Morphology and stress in Nez Perce verbs*

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This paper addresses the interaction between word-level stress and morphological constituency in Nez Perce, originally described by Crook (1999). Stress in Nez Perce, which is usually regularly *rightmost* in some domain, becomes unexpectedly *leftmost* in words that contain at least one accented prefix. Default rightmost stress is re-asserted, however, by the presence of any accented suffix. It is argued that these facts are best accounted for in terms of a positional faithfulness constraint privileging the realization of accents in certain *morphological* positions. The constraint proposed is PRESERVE EDGEMOST, which requires additional faithfulness to accents that are furthest away from the root towards the word edges. A novel property of this constraint is that it is sensitive not to hierarchical morphological structure, but only to linear morphological divisions. Later sections of the paper also address the relevance of Nez Perce for the typology of default-to-opposite stress systems.

1   Introduction

This paper addresses the interaction between word-level stress and morphological constituency in Nez Perce, a Sahaptian language spoken in parts of Washington, Oregon, and Idaho. The description of Nez Perce stress is drawn from Crook (1999), corroborated by data drawn from Aoki and Walker (1989) and Aoki (1994).

Stress in Nez Perce depends on the interaction between default alignment preferences and underlying accents (i.e. lexically determined stresses). The default pattern is for primary stress to be *rightmost* in some domain.

Nez Perce stress assignment is of particular interest to phonological theory because it shows interactions between morphology and phonology that are *non-cyclic*. Accented verbal prefixes trigger a *reversal* in the edge-alignment of stress in Nez Perce: they trigger left alignment of primary stress, overriding the default right alignment of the language. Default rightmost stress alignment is preserved, however, whenever a verb contains an accented suffix, *regardless of the relative scope between that suffix and any prefixes*.

The analysis of the Nez Perce facts proposed here is developed within the framework of Optimality Theory (OT) (Prince and Smolensky, 1993; McCarthy and Prince, 1994), using a set of stress-alignment constraints proposed in Gordon (2002). In this paper I argue that analyzing the reversal of stress alignment that is triggered by accented prefixes requires a constraint that is sensitive to morphological constituency, but in a relatively limited way: it is sensitive to *linear*, rather than hierarchical, morphological structure. The required constraint (PRESERVE EDGEMOST) prefers that accents (represented as stresses in the Input) be preserved on morphological constituents that are furthest from the root towards the word edge. The effect of this constraint will be to prefer to place primary stress at a word edge, so long as that does not involve placing primary stress on the root. This constraint is potentially in conflict with the constraint that aligns primary stress at the right edge of the word; in most cases these constraints can both be satisfied by a single candidate, but when their demands diverge, it will be PRESERVE EDGEMOST that is satisfied. This analysis is detailed in section (32). Section 5 dis-

cusses how this analysis improves over the previous analysis proposed in the literature, that of Crook (1999), which accounted for the data via cyclic constraint-re-ranking together with a process of partial bracket erasure.

The correct analysis of the Nez Perce stress system bears directly on theoretical debates concerning the nature of the phonology-morphology interface. A number of recent theories propose that morpho-phonological interactions result (at least sometimes) from Output-Output relationships between related words (Benua, 1997; Burzio, 1998; Kenstowicz, 1996; McCarthy, 2005; Steriade, 1998). Cyclic effects are preserved in the case of derivational morphology by the principle of Base Priority (Benua, 1996, 1997), which constrains the directionality of transderivational correspondence.

The non-cyclic effects of Nez Perce point towards a residue of cases where morphology and phonology interact directly, independently of correspondence between derivationally related words. If the analysis presented in this paper is correct, it may be taken to illustrate the kinds of morphological information to which the phonological component has access.

The analysis of Nez Perce stress presented here also bears on debates concerning *default-to-opposite* stress systems and their analysis. First described for Eastern Cheremis by Kiparsky (1973) and for Selkup by Halle and Clements (1983); Idsardi (1992), default-to-opposite stress systems canonically involve reversal of stress alignment triggered by the presence of *heavy* syllables.

Recent analyses of default-to-opposite phenomena have disagreed on whether it results from the interaction of positional licensing with stress alignment (Zoll, 2002), or is an illusion resulting from obscuring phonetic factors Gordon (2000). Section 4 discusses how Nez Perce can be understood as a default-to-opposite stress system in which positional *faithfulness*, rather than positional *markedness*, interacts with stress alignment, providing indirect support for Zoll's analysis of default-to-opposite stress more generally.

2   Nez Perce stress

Before moving on to the stress facts themselves, it will be useful to review some of the basic phonotactics of Nez Perce. The segmental inventory of Nez Perce appears in (1):[1]

(1)   p, p'   t, t'   k, k'   q, q'   ʔ
                              c, c'
                     ł   s   x   χ   h
            m, m'   n, n'
              w   y
                     l, l'

Nez Perce has a standard five-vowel inventory (*a, e, i, o, u*), with an underlying contrast in length that surfaces only under primary stress (with some irregular exceptions).[2]

Vowels in Nez Perce also participate in a process of *vowel harmony*: the surface form of a word can contain only vowels from either the 'dominant' or the 'recessive' set Aoki (1966, et seq.). The presence of an underlyingly 'dominant' vowel triggers harmony: underlyingly recessive vowels will surface only in the absence of any dominant vowel in the same word.

(2)   *Dominant:*   *Recessive:*
                i   i   u
                          o   e
                    a

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[1] This chart is adapted from the inventory presented in Aoki (1970, p. 10). It is adapted to reflect the system of transcription used in Crook (1999), which is used throughout this paper.

[2] Readers interested in details of the weight-stress interaction in Nez Perce are referred to §4.2.1 of Crook (1999).

Surface forms given in this paper reflect the operation of both vowel harmony and stress-weight interactions. Underlying forms show underlying length and quality contrasts, as provided in Aoki's (1994) *Nez Perce Dictionary* and in Crook (1999).

Section 2.1 describes rhythmic stress in Nez Perce, the fully predictable position of stress in words that contain no lexical accents, and provides an analysis in terms of constraints on the alignment of grid marks (based on the system of constraints developed in Gordon, 2002). Section 2.2 goes on to describe the patterns of stress seen in words containing at least one lexical accent (though without the complications introduced by accented prefixes), and extends the analysis of section 2.1 to account for these cases as well.

2.1 Rhythmic stress assignment

As mentioned in the introduction, in the absence of other determining factors primary stress in Nez Perce is aligned at the right edge of the word: stress is regularly penultimate (rather than absolutely final), and shifts rightwards under suffixation:[3]

(3) a. pískis   pìskís-ne   b. hàníi-sa   hàni-sáaqa
         piskis   **piskis**-ne   **hanii**-see   **hanii**-seeqa
         door   door-OBJ   make-INC   make-REC

     c. wéeptes   wèptéesne   d. càpátna   càpatíca
         weeptees   **weeptees**-ne   **capat**-ne   **capat**-cee
         eagle   eagle-OBJ   move.lengthwise-PFTV   move.lengthwise-INC

(Crook, 1999, pp. 294-5, 300)

All the examples in (3) involve bisyllabic roots, with stress shifting due to the addition of an affix (the difference between nominative and objective case in (3a,c)), the replacement of a monosyllabic suffix with a bisyllabic one (incompletive aspect versus the recent past tense in (3b)), or alternation between a suffix that requires epenthesis of a vowel after the root and one that does not (perfective versus incompletive aspect in (3d)).

Secondary stresses occur on initial syllables that do not bear primary stress, though Crook (1999) reports that this initial secondary stress is sometimes optional, particularly when it clashes with a peninitial stress.[4]

In the analysis pursued here I will adopt grid-based representation for stress, in which the relative prominence of a syllable corresponds to the relative height of columns of grid marks associated with it (Prince, 1983; Selkirk, 1984; Walker, 1996; Gordon, 2002). Representational well-formedness requires that any syllable associated with a grid mark on level n also be associated with a grid mark on level $n - 1$. All syllables must be associated with a level 0 grid mark (x_0). Primary stress will be represented here by a level 2 grid mark (x_2), while secondary stress will be represented by a a level 1 grid mark (x_1). This is illustrated in (4) for the word *wèptéesne*:

(4)   wèptéesne =   x
                       x   x
                       x   x   x
                      wep tees ne

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[3] The following abbreviations are used in this paper: 3 = 3rd person (subject or object), NOM = nominative case, OBJ = objective case, ERG = ergative case, INC = incompletive aspect, INST = instrumental, IRR = irrealis LOC = locative, PFTV = perfective aspect, PL = plural agreement, PLOB = plural object, REC = recent past tense, SF = stem formative

[4] Crook reports that rhythmic secondary stresses also occur to prevent two-syllable lapses, and that there is interaction between underlying vowel length and secondary stress assignment. These issues are beyond the scope of this paper.

Following Gordon (2002), I assume that the location of stress is determined by the action of a family of ALIGN constraints specific to particular grid levels. ALIGN constraints that determine the location of a grid mark on level n will generally refer to its alignment with respect to the edges of level $n - 1$, though reference to other levels (particularly level zero) is in principle possible.

The relevant constraints for determining the position of stress in unaccented words in Nez Perce are NON-FINALITY, ALIGN(x_1, Edges), and ALIGN(x_2, R):

(5) NON-FINALITY
Assign one violation mark for every grid mark above level 0 assigned to the last syllable of a word.

(6) ALIGN(x_1, Edges)
"The edges of level 0 of grid marks in a prosodic word are aligned with level 1 grid marks." (Gordon, 2002, p.8)

(7) ALIGN(x_2, R)
Align all level 2 grid marks to the right edge of the level 1 grid. (one violation is assigned for each secondary stress between the primary stress and the right edge of word.)

I assume that spurious stresses are avoided due to the action of the following DEP constraint:

(8) DEP (x_n)
Assigns one violation for every grid mark of level n that is present in the output but does not correspond to a grid mark in the output.

These constraints must be ranked as follows:

(9) NON-FINALITY≫ALIGN-EDGES ≫DEP (x_1)

(10) NON-FINALITY≫ALIGN(x_2, R) ≫ALIGN(x_2, L)[5](Primary stress rightmost but non-final)

The ranking in (9) accounts for the fact that there are initial and penultimate stresses. ALIGN-EDGES penalizes each level zero grid mark that intervenes between a level one grid mark and the edge of the word. NON-FINALITY, however, requires that no level one grid mark align with the final syllable of the word. Together, these two constraints ensure that a level one grid mark will align with the first syllable of a word, and with the *penultimate* syllable of a word. The fact that ALIGN-EDGES outranks DEP (x_1) ensures that secondary stresses can be inserted at all, though this may result in unfaithfulness to the relative prominence relations in the input form.

The ranking in (10), meanwhile, accounts for the fact that primary stress is penultimate.The ALIGN(x_2, R) and ALIGN(x_2, L) constraints assign a penalty for each level one grid mark to the right (or left) of a level two grid mark. The effect of the ranking in (10) is therefore to prefer that there be no secondary stresses to the right of the primary stress in a word. Assuming that there can be only one level two grid mark in a word (potentially resulting from an undominated CULMINATIVITY constraint), it will occur in the rightmost column containing a level one grid mark.

The effect of these rankings in deriving initial secondary and penultimate primary stresses are shown in the tableau in (11).

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[5] In later discussion in this paper, ALIGN constraints that are outranked by their inverse counterpart will be omitted; the mention of an ALIGN-R constraint can be taken to imply that it outranks the corresponding ALIGN-L constraint, and vice versa.

(11)　NON-FINALITY≫ALIGN-EDGES,　ALIGN(x_2 R) ≫ALIGN(x_2 L), DEP (x_1)

weeptees-ne	NON-FINALITY	ALIGN-EDGES	ALIGN(x_2 R)	ALIGN(x_2 L)	DEP (x_1)
a. ☞ **wèptées**-ne		*		*	**
b. **wéeptès**-ne		*	*!		**
c. **wèeptes**-né	*!*			*	**
d. **weeptés**-ne		**!		*	*

In this tableau, the candidate that best satisfies all ALIGN constraints, (11c), is nonetheless excluded because it violates the highly-ranked constraint NON-FINALITY(it violates this constraint twice, because a primary stress involves two grid-marks above level zero). The winning candidate, (11a), is the one that best satisfies ALIGN-EDGES and ALIGN(x_2 R) while still incurring no violations of NON-FINALITY: it has one violation of ALIGN-EDGES, due to there being no stress aligned at the right edge of the word, but this is true of all candidates that do not violate NON-FINALITY. The candidate in (11b) is excluded because it satisfies ALIGN(x_2,L) at the expense of the higher-ranked ALIGN(x_2,R), while (11d) is excluded because it has a second critical violation of ALIGN-EDGES, not required in order to satisfy NON-FINALITY.

This now sets the stage for an account of accentual (i.e. lexically determined) stress assignment in Nez Perce.

2.2 Accent-determined stress assignment

As mentioned in the introduction, some morphemes in Nez Perce possess lexically-specified accents. In words that have exactly one underlying accent, primary stress remains fixed on a single syllable even when suffixation moves that syllable further from the right word edge, as illustrated in (12):

(12)　a.　híisèmtùks　b.　'ìníit　c.　hipú'　d.　láwyàlacàqa
　　　　híisemtuks　　**'iníit**　　**hip**-ú'　　**láwyala**-ceeqa
　　　　'sun (nom)'　　'house　　eat-IRR　　gaff-REC
　　　　　　　　　　　(nom)'

　　　　　　　　　　　　　　'I will eat'　　'I fished with a gaff hook recently.'
　　　　　　　　　　　　　　　　　　　　　(Crook, 1999, pp. 319, 321, 377)

To account for the interaction of accent with stress placement, it is useful to adopt a specific assumption about the representation of accents in the input. Given that accents can be viewed as lexically-specified positions of prominence, and we have a grid-based representation of prominence in the *output* (i.e. stress), the simplest hypothesis is that accents have the same representation. This paper therefore assumes that lexical accent is the underlying specification of a level two grid mark associated with a particular syllable.[6]

Once accent is formalized in this manner, the assignment of primary stress to an accent is simply a matter of ordinary MAX and DEP faithfulness constraints; no special accent- or stress-specific mechanisms are required. The particular constraint that will be relevant is a MAX (x_2) constraint, which will penalize the deletion of level two grid marks. MAX (x_2) must outrank the stress-related ALIGN constraints in order for it to allow arbitrary stress placement. This constraint must also outrank NON-FINALITY in order to allow primary stress to be assigned to word-final accents, as in (12b-c). The following tableau illustrates this point with respect to the accented noun '*ìníit* 'house (NOM)'.

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[6] There is no reason accent could not be represented as a level one grid mark instead. The choice between these two options is at this point arbitrary, though the assumption that accent is represented as a level two grid mark will be useful in accounting for the interaction of accent and secondary stress assignment, in words with more than one accented syllable.

(13) MAX (x₂) ≫ NON-FINALITY

'iníit	MAX $_{IO}$(x₂)	NON-FINALITY
a. ☞ 'ìníit		*
b. 'íniit	*!	

In words with more than one accent (which can occur when multiple accented morphemes appear together in a word) the multiple accents are in competition with one another to receive primary stress. In such cases of accent clash, primary stress surfaces on the rightmost non-final accented syllable. All other accents (including those that are final) receive secondary stress:

(14) a. sèpíinèwiyù'
          sepíinewi-ú'
          meaure-IRR
          'I will measure'

      b. pàynóosàqa
          páay-núu-saaqa
          arrive-toward-REC
          'I recently arrived towards'

      c. k'òmaynáapìiksa
          k'óomay-náapii-k-see
          sick-away-SF-INC
          'I being sick am kept away'

(Crook, 1999, pp. 352, 456, 458)

CULMINATIVITY, an undominated constraint requiring that all words contain one and only one syllable with primary stress, requires that MAX (x₂) be violated at least once in any word with more than one underlying acent. Because of this, the previously-established ranking of NON-FINALITY over ALIGN(x₂,R) can reassert itself in such words, resulting in primary stress falling on the rightmost non-final accent.

The fact that that all accented syllables surface with at least secondary stress indicates the separate action of a MAX (x₁) constraint, which also dominates NON-FINALITY, but whose preservation of accents is not constrained by culminativity. This is illustrated in the tableaus in (15) and (16):

(15) MAX (x₁), MAX (x₂) ≫ NON-FINALITY ≫ ALIGN(x₂, R)

páy-núu-saaqa	MAX (x₁)	MAX (x₂)	NON-FINALITY	ALIGN(x₂ R)
a. páynòsàqa		*		**!
b. pàynòsáaqa		**!		
c. pàynosáaqa	*!	**		
d. ☞ pàynóosàqa		*		*

(16) MAX (x₁), MAX (x₂) ≫ NON-FINALITY ≫ ALIGN(x₂, R)

kíwyek-síix	MAX (x₁)	MAX (x₂)	NON-FINALITY	ALIGN(x₂ R)
a. ☞ kíwyeksìx		*		*
b. kíwyèksix	*!	*		*
c. kìwyeksíx		*	*!	
d. kìwyéksìx		**!		*

Because there is a culminativity requirement on level two grid marks, but not on level one grid marks, all but one of the level two grid marks in the input must be absent in the output, and so all potentially optimal candidates (that is, all candidates that do not violate the CULMINATIVITY(x₂) constraint omitted from the tableau in (16)) violate MAX (x₂) equally. The activity of the NON-FINALITY and ALIGN(x₂) constraints is therefore able to influence the choice of *which* accent will be preserved as the primary word stress. Because multiple level one grid marks are allowed in the output, however, all ac-

cented syllables may retain a secondary stress, and the constraints governing the location of rhythmic secondary stress have no effect.

The action of CULMINATIVITY is illustrated in the following tableaus. MAX (x_2) is relevantly dominated only by this constraint, but CULMINATIVITY does *not* outrank MAX (x_1), and so all accents result in secondary stresses:

(17)   MAX (x_1), CULMINATIVITY ≫MAX (x_2) ≫NON-FINALITY≫ALIGN(x_2, R) ≫ALIGN(x_2, L)

hip-ú'	MAX (x_1)	CULMIN.	MAX (x_2)	NON-FINALITY	ALIGN(x_2 R)	ALIGN(x_2 L)
a. ☞ hìpú'				**		*
b. hípù'			*!	*	*	
c. hípu'	*!		*			

When there are multiple accents in a word, NON-FINALITY requires that primary stress be assigned to a non-final accent; primary stress still must surface on some accent, however, and the final accent receives secondary stress:

(18)   MAX (x_1), CULMINATIVITY ≫MAX (x_2) ≫NON-FINALITY≫ALIGN(x_2, R) ≫ALIGN(x_2, L)

sepíinewi-ú'	MAX (x_1)	CULMIN.	MAX (x_2)	NON-FINALITY	ALIGN(x_2 R)	ALIGN(x_2 L)
a. ☞ sèpíinèwiyù'			*	*	**	*
b. sèpìinewíyu'	*!		**			**
c. sèpìinèwiyú'			*	**!		***
d. sèpíinèwiyú'		*!		**		*

It is crucial to the analysis above that ALIGNconstraints be evaluated *gradiently*. This contradicts McCarthy (2003), who claims that all OT constraints are evaluated *categorically*, and that gradient constraint evaluation is both theoretically and empirically undesireable. His specific proposal with regard to stress alignment is that categorical alignment (specifically framed in terms of the alignment of feet at word edges) is able to derive all of the attested stress patterns, and the addition of gradient alignment predicts unattested stress patterns.

The alternative mechanism for deriving penultimate stress adopted in McCarthy (2003) is to align a trochaic foot at the absolute right edge of a word. This specific proposal will not account for penultimate stress in Nez Perce: according to Crook (1999), there is always a penultimate secondary stress in the output, even when underlying accents have moved primary stress further to the left. Such metrically-determined penultimate stresses can be immediately followed by a *final* secondary stress, when the final syllable is underlyingly accented:

(19)   a. kíwyèksìx   b. híitèmyèkù'   c. híitàmyàksìx
            kíwyek-síix   hiitemyek-ú'   híitemyek-síix
            feed-INC.PL   sweat-IRR   sweat-INC.PL
            "we are feeding"   "I will sweat"   "we are sweating"

(Crook, 1999, pp. 446-7)

If the penultimate syllable bore stress due to rightmost alignment of a trochaic foot, two stresses at the right edge of a word should not be possible. Thus, the presence of a rhythmic penultimate secondary stress even in the presence of a final stress provides indirect evidence for the necessity of gradiently-evaluable ALIGN constraints.

3   Alignment reversal with accented prefixes

We are now in a position to turn to the main empirical focus of this paper, the unexpected alignment reversal triggered by accented prefixes in certain morpho-phonological configurations.

The previous section established that primary stress in Nez Perce is generally aligned to the *right* rather than to the left. The examples in (20) and (20) show that stress is unexpectedly attracted iteratively leftwards onto accented verbal prefixes.[7]

(20)   a.   cúukwe-ce   b.   siléew-cùukwe-ce
               cúukwe-cee   siléew-**cúukwe**-cee
               know-INC   by.seeing-know-INC
               "I know."   "I know by seeing."

         c.   sepée-silèew-cùukwe-ce   d.   née-sepèe-silèew-cùukwe-ce
               sepée-siléew-**cúukwe**-cee   nées-sepée-siléew-**cúukwe**-cee
               CAUS-by.seeing-know-INC   PLOB-CAUS-by.seeing-know-INC
               "I make you (sg.) know by seeing."   "I make you (pl.) know by seeing."

(Crook, 1999, p. 462)

What is particularly interesting about this pattern is that it is *not* the case that accented prefixes are *universally* preferred locations for stress: an accented *suffix* will always attract stress back to the right edge of the word.

(21)   a.   hì-nées-wèyik-se   b.   hì-nès-wèyik- úu -se
               hii-nées-**wéeyik**-see   hii-nées-**wéeyik**- úu -see
               3-PLOB-cross-INC   3-PLOB-cross-toward-INC
               'He is crossing them.'   'He is crossing toward them.'

(Crook, 1999, pp. 463, 480)

The reassertion of rightmost stress by accented suffixes is not simply a cyclic effect — that is, it is not the case that stress is assigned cyclically to the most recently affixed accented morpheme, and suffixes create the illusion of outermost stress simply because they are cyclically outside prefixes. Accented suffixes over-ride the leftward assignment of stress onto an accented prefix even when they are *inside* the morphological scope of such prefixes.

To see this, begin with (22), which shows shows that accented prefixes attract stress leftward from the accented root *páay* 'arrive':

(22)   a.   hì-sapáa-pày-ca   b.   hì-náa-sapàa-pày-ca
               hii-sepée-**páay**-cee   hii-nées-sepée-**páay**-cee
               3-CAUS -arrive-INC   3-PLOB-CAUS-arrive-INC
               'He makes arrive (someone).'   'He makes them arrive.'

In (23), the derivational suffix *-núu* 'towards' transitivizes the intransitive root *páay* 'arrive' (Crook, 1999, p. 481), adding an object argument. In (23a), the plural object agreement marker *nées-* agrees with the object introduced by *-núu*, suggesting that the prefix is *outside* the root-suffix constituent (following, for example, the work of Pylkkänen 2008). Similarly, in (23b), the suffix *núu* is semantically within the scope of the causative prefix *sepée-*.

Despite its scope with respect to the prefix, the accented suffix reasserts rightmost stress in both cases, showing that it is *not* the stress properties of the 'highest' accented affix that determine stress assignment in the word, as would be the case were this a cyclic phenomenon:

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[7] This is observed in verbs but not in nouns, something that could be attributed to the absence of accented nominal prefixes in the language (Amy-Rose Deal, p.c.).

(23) a. hì-nàs-pày-nóo-ca   b. hì-nà-sapà-pày-nóo-ca
      hii-[nées-[**páay**-núu]]-cee   hii-nées-sepée-**páay**-núu-cee
      3-[PLOB-[arrive-toward]]-INC   3-PLOB-CAUS-arrive-toward-INC
      'He arrives toward (them).'   'He makes them arrive toward him'

     For purposes of comparison, we can consider stress assignment in Chamorro, as described by Chung (1983). Chamorro stress assignment displays truly cyclic interaction between the stress properties of prefixes and suffixes; the comparison between this pattern and the one we have seen in Nez Perce can help to illustrate the non-cyclic nature of the latter.

     By default, primary stress in Chamorro is penultimate. The language also has lexically determined stress, however: roots can be specified to require stress to fall within a three syllable final window.

     Further lexically determined stress in Chamorro involves a class of stress-attracting prefixes: these prefixes attract stress onto themselves away from its default position on the penultimate syllable of the word.

(24) Chamorro stress-attracting prefixes
      a. púgas   mípugas   'uncooked rice' / 'abounding in
                                                uncooked rice.'
      b. mantíka   mímantika   'fat' / 'abounding in fat'
      c   paníti   ápaniti   'to strike' / 'to strike one another'
      d. agradési   sénagradesi   'to give thanks' / 'to give many
                                                thanks'

                                                              (Chung, 1983, p. 40)

The stress attraction by prefixes, however, is *cyclic* in nature: a prefix attracts stress onto itself only when it is morphologically outermost. Suffixes re-assert regular penultimate stress. A prefix *outside* the scope of a suffix will therefore attract stress as in (a) and (d) below, while a prefix *within* the scope of a suffix does not, as in (b) and (c).

(25) Bracketing-sensitive stress
      a. [á[[kwentus]i]]   'to speak to one another'
                                 (cf. *kwéntus* 'to speak', *kwentús + i* 'to speak to')
      b. [[mi[mantiká]]ña]   'more abounding in fat'
                                 (cf. *mantíka* 'fat', *mí+mantika* 'abounding in fat')
      c. [[ma[faʔtinás]]ña]   'its being made'
                                 (cf. *faʔtínas* 'to make', *ma +faʔtínas* 'being made')
      d. [man[á[[tügiʔ]i]]]   'to write to one another (pl.)'
                                 (cf. *tugiʔ* 'to write', *tugiʔ+ i* 'to write to', *´ä + tugiʔ+ i* 'to
                                 write to one another')

                                                              (Chung, 1983, p. 41)

The contrast with Nez Perce stress assignment is clear: while in Nez Perce leftwards attraction of stress onto prefixes is overcome by *any* accented suffix, regardless of their relative morphological scopes, in Chamorro accented prefixes present a real *cyclic* effect, where the outermost affix always regularly asserts its influence on word-level stress.

     In the absence of a cyclic explanation for the interaction between morphological constituency and stress assignment in Nez Perce, we must search for another account. The observation I will capitalize on in what follows is that accented prefixes *only* attract stress iteratively leftwards when the only alternative would be to place primary stress on a syllable belonging to the root: whenever the rightmost accented syllable in a word does *not* belong to the root (as in cases where there is an accented suffix), the default rightmost pattern reasserts itself (as in (21) and (25)).

More specifically, the proposal I will implement here is that the alignment reversal triggered by accented prefixes in Nez Perce results from conflicting requirements on the alignment of stress: the pressure for rightmost alignment (resulting from the action of ALIGN(x_2, R)) competes with a constraint privileging the preservation of accent on morphological constituents *furthest toward each word edge*.

This preservation of accents at word edges is accomplished via the constraint in (26):

(26)　PRESERVE EDGEMOST (x_2) [PRES-EDGES]
　　　Assign a violation if a level-2 gridmark that is outermost from the root on one edge in the input is not present in the output.

PRESERVE EDGEMOST is a differential faithfulness constraint: it does not require that primary stress be edgemost in the output, but instead preserves (non-root) accents that are located furthest towards the word edges. In this respect it is sensitive only to *linear* morphological structure, in that it can detect boundaries between morphemes but not their hierarchical or bracketed relationships to one another.

It is necessary that this constraint be framed in terms of *faithfulness* because, as we have already seen, it is only accents (stresses represented in the input) that show signs of its effect. All potential stress positions are indistinguishable in the output — looking only at candidate outputs, a stress resulting from an underlying accent is indistinguishable from a stress placed for purely metrical reasons. Yet it is only *accents* that trigger alignment reversal in Nez Perce: the responsible constraint must therefore be sensitive to input representations, and must therefore be a faithfulness constraint.

For illustration of the contexts in which this constraint will be violated, consider the hypothetical underlying structure in (27). This structure contains a root and three affixes (α, β, and γ), all of which are accented. The relative hierarchical positions of the affixes are indicated by the given bracketing; the suffix γ is the affix structurally closest to the root (the 'lowest' affix):

(27)　[$\acute{\alpha}$ - [$\acute{\beta}$ - [[ROOT] - $\acute{\gamma}$]]]

PRESERVE EDGEMOST (x_2) would be violated by the deletion of a level two grid-mark from α *or* from γ, because those accents are furthest from the root on the left and right edges, respectively. It would *not* be violated by deletion of a level two grid-mark on β, because β is not furthest toward the word edge on either side of the root.

Furthermore, were there no suffix in the structure in (27)– were γ absent from the structure – PRESERVE EDGEMOST(x_2) would require that primary stress fall on α. It would not be satisfied by preserving an accent on the root, even if that accent were at the right edge of the wrod, because the root morpheme will never count as edgemost for the morphological purposes of this constraint.

PRESERVE EDGEMOST(x_2) must be outranked by CULMINATIVITY, as only *one* edgemost accent is ever preserved. It must also outrank the ALIGN(x_2, R) constraint in order to force leftward stress assignment:

With these rankings, the inclusion of this constraint enables us to account for the fact that, in words where all accents are either on the root on on prefixes, stress falls on the leftmost accent. This is shown in the tableau in (28), where the root morpheme is bolded in the input:

(28)　PRESERVE EDGEMOST (x_2) , MAX (x_2) ≫ALIGN(x_2, R) ≫ALIGN(x_2, L)

nées-sepée-sléew-**cúukwe**-cee	PRES-EDGES	MAX (x_2)	ALIGN(x_2 R)	ALIGN(x_2 L)
a. ☞ née-sepè-slèw-cùkwè-ce		***	****	
b. nèe-sepè-slèw-cùkwé-ce	*!	****!		****
c. nèe-sepè-slèw-cúkwè-ce	*!	***	*	**
d. nèe-sepè-sléw-cùkwè-ce	*!	***	**	**

When an accented suffix is present, the same ranking predicts the reassertion of right-aligned primary stress: note that the prefix-stressing and suffix-stressing candidates incur equal violations of PRESERVE EDGEMOST (x_2):

(29)   PRESERVE EDGEMOST (x_2) , MAX (x_2) $\gg$ALIGN(x_2, R) $\gg$ALIGN(x_2, L)

hii-nées-**wéeyik**-úu-see	PRES-EDGES	MAX (x_2)	ALIGN(x_2 R)	ALIGN(x_2 L)
a. ☞ hì-nès-wèyik-úu-se	*	**		***
b. hì-nés-wèyik-ùu-se	*	**	*!*	*
c. hì-nès-wéyik-ùu-se	**!	**	*	**

The fact that PRESERVE EDGEMOST enables us to account for the non-cyclic interaction between accented prefixes and suffixes in Nez Perce justifies its existence in spite of the non-canonical interaction between phonology and morphology that is central to its evaluation.

4   Nez Perce as a default-to-opposite system

Upon first review, the reversal of alignment triggered by stressed prefixes in Nez Perce may not appear to resemble classic default-to-opposite stress patterns. This sections shows, however, that the analysis of nez perce stress developed here places these facts within the typology of default-to-opposite (or 'conflicting directionality') phenomena proposed in Zoll (2002). Indeed, patterns with the profile of Nez Perce are predicted, in a typology of stress that includes accentually-determined stresses (accents) whose surface distribution is governed by faithfulness, rather than markedness, constraints.

In classic default-to-opposite stress systems, stress is aligned at one word edge in words containing only light syllables, but will fall on the heavy syllable closest to the *opposite* edge in words containing at least one heavy syllable. In most cases of default-to-opposite stress that have been described (Gordon, 2000), primary stress falls on a rightmost heavy syllable, but otherwise is initial (this is the case, for example, in Selkup: Halle and Clements, 1983; Idsardi, 1992).

Zoll proposes that default-to-opposite systems emerge when marked structures are limited in their distribution to either initial or final position, while more general constraints align the unmarked versions of such structures at the opposite edge.

For languages in which stress is either initial (if on a light syllable) or rightmost (if on a heavy syllable), Zoll argues for the existence of positional licensing constraints affecting the distribution of marked stressed syllables (i.e. stressed light syllables). She proposes that such syllables are able to surface *only* when they are in an independently prominent position within the word: for example, the initial syllable of the word. Such constraints may exist quite generally in a language, but their effect will be apparent only when they outrank the general stress alignment constraints for a language, *and* when the general stress alignment constraints would have aligned the marked stress at the opposite word edge.

The analysis of Nez Perce presented in this paper conforms to this general pattern, in there is a constraint (PRESERVE EDGEMOST) that applies only to a subset of stresses in the language, which outranks the general alignment constraints in the language, and whose effect is visible exactly when it requires that a given instance of stress appear at the opposite edge from where the general alignment constraints would have placed it.

What distinguishes Nez Perce from the languages discussed in Zoll (2002) is that the alignment reversal is not triggered by positional *licensing*, but by positional *faithfulness*.

However, Zoll's original discussion is framed only in terms of languages in which the position of stress is a function of properties of the output form. Once we look more broadly, considering also languages in which there is stress (i.e. accent) in the input, we expect to find languages with exactly the profile of Nez Perce, in which it is faithfulness, rather than markedness, that interacts with general

stress alignment in order to produce a default-to-opposite pattern. Nez Perce therefore presents an in-direct confirmation of Zoll's analysis of default-to-opposite phenomena, against alternative proposals (such as Gordon, 2000, in which default-to-opposite patterns are an illusion resulting from intonational prominence).

5   Against a previous analysis

The previous analysis of morphologically determined stress in Nez Perce was presented in Crook (1999). Crook provides a thorough overview of the phonolology and morphology of Nez Perce, and is concerned with morphologically determined stress not only in verbs but also in nouns. His ac-count of the leftward attraction of stress onto accented prefixes, however, is largely independent of his account of the different patterns found in nouns, and so can be compared directly with the account pro-posed in this paper.

Crook develops his analysis within a model of OT that allows constraints to be cyclically re-ranked, consistent with other proposals for cyclic implementations of OT such as Stratal OT (Kiparsky, 2000).

The ability of constraints to be re-ranked is crucial to Crook's analysis of the leftward attraction of stress onto accented prefixes. Crook proposes that accented prefixes trigger a re-ranking in which a constraint *STRESSED LEXICAL HEAD, defined in (30), is promoted over the ALIGN constraints other-wise responsible for the location of primary stress:[8]

(30)   *STRESSED LEXICAL HEAD
       "Main stress must not be assigned to the lexical head." (Crook, 1999, p. 454)

This constraint will not, by itself, require that stress fall on a leftmost accented prefix: it will be satisfied by stress falling on any non-root morpheme. Crook proposes that stress becomes leftmost be-cause the constraint re-ranking triggered by accented prefixes is accompanied by cyclic *bracket erasure*: after an accented prefix is appended to a word, all interior brackets are erased. Thus, the only morpho-logical constituent distinguishable from the root will be the outermost (i.e. leftmost) prefix, and so the constraint in (30) will mandate that stress fall on that prefix.

Thus, for the purposes of stress assignment, the full bracketed structure in (31a) will be treated as the partially-bracketed structure in (31b).

(31)   Original bracketing: *sepéeslèwcùkwèce* 'I make you know by seeing.'

       [sepée [sléew   [cúukwe]]] -cee
       [CAUS [by.seeing [know]]]   INC

       After bracket erasure:

       [sepée [sléew   cúukwe]] -cee
       [CAUS [by.seeing know]]   INC

Applied to the structure in (31b), *STRESSED LEXICAL HEAD will require that stress be placed on the leftmost prefix.[9]

Having thus accounted for the ability of accented prefix to trigger unexpectedly left aligned stress, Crook turns to the complication of accented suffixes. As we have already seen, the re-assertion of rightmost stress by suffixes is *non-cyclic*, in that it does not depend on the relative scope of prefixes and suffixes. A cyclic account such as Crook's, however, predicts that a suffix within the scope of an accented prefix should have the brackets dividing it from the root erased by bracket erasure, and thus

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[8] This constraint is also used by Crook to account for stress in noun-noun compounds. In a significant proportion of such cases stress is required to fall on the non-head member of the compound.

[9] It would also be satisfied by stress being placed on the final inflectional suffix, which is plausibly outside the scope of the causative prefix and hence is not subject to bracket erasure, but the suffix is not an accented morpheme and so is not a potential location for primary stress.

predicts that *Stressed Lexical Head should be violated by stress falling on such a suffix. Thus in (32), if the accented prefix *nées* triggered total bracket erasure, the suffix *úu* would no longer be morphologically distinguishable from the verb root:

(32)   Original bracketing: *hìnàsapàpàynóoca* 'he makes them arrive toward him':

        [hii [nées [sepée [[páay] núu]]]]   cee
        [3   [PLOB [CAUS [[cross] toward]]]] INC

    After bracket erasure (triggered by accented prefix *nées*):

        [hii [nées [sepée páay núu]]]   cee
        [3   [PLOB [CAUS cross toward]]] INC
    Incorrectly predicted output: *hì-**náa**-sapà-pày-nò-ca
    Actual output: hì-nà-sapà-pày-**nóo**-ca

        Recall that in the analysis proposed in section , this problem did not arise, because the constraint responsible for primary stress falling on a leftmost prefix (Preserve Edgemost(x_2)) was *also* satisfied by primary stress falling on an accented suffix, though not by primary stress falling on the verb root. The problem for Crook's analysis is that *Stressed Lexical Head will only require stress to fall on a leftmost accented prefix when it is combined with a process of bracket erasure, and once bracket erasure is employed it destroys the ability of suffixes to be distinguished from the verb root.

        Crook's solution to this problem is to protect the brackets separating accented suffixes from the root from erasure: bracket erasure is therefore only partial, and brackets separating accented suffixes from their base are not erased. Thus, even after bracket erasure, an accented suffix is still distinguishable from the root for the purposes of a constraint such as *Stressed Lexical Head. This revision is illustrated in (33), where the bracket that is protected from being erased by the following accented suffix is circled:

(33)   Original bracketing: *hìnàsapàpàynóoca* 'he makes them arrive toward him':

        [hii [nées [sepée [[páay] núu]]]]   cee
        [3   [PLOB [CAUS [[cross] toward]]]] INC

    After *partial* bracket erasure (triggered by accented prefix *nées*):

        [hii [nées [sepée páay( ])núu]]]   cee
        [3   [PLOB [CAUS cross] toward]]] INC

        With the circled bracket preserved from erasure, the constraint *Stressed Lexical Head will be satisfied by the assignment of primary stress *either* to the accented plural object prefix *nées-*, or to the directional suffix *-núu*. As a result, it is the lower-ranked alignment constraints that decide between these two candidates, and so default rightward alignment is reasserted.

        With the introduction of partial bracket erasure, however, Crook's analysis ceases to present a truly cyclic analysis of the phenomenon, weakening the attraction also of the cyclic re-ranking of constraints that is also required. Furthermore, the analysis relies upon the fundamentally coincidental fact that the set of affixes that are lexically accented is a union of the set of affixes that trigger constraint re-ranking and bracket erasure (the accented prefixes) with the set of affixes whose brackets are protected from being erased (the accented suffixes). The analysis also requires affixes to be able to *revert* the constraint ranking to one in which *Stressed Lexical Head is ranked low, or else unaccented prefixes to the left of accented prefixes would have the pernicious effect of erasing the brackets distinguishing lower accented prefixes from the root, triggering reassertion of rightmost stress. This does not occur.

        These same objections will arise in terms of an alternative non-cyclic account framed in terms of of Alderete's (2001) approach to root-affix accent interactions. Alderete proposes that some languages have affix-controlled accentual systems, in which accented affixes 'erase' accentual contrasts on the constituent to which they attach. Like a cyclic account, this approach would predict that prefix-

suffix stress interactions would be sensitive to the relative scopes of the affixes involved; as they are not, we cannot analyze the Nez Perce data as showing that accented prefixes override inner accentual contrasts.

6   Conclusion

This paper has presented an analysis of morphologically-determined stress assignment in Nez Perce that rests upon a constraint – PRESERVE EDGEMOST – that shows a peculiar kind of morphological sensitivity. This constraint is not sensitive to hierarchical morphological structure, in that it is not sensitive to the relative scopes of prefixes and suffixes, but is nonetheless sensitive to linear morphological *boundaries*, being able to distinguish the root from affixes, and to determine which affix is closest to a word edge. This constraint, which is a differential faithfulness constraint that prefers primary stress to be assigned to peripheral non-root accents, was able to account for the fact a leftmost prefixes disrupta the otherwise-rightmost patterns of stress assignment in Nez Perce *only* when it carries the only non-root peripheral accent in a word.

Sensitivity of phonological processes to linear rather than hierarchical morphological constituency has not been widely described in the literature, and in fact goes against the long-established, and generally successful, tradition of accounting for morpho-phonological interactions in *cyclic* terms. Assuming that it is correct to describe the Nez Perce data as non-cyclic, the very existence of this kind of phonological process is theoretically interesting.

Given recent proposals to account for cyclic phenomena in terms of Output-Output correspondence (Benua, 1997, and subsequent work), we might wonder if there is a residue of cases in which the evaluation of output forms is truly sensitive to the morphological constituency of the input, but the sensitivity is constrained to the kind of linear structure proposed here. This is an interesting question for further research, and one which deserves a broader review of the literature on non-cyclic phonology-morphology interactions.

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