fortson (2004: 108)
hysterokinetic	father	peh$_2$	ter	ph$_2$téːr	ph$_2$term̥	ph$_2$trés		Schindler (1975b: 263)
	male	h$_2$ers	en	h$_2$r̥séːn	h$_2$r̥sénm̥	h$_2$r̥snés		Kim (2002: 43)
	star	h$_2$es	ter	h$_2$stéːr	h$_2$stérm̥	h$_2$strés		Schindler (1975b: 263)

Appendix B:
Tableaux for Nouns Inflected with Strong Ending with Dominance Realized through Accent Deletion/Insertion

1. proterokinetic noun (type RŚ): ‘thought’ *nom, acc, gen sg*

	/men-té^{1}y/ + {s$_{dom}$, m$_{dom}$, és$_{rec}$ …}	¬OP-DEP(A)	OP-DEP(A)	¬OP-MAX(A)	OP-MAX(A)	¬OP-NOFLOP(A)	OP-NOFLOP(A)	MAX(A)$_{deriv}$	MAX(A)	NOFLOP(A)$_{deriv}$	NOFLOP(A)	ALIGNL	DEP(A)$_{root}$	DEP(A)
a	☞ <mé^{2}ntis, mé^{2}ntim, mn̥té^{1}ys>		**		**	**		**	**			*	**	**
b	<mn̥té^{1}ys, mn̥té^{1}ym̥, mn̥té^{1}ys>	** (!)		** (!)		**						***		
c	<mé^{1}ntis, mé^{1}ntim, mn̥té^{1}ys>	** (!)		** (!)			** ** (!)			** (!)	** (!)	*		

rankings demonstrated by tableau:

candidate (b): {¬OP-DEP(A), ¬OP-MAX(A)} » OP-DEP(A)
{¬OP-DEP(A), ¬OP-MAX(A)} » OP-MAX(A)
{¬OP-DEP(A), ¬OP-MAX(A)} » MAX(A)$_{deriv}$

candidate (c): {¬OP-DEP(A), ¬OP-MAX(A), OP-NOFLOP(A), NOFLOP(A)$_{deriv}$, NOFLOP(A)} » ¬OP-NOFLOP(A)

2. proterokinetic noun (type R$_{PoA}$S)

		/R$_{PoA}$Ś^{1}E$_{dom}$/	¬OP-DEP(A)	¬OP-MAX(A)	¬OP- NOFL(A)	MAX (A)$_{deriv}$	MAX(A)	NOFL(A)$_{deriv}$	NOFL(A)	POSTACC	ALIGNL	DEP (A)$_{root}$	DEP (A)
RŚ^1	a	☞ Ŕ^{2}SE			*	*	*			*		*	*
	b	RŚ^{1}E	*(!)	*(!)	*						*		
	c	Ŕ^{1}SE	*(!)	*(!)				*(!)	*(!)	*			

rankings demonstrated by tableau:

candidate (b): {¬OP-Dep(A), ¬OP-Max(A)} » Max (A)$_{deriv}$
candidate (c): {¬OP-Dep(A), ¬OP-Max(A), NoFl(A)$_{deriv}$, NoFl(A)} » ¬OP-NoFl(A)

3. acrostatic noun (type ŔS)

/Ŕ^{1}SE$_{dom}$/			Max(A)$_{root}$	NoFl(A)$_{root}$	¬OP-Dep(A)	¬OP-Max(A)	¬OP-NoFl(A)	NoFl(A)$_{deriv}$	NoFl(A)	Max(A)$_{deriv}$	Max(A)	AlignL	Dep(A)$_{deriv}$	Dep(A)
	a	☞ Ŕ^{1}SE			*	*	*							
Ŕ^{1}S	b	RŚ^{1}E		*(!)	*	*		*(!)	*(!)			*(!)		
	c	RŚ^{2}E	*!				*			*	*	*	*	*

ranking demonstrated by tableau:

Max(A)$_{root}$ » ¬OP-Dep(A), ¬OP-Max(A)

4. summary constraint ranking:

Max(A)$_{root}$

{¬OP-Max(A), ¬OP-Dep(A)} NoFlop(A)$_{root}$

Max(A)$_{deriv}$ NoFlop(A)$_{deriv}$

Max(A) NoFlop(A)

PreAccent PostAccent

AlignL

Dep(A)$_{root}$

Dep(A)$_{deriv}$

Dep(A)

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