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# Constraint Universality and Prosodic Phrasing in Māori[*],[†]

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This paper explores the notion that all constraints are present in all grammars ('Universality'). For any pair of constraints, Universality is shown to produce four types of system, differing in terms of the constraints' activity (i.e. visible effect). Conditions on the typological predictions are identified. Building on Samek-Lodovici (1996, 1998a,b), one of the more surprising results – that two constraints may both be active in a language even if they conflict – is explored for the syntax-phonology interface. The empirical focus is the Polynesian language Māori, where it is argued that both left and right edges of lexical syntactic phrases align with the left and right edges of Phonological Phrases respectively.

## 1. Introduction

The aim of this paper is to examine the hypothesis in (1), with special reference to its effect on syntax-prosody interaction.

(1) <u>Universality</u>: All constraints are present in all grammars.

Universality hypothesizes that there is no choice about whether a grammar contains a constraint or not: if a constraint is present in the constraint component CON or is produced by one of CON's schemas, it is present in all grammars (Prince & Smolensky 1993, Green 1993, McCarthy & Prince 1993b:6).

The hypothesis in (1) implicitly underlies the majority of work in Optimality Theory, and has been explicitly discussed by Prince & Smolensky (1993), Green (1993), Samek-Lodovici (1996, 1998a,b), and McCarthy (2002a§1.2.1,§3.1.5.2).[1] This paper

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[†] Abbreviations used in this paper are PPh 'Phonological Phrase', IP 'Intonational Phrase', TP 'Tense phrase', ACC 'accusative case', pass 'passive suffix', PROG 'progressive aspect'. Symbols used: [$_{XP}$ ] enclose a syntactic phrase of type X; { } mark PPh edges, ⟦ ⟧ mark IP edges, ( ) mark PrWd edges, ˝ indicates PPh-level stress, and ˊ marks PrWd-level stress.

[1] 'Universality' is used here in place of Green's (1993) term 'Completeness'.

expands on this previous work by discussing Universality further, and identifying its typological consequences and limits.

One of Universality's most striking predictions relates to pairs of 'similar' constraints, such as those derived from the same schema (Samek-Lodovici 1998a,b). The examples discussed in this paper involve McCarthy & Prince's (1995) ANCHOR schema, given in (2).

(2) ANCHOR-E($Cat_1$, $Cat_2$)
"For all $Cat_1$, the element at edge E of $Cat_1$ has a correspondent at edge E of some $Cat_2$."
(i) E ∈ {left, right}
(ii) Cat1, Cat2 ∈ {prosodic, morphological, and syntactic constituents}
[McCarthy & Prince 1995:123, slightly reformulated]

For the interaction of prosody and syntax, the most relevant categories are the Phonological Phrase (PPh) and syntactic phrases that are headed by the major lexical categories Noun, Adjective, and Verb (i.e. open class items – abbreviated as XP) (Selkirk 1986, 1995, Selkirk & Shen 1990). The two constraints of interest here are ANCHOR-Left(XP,PPh) and ANCHOR-Right(PPh,XP) (Selkirk 1995, Truckenbrodt 1995). These constraints require the leftmost and rightmost elements respectively of lexical XPs to also be the leftmost/rightmost elements of PPhs.

Universality predicts that a grammar cannot choose between ANCHOR-L(XP, PPh) and ANCHOR-R(XP, PPh) – both constraints are present in every grammar. More generally, Universality predicts four general types of language, given in (3). ℂ is a set of constraints that renders the ANCHOR constraints inactive (see section 3).

(3) <u>Universality's predicted typology for ANCHOR-L and ANCHOR-R</u>

| | | |
|---|---|---|
| (a) | ‖ ANCHOR-L » ℂ » ANCHOR-R ‖ | *Left alignment only* |
| (b) | ‖ ANCHOR-R » ℂ » ANCHOR-L ‖ | *Right alignment only* |
| (c) | ‖ ANCHOR-L, ANCHOR-R » ℂ ‖ | *Both edges must align* |
| (d) | ‖ ℂ » ANCHOR-L, ANCHOR-R ‖ | *No alignment imposed* |

If Universality is not valid, not all of the systems in (3) would necessarily exist. For example, a theory without Universality could prevent both ANCHOR-L and ANCHOR-R from appearing in the same grammar (as in parametric theories – section 3.1); such a theory would predict that option (c) does not exist. This point is particularly relevant to PPh-XP alignment because Truckenbrodt (1995:81) has observed that only systems (a) and (b) have been reported to exist in natural language.

This paper will show that option (c) does in fact exist, and is found in the Polynesian language Māori. An example is given in (4). Braces mark PPh boundaries and ⟦ ⟧ represent Intonational Phrase boundaries.

(4) ⟦ ka {ɸı̋u -a} e { mẽ́ɾe } taːna{ kẽ́te } ki te { mṍana } ⟧
[$_{CP}$ C+T throw-PASS [$_{TP}$[$_{PP}$by [$_{NP}$Mary]] [$_{TP}$[$_{DP}$her [$_{NP}$bag]] [$_{PP}$ to the [$_{NP}$ sea ]]]
"Mary threw her bag into the sea."(lit."her$_i$ bag was thrown into the sea by Mary$_i$")

The claim that both ANCHOR-L(XP,PPh) and ANCHOR-R(XP,PPh) exist builds on Samek-Lodovici's (1996, 1998a,b) work, which argues a similar point for a pair of ALIGN constraints that relate focused constituents and word order (i.e. ALIGN-L(focused_XP, VP) and ALIGN-R(focused_XP,VP)). The relation of the results in this paper to Samek-Lodovici's are discussed in section 3.

Section 2 discusses Universality and its implications for the relation between lexical XPs and PPhs. Māori is shown to have a system in which both left and right edges of XPs and PPhs must coincide, and so where both ANCHOR-L(XP,PPh) and ANCHOR-R(XP,PPh) are active.

Section 3 discusses Universality's typological predictions and identifies situations when pairs of constraints cannot produce the full range of options in (3). The relation of parametric theories to Universality is also discussed.

Section 4 presents a summary and conclusions.

## 2. Universality and prosodic phrases in Māori

The aim of this section is to show that Universality makes the right predictions for the constraints ANCHOR-L(XP,PPh) and ANCHOR-R(XP,PPh): both can be visibly active in a single grammar. This specific case serves as an example of the more general typological predictions of Universality.

The constraints ANCHOR-L(XP,PPh) and ANCHOR-R(XP,PPh) are the focus of this section because they seem to pose a challenge to Universality. Previous work has identified languages in which one or the other has a visible effect: e.g. ANCHOR-L(XP, PPh) in Japanese (Selkirk & Tateishi 1988, Truckenbrodt 1995), and ANCHOR-R(XP, PPh) in Chi Mwiini (Selkirk 1986, Truckenbrodt 1995). However, no language has been reported in which both are visibly active (Truckenbrodt 1995:81). If there is no such language, Universality's prediction (3c) is incorrect. However, the following subsections argue that Māori is a language of this type.

Māori is a Polynesian language, native to New Zealand. The data presented in the following sections come from my own fieldwork, from members of the Ngāti Pōrou and Ngāti Awa tribes. Prosodic Phrasing in Māori has been previously discussed by Biggs (1961) and Bauer (1993), and the relation of focus to phrasing has been discussed by Bauer (1991, 1997). The present results agree broadly with both Biggs' and Bauer's findings, although certain theoretical assumptions are different.

The aim of this section is to show that both left and right edges of lexically headed syntactic phrases (XPs) coincide with the left and right edges respectively of PPhs. To achieve this aim, section 2.1 provides background information on Māori syntactic structure. Section 2.2 argues that left edges of XPs coincide with left PPh edges, while section 2.3 shows that the right edges of XP also coincide with PPh right edges.

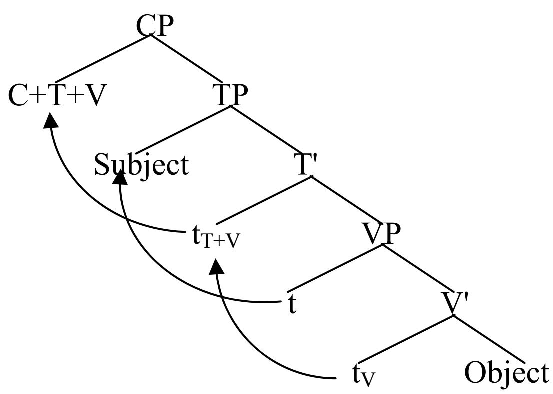
## 2.1 Syntactic structure in Māori

The surface form of a kernel declarative verbal sentence in Māori can be described by the template [Tense ($\text{Adverbs}_{I}$) Verb ($\text{Adverbs}_{II}$) Subject Object]. Tense morphemes come first, followed by a very restricted set of adverbs (Bauer 1997:317ff). The verb can be separated from its arguments by several functional elements, including aspect markers and certain adverbs. The subject standardly precedes the object (Bauer 1997:48-9, Pearce 1997). (5) provides an example of a transitive sentence.

(5) e kai ana ŋaː tamaɾiki i ŋaː aːporo
TNS eat PROG the(pl.) child ACC the(pl.) apple
'The children are eating the apples'

Following much previous work, I assume that the verb moves out of the VP and adjoins to the head of a higher phrase (Sproat 1985, Waite 1989, 1994, Collberg 1994, Pearce 1995, 1997, Pearce & Waite 1997). Specifically, the V head-moves to C. The subject moves to the specifier of the Tense Phrase, as required by the Extended Projection Principle (Chomsky 1981, 1995). The object may remain in situ, though this issue will not prove significant for present purposes (see Pearce 1995, Waite & Pearce 1997 *cf* Waite 1989, de Lacy 1999).

(6)




Arguments in Māori can be determiner phrases (DPs), prepositional phrases (PPs), or clauses (CPs/TPs). Prepositional phrases have the order [P DP], and determiner phrases have the structure [D N (Adj)(PP*)]; only one adjective is permitted per NP, but any number of modifying PPs can be present.

## 2.2 Left edges

The aim of this section is to show that left XP boundaries coincide with left PPh boundaries in Māori. As background to Māori phonology, its phonemes are listed in tables (7) and (8). Syllables have the shape $(C)V_1(V_2)$, where $V_2$ is equally or less sonorous than $V_1$.

(7) Māori Consonants

| | | | |
|---|---|---|---|
| p | t | k | |
| f / ɸ | | | h |
| m | n | ŋ | |
| | ɾ | | |
| w | | | |

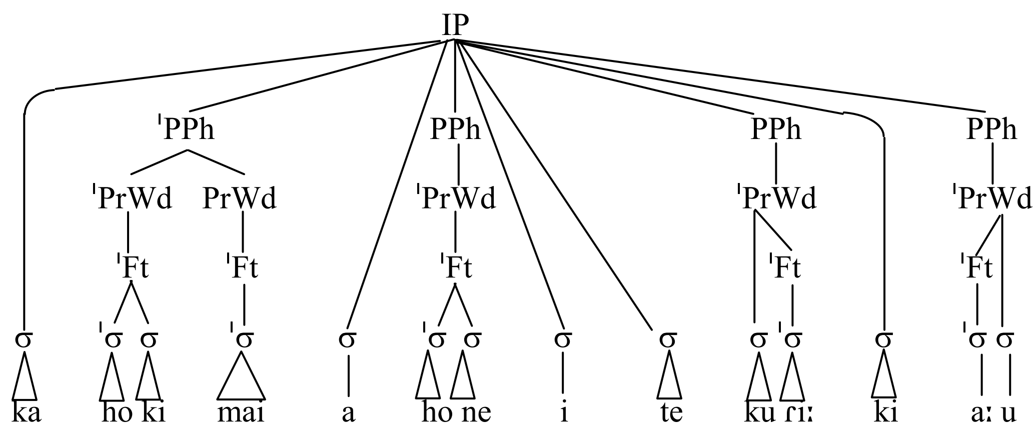
(8) Māori Vowels

| | | | | |
|---|---|---|---|---|
| i | iː | | u | uː |
| e | eː | | o | oː |
| | | a aː | | |

An example of the relation between lexical XPs and PPhs is given in (9). The following sections will argue that it has the prosodic structure indicated, which is also presented graphically in (10). The IPA stress symbol ˈ marks prosodic heads. (11) shows the $F_0$ for this sentence, from a female Māori speaker.[2]

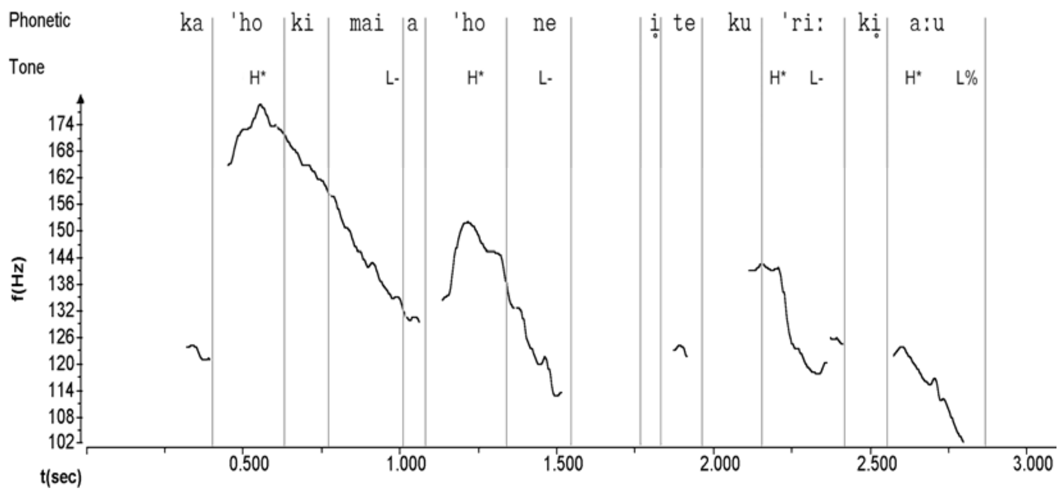
(9) H* $L^-$ H* $L^-$ H*$L^-$ H* L%
⟦ {ka (hő́ki)(mái)} a {(hő́ne)} i te {(kuɾí́ː)} ki { (á́ːu) }⟧
[$_{CP}$C+T return here[$_{TP}$[$_{DP}$the[$_{NP}$John]][$_{VP}$[$_{PP}$ACC the [$_{NP}$dog]] [$_{PP}$to [$_{NP}$the+1p.sg]]]]]
'John returned the dog to me (here).'

(10)




[2] The final PP is orthographically *ki a au*. The consultant coalesced the determiner *a* with the pronoun *au* to form [áːu].

(11)




The main diagnostics for PPh boundaries in Māori are intonation and pause. PPhs serve as the primary domain for intonation tunes.[3] The default declarative intonation consists of a H*L$^{-}$ tune that appears in every PPh (also see Bauer 1993:559); the transcription in (9) and pitch track in (11) marks high (H*) and low (L$^{-}$, L%) pitch targets. The high target is reached over the most prominent syllable in every PPh, and the low target is reached at the end of every PPh. Without the phrasal boundaries as indicated, the reason for the placement of the L tones would be mysterious, to say the least.[4] Further support is provided by pause (also see Biggs 1961:11): in moderately paced natural speech, a brief period of silence occurs after right-PPh boundaries (e.g. 20-30ms for one male consultant).

While intonation and pause provides direct evidence for right PPh boundaries, there is no direct evidence for left PPh boundaries (e.g. there is no left phrase accent, no PPh-initial lenition, etc.). In addition, there is no other phonological process demonstrably bounded by the left PPh edge in Māori. At the very least, the PPh left edge must appear before the PrWd that receives the pitch accent.[5] I have found no evidence to suggest a more inclusive phrasing (e.g. where the PPh includes elements before the PrWd, as in *{a (hṓne)}), so the minimally inclusive phrasing is adopted here.

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[3] Also see Biggs (1961:15*ff*) for a detailed discussion of phrase formation in Māori. Biggs' boundaries relate to the units used herein as follows: # = IP boundary, // = PPh boundary, and PrWds are 'contour words' (p.17). Biggs' generalizations are generally in agreement with the ones made here. Apparent differences may be due to differences in the rate of speech of Biggs' data, and the attendant reduction of PPh size.

[4] The intonation tune does not have a H*+L pitch accent. Such a tune would predict a sharp drop to low immediately after the head of the PPh. In contrast, the descent from high to low pitch is gradual, stretching from the head of the PPh to its right edge. An example is seen in (11) after the first H* – there is a gradual drop from the head *ho* to the end of the PPh (i.e. at the end of *mai*). Bauer (1993:559) also provides relevant discussion.

[5] If a PrWd bears the pitch accent, it is the head of a PPh. Therefore, a PPh node dominates it, and the left edge of the PPh therefore coincides or falls before the left edge of the PrWd, due to facts about the prosodic hierarchy: a PPh's left edge cannot fall inside a PrWd that it dominates.

Example (9) shows that the grammar requires left XP edges and left PPh edges to coincide. If the grammar did not require left XP boundaries to coincide with left PPh boundaries, there would be no reason to have the boundary before the first NP [hone].

The competing hypothesis would be that the language only requires *right* XP boundaries to coincide with *right* PPh boundaries. However, there is no right XP boundary before [hoki]; there is only a verb and a directional particle, which is not contained inside a lexical XP (recall that the verb has moved out of the VP to adjoin to T).

In other words, if the language did not explicitly require left XP and PPh boundaries to coincide, (9) should be parsed as *⟦{ka hoki mai a hṓne}i te {kuɾiː}ki {aːu}⟧. More generally, the first lexical XP of a sentence would be parsed into the same PPh as all preceding elements in this situation.

Further evidence for left edge alignment is found in constructions with embedded XPs. The example in (12) is a DP that contains two modifying PPs.

(12) ⟦ te { (hā́oɾa)} o te ɾua {(kā́ɾaka)} o te { (ā́hiahi) } ⟧
[$_{DP}$the [$_{NP}$hour [$_{PP}$of [$_{DP}$the two [$_{NP}$clock [$_{PP}$of [$_{DP}$the [$_{NP}$afternoon]]]]]]]]
"Two o'clock in the afternoon."

PPh boundaries appear at the left edges of all NPs in (12). Importantly, the structure contains no medial XP right edge, so a requirement that the right edges of XPs and PPhs coincide is not enough to explain the PPh structure in (12); if there were no requirement that left edges of XPs and PPhs must coincide in the language, the prosodic structure should be *⟦{te haoɾa o te ɾua kaɾaka o te ahiahi}⟧.

Evidence that the right PPh boundaries are where they are indicated again comes from intonation and pause: pitch descends to low at the end of *haora*, not *rua*, indicating that the phrasing is indeed ⟦…haoɾa} o te ɾua {kaɾaka}⟧ and not *⟦…haoɾa o te ɾua}⟧.

To summarize, Māori imposes a requirement that the left edge of every XP line up with the left edge of a PPh. Without such a requirement, a string without right-edge XP boundaries should be parsed into a single PPh, incorrectly predicting that a simple intransitive declarative sentence should have the phrasing *⟦{T V DP}⟧, not the attested ⟦{T V}{DP}⟧. The same goes for complex DPs: without left edge alignment, there should be no PPh boundaries medially in complex NPs, predicting a structure such as *⟦{N P NP}⟧, not the attested ⟦{N}{P NP}⟧.

### 2.2.1 Analysis

The constraint ANCHOR-L(XP,PPh) requires the left edge of every XP to coincide with the left edge of a PPh. In Māori, this constraint must outrank every constraint that seeks to minimize PPhs, such as *PPh. Tableau (13) illustrates this ranking. For the sake of brevity, the direct and indirect objects are left out of example (9) and only lexical XP boundaries are marked.

(13)

| /ka hoki mai a [$_{NP}$ hone]/ | ANCHOR-L(XP,PPh) | *PPh |
|---|---|---|
| ☞ (a) ⟦ka {hőki mái} a {hőne}⟧ | | * * |
| (b) ⟦ka {hóki mái a hőne}⟧ | *! | * |

Candidate (b) does not have a PPh boundary at the left edge of the NP [hone], so it fatally violates ANCHOR-L(XP,PPh). In contrast, all left lexical XP boundaries in (a) match up with left PPh boundaries: there is just one lexical XP in this case: *hone*'s NP. If the ranking were reversed, (a) would be incorrectly eliminated as it contains more PPhs than (b).

### 2.2.2 PrWds and the Left Edge

The PPh over *hoki mai* in the example above requires further explanation. In other words, some account must be given of the losing candidate *⟦ka hoki mai a {hőne}⟧, where only the NP is parsed into a PPh while the preceding material is adjoined directly to the Intonational Phrase.[6] This form is of significant interest because it does not violate ANCHOR-L(XP,PPh). The reason for its failure is instead due to restrictions on PrWd formation. In Māori, every root (noun, verb, adjective, adverb) forms a PrWd.[7] So, in (9), *hoki, mai*, *hone*, *kuɾiː*, and *aːu* all form separate PrWds. In contrast, non-roots cannot form PrWds. So, in *i te kuɾiː*, the PrWd structure *⟦(í te)(kuɾiː)⟧ is not permissible because *i* and *te* are not root elements.

The restrictions on PrWds are due to the effect of the constraints ANCHOR-L/R(Root, PrWd) and ANCHOR-L/R(PrWd, Root); these constraints are straightforward instantiations of McCarthy & Prince's (1995) ANCHOR schema, and have precursors in Selkirk's (1995) constraints on root-PrWd interaction. (14) provides definitions of the left-edge constraints.

(14) ANCHOR-L(Root,PrWd) "The left edge of every Root coincides with the left edge of every PrWd."
ANCHOR-L(PrWd,Root) "The left edge of every PrWd coincides with the left edge of every Root."

ANCHOR-L(Root, PrWd) and ANCHOR-R(Root,PrWd) are violated when a root is not contained in a separate PrWd: e.g. *[i te kuɾiː]. This constraint outranks all constraints that seek to minimize the number of PrWds – e.g. *PrWd.

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6 Intonational Phrase (IP) edges align with CPs in Māori. The right boundary of IPs is easily identifiable by the fact that the final vowel is almost always devoiced (Biggs 1961:11). IPs are also the domain of downdrift: the phonetic targets for tones lower successively throughout the IP, but the target is reset at the beginning of every IP (Bauer 1993:559-560).

7 There are several diagnostics for PrWd boundaries, including stress and syllabification (de Lacy 2002).

(15)

| /i te kuɾiː/ | ANCHOR-L(Root,PrWd) | *PrWd |
|---|---|---|
| ☞ (a) i te (kuɾíː) | | * |
| (b) i te kuɾiː | *! | |

ANCHOR-L(PrWd, Root) effectively bans gratuitous proliferation of PrWds. For example, *[(í te)(kuɾíː)] violates ANCHOR-L(PrWd, Root) because the left edge of the first PrWd does not coincide with the left edge of a root – *i* is not a root. The most harmonic parse of *i te kuɾiː*, then, is [i te (kuɾíː)].

ANCHOR-L(PrWd, Root) must outrank all constraints that require material to be incorporated into a PrWd, such as EXHAUSTIVITY(PPh) (after Selkirk 1995).

(16) EXHAUSTIVITY(PPh) "PPhs may only dominate PrWds" (Selkirk 1995).

(17)

| /i te kuɾiː/ | ANCHOR-L(PrWd,Root) | EXHAUSTIVITY(PPh) |
|---|---|---|
| ☞ (a) ⟦i te {(kuɾíː)}⟧ | | * |
| (b) ⟦(í te)(kuɾíː)}⟧ | *! | |

The preceding discussion of PrWd formation provides a way to explain why [hoki mai] is contained in a PPh in ⟦ka {(hőki)(mái)} a {(hőne)}⟧. This phrasing follows from a requirement that all PrWds be contained inside a PPh, effected by the constraint PARSE-PrWd (analogous to Prince & Smolensky's 1993 PARSE-σ).

(18) PARSE-PrWd "Every PrWd is dominated by a PPh."

The attested phrasing ⟦ka {(hőki)(mái)} a {(hőne)}⟧ does not violate PARSE-PrWd, while *⟦ka (hóki)(mái) a {(hőne)}⟧ does by failing to incorporate (hoki)(mai) into a PPh. Like ANCHOR-L(XP,PPh), PARSE-PrWd must outrank those constraints that seek to minimize PPhs (i.e. *PPh).

(19)

| /ka hoki mai a [$_{NP}$ hone]/ | PARSE-PrWd | *PPh |
|---|---|---|
| ☞ (a) ⟦ka {(hőki)(mái)} a {(hőne)}⟧ | | * * |
| (b) ⟦ka (hóki)(mái) a {(hőne)}⟧ | * *! | * |

ANCHOR-L(Root,PrWd) must also outrank *PPh otherwise violations of PARSE-PrWd could be eliminated by not parsing *hoki* and *mai* into PrWds.

Diagram (20) presents the core rankings identified in this section. The constraints ANCHOR-L(PrWd,Root) and EXHAUSTIVITY(PPh) are omitted as they do not interact with ANCHOR-L(XP,PPh).

(20) *Interim ranking summary*

ANCHOR-L(XP,PPh)    PARSE-PrWd    ANCHOR-L(Root,PrWd)

*PPh    *PrWd

For prosodic phrasing, the significant rankings are || ANCHOR-L(XP,PPh) » *PPh || and || PARSE-PrWd, ANCHOR-L(Root,PrWd) » *PPh ||. The former ranking ensures that XP left edges are aligned with PPh edges; the latter ensures that every PrWd appears in a PPh.

## 2.3 Right edges

Māori also requires the right edges of lexical XPs to coincide with the right edges of PPhs. Relevant evidence is found in constructions where the right edge of a lexical XP is not immediately followed by the left edge of another XP. Clear cases are found in constructions with a Subject-Verb-Object order.

SVO constructions come about through topicalization (21), indefinite-subject fronting ((22) – Chung 1978, Polinsky 1992), or subject inversion processes (23). Without the requirement that the right edges of lexical XPs coincide with PPhs, there should be no PPh boundary after the fronted NP.

(21) ⟦ ko te { (tấŋata)} ka {(hấeɾe)} ki te { (mốana)} ⟧
[$_{CP}$[$_{PP}$TOPIC [$_{DP}$the [$_{NP}$man ]]] [$_{C'}$ C+T go [$_{TP}$[$_{VP}$[$_{PP}$to [$_{DP}$the [$_{NP}$ocean ]]]]]
"It is the man who went to the ocean."

(22) ⟦ he {(tấŋata)} ka {(hấeɾe)} ki te { (mốana)} ⟧
[$_{CP}$[$_{DP}$a [$_{NP}$man ]] [$_{C'}$ C+T go [$_{TP}$[$_{VP}$[$_{PP}$to [$_{DP}$the [$_{NP}$ocean ]]]]
"A man went to the ocean."

(23) ⟦ { (ı̃nanahi) } te { (tấŋata)} ka{(hấeɾe)} ki te { (mốana)}⟧
[$_{CP}$[$_{AdvP}$ yesterday] [$_{TP}$[$_{DP}$the [$_{NP}$man ] T go [$_{VP}$[$_{PP}$to [$_{DP}$the [$_{NP}$ocean]]]]]
"Yesterday, the man went to the ocean."

The constraint ANCHOR-R(XP,PPh) is needed to induce a right PPh boundary after *taŋata* in (21). Without such a restriction, there is no need for a PPh boundary at that point. ANCHOR-L(XP,PPh) will not force one to appear as there is no left lexical XP edge immediately after *taŋata*.

Further evidence for ANCHOR-R(XP,PPh) is found in a particular type of genitive construction, illustrated in (24).

(24) ⟦ t -oː te { (mấːhita)} {(ɸấɾe)} ⟧
[$_{DP}$ the [$_{NP}$ [$_{PP}$ of the [$_{NP}$ teacher]] house]]
"The house of the teacher."

A pause (marking a PPh boundary) is clearly evident after the first (i.e. possessor) noun in slow speech. Without right-edge alignment, such a break should not exist since there is no left-edge XP boundary between *maːhita* and *ɸare*. In other words, without a requirement that right XP edges coincide with right PPh edges, the phrasing for (24) is incorrectly predicted to be *⟦toː te {(maːhita)(ɸare)}⟧.

Having discussed the location of both left and right PPh edges, an alternative can now be dismissed. The alternative is that the language requires PPh edges to coincide with PrWd edges, rather than XP edges. Evidence against this approach can be found in tableau (19). If PPh edges had to coincide with PrWd edges, the output should be *⟦ka{(hoki)}{(mai)}a {(hone)}⟧, not the attested *⟦ka{(hoki)(mai)}a {(hone)}⟧. To generalize this specific example, verbs can be followed by a number of items that are roots but do not head lexical XPs. In these cases, the verb's PrWd is not followed by either a right or left XP boundary, as shown in (25).

(25) ⟦ e {(hа̋eɾe) (ána)} a {(hő̋ne)}⟧
[$_{CP}$T go [$_{AspectP}$PROG [$_{TP}$ [$_{DP}$the [$_{NP}$John]]]]]
"John is leaving."

The first PPh contains two PrWds. Intonation provides evidence for this claim – the H* falls on the stressed syllable of *haere*, but the low boundary tone falls at the end of *ana*. If it were the case that every PrWd formed a separate PrWd, then there should be two PPhs: *⟦e {(hа̋eɾe)}{(ána)}…⟧. In fact, several functional items can follow the verb, all separate PrWds, but all falling in the same PPh as the verb.

In contrast, the proposal that (a) XP edges match up with PPh edges and (b) all PrWds must be parsed into a PPh accounts for the phrasing in (25) straightforwardly; tableau (26) makes this point.[8]

(26)

| /e haeɾe ana a [$_{NP}$ hone]/ | ANCHOR-L(XP,PPh) | PARSE-PrWd | *PPh |
|---|---|---|---|
| ☞ (a) ⟦e{(hа̋eɾe)(ána)}a{(hő̋ne)}⟧ | | | * * |
| (b) ⟦e{(hа̋eɾe)}{(а̋na)}a{(hő̋ne)}⟧ | | | * * *! |
| (c) ⟦e(háeɾe)(ána)a{(hő̋ne)}⟧ | | * *! | * |
| (d) ⟦e{(háeɾe)(ána)a(hő̋ne)}⟧ | *! | | * |

Candidate (d) fails to align a left PPh edge with the XP edge, so fatally violating ANCHOR-L(XP,PPh). Candidate (c), in contrast, avoids violations of ANCHOR-L(XP,PPh) but incurs the wrath of PARSE-PrWd by failing to incorporate the PrWds *haere* and *ana* into a PPh. The competition between (a) and (b) shows that *PPh is still significant in Māori, despite its low rank. It favors candidate (a) as it minimizes the number of PPhs;

[8] Andries Coetzee observes that Selkirk's (1995) EXHAUSTIVITY$_{PPh}$ – a constraint requiring PPhs to dominate only PrWds – could be responsible for (d)'s failure, not ANCHOR-L(XP,PPh). However, evidence that ANCHOR-L(XP,PPh) is necessary in any case comes from sentences with bare noun NPs: e.g. ⟦e {(hа̋ere)(ána)}{(tе̋ːnei)}⟧ beats *⟦e {(háere)(ána)(tе̋ːnei)}⟧ – where *teːnei* 'this one' is a 'compound' Determiner+Noun. Neither of these forms violate EXHAUSTIVITY$_{PPh}$, yet the former beats the latter; the only significant difference is that the latter's left NP edge (i.e. *teːnei*) does not coincide with a left PPh edge – hence the need for ANCHOR-L(XP,PPh).

candidate (c) is gratuitous in this respect – it has PPhs when no higher-ranked constraint compels it to do so.

### 2.3.1 Analysis

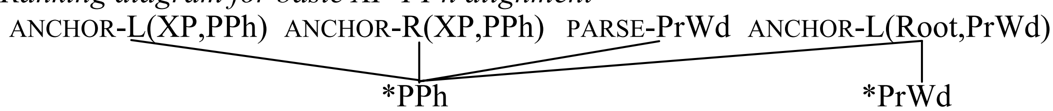
As with ANCHOR-L(XP,PPh), ANCHOR-R(XP,PPh) must outrank all constraints that seek to minimize the number of PPhs (e.g. *PPh). If this were not so, there would be no PPh boundary after the first NPs in (21), (22), and (23). Tableau (27) illustrates this ranking with example (22).

(27)

| /he [$_{NP}$ taŋata] ka haeɾe}/ | ANCHOR-R(XP,PPh) | *PPh |
|---|---|---|
| ☞ (a) ⟦he {tá̋ŋata}ka {há̋eɾe}⟧ | | * * |
| (b) ⟦he {táŋata ka há̋eɾe}⟧ | *! | * |

Diagram (28) adds the ranking in (27) to those established in (20).

(28) *Ranking diagram for basic XP-PPh alignment*




The rankings of most immediate interest are those involving ANCHOR-L(XP,PPh) and ANCHOR-R(XP,PPh). Both necessarily outrank *PPh, and both are active, in the sense that they make a crucial distinction between winning and losing candidates in Māori. The following section will discuss this result in the more general context of Universality.

## 3. Implications of Universality

The preceding section has argued that both ANCHOR-L(XP,PPh) and ANCHOR-R(XP,PPh) have visible effects in Māori. As discussed in section 1 and in Samek-Lodovici (1998b), this situation is entirely expected given Universality.

The Universality hypothesis states that if CON contains a constraint κ, κ is present in every grammar. For every individual constraint κ, then, Universality predicts two types of languages: one in which κ is active, and one in which κ is inactive. Adopting McCarthy's (2002a:12) terminology, a constraint is 'active' iff it is "the highest-ranking constraint that distinguishes some losing candidate from the winner". In other words, the constraint has a visible effect on the grammar, making a crucial distinction between the winning form and a competitor in some competition.[9]

[9] Take a constraint to be a function *f*(S)→W from a set of candidates S to a subset W of S (i.e. 'winners') (Samek-Lodovici & Prince 1999). If constraint $\mathbb{C}_1$ immediately outranks constraint $\mathbb{C}_2$, then $\mathbb{C}_2(\mathbb{C}_1(\text{CAND}))$, where CAND is the set of candidates produced by recursively applying all higher-ranked constraints to the entire candidate set. Thus, κ is active if κ(S)→Z, where Z⊂S.

Extending Universality's predictions to pairs of constraints, four types of system are predicted for almost any constraint pair κ χ, given in (29).

(29)

| | κ | χ | Comment |
|---|---|---|---|
| (a) | active | active | Effects of both κ and χ are visible |
| (b) | active | inactive | Effects of κ alone are visible |
| (c) | inactive | active | Effects of χ alone are visible |
| (d) | inactive | inactive | Effects of neither κ nor χ are visible |

For κ=ONSET and χ=NOCODA, the empirical effects are (a) languages with CV syllables only, (b) languages with a CV(C) syllable template, (c) those with a (C)V template, and (d) those with a (C)V(C) template.

For κ=ANCHOR-L(XP,PPh) and χ=ANCHOR-R(XP,PPh), the typology predicts (a) languages in which both XP edges must align with PPhs' (e.g. ⟦{NP}V{NP}⟧), (b) those in which only left XP-PPh edges must align (e.g. ⟦{NP V}{NP}⟧), and (c) those with right XP-PPh alignment only (e.g. ⟦{NP}{V NP}⟧), and (d) those in which other phonological restrictions determine Phrasing (e.g. ⟦{NP V NP}⟧, favored by *PPh).

- *Caveat 1: Perpetual (in)activity*

There are two caveats regarding the typological schema in (29).

One is that there must be a constraint or constraints that can force κ and χ to be inactive. For example, ONSET can be rendered inactive by the combined effect of NOCODA, DEP, and MAX. Tableau (30) shows that with these constraints outranking ONSET, ONSET is not crucial even for syllabification; its inactivity is indicated by shading of its violations.[10]

(30)

| | /aka/ | NOCODA | DEP | MAX | ONSET |
|---|---|---|---|---|---|
| ☞ | (a) a.ka | | | | * |
| | (b) ak.a | *! | | | |
| | (c) ʔa.ka | | *! | | |
| | (d) ka | | | *! | |

If no combination of constraints could render κ inactive, then options (c) and (d) will not be attested. In practice, almost every constraint proposed in the literature can be rendered inactive. The only two classes of exceptions are (a) those constraints that are undominated (e.g. Selkirk's 1995 HEADEDNESS, which requires a node *n* to dominate at least one node of type *n-1*) and (b) constraints whose violation would result in an uninterpretable form (e.g. the no-crossing constraint – Goldsmith 1976, Sagey 1988). In no grammar are HEADEDNESS or the no-crossing constraint ever inactive.[11]

[10] This further assumes that ONSET's effects cannot be seen in 'emergent' contexts – as in reduplicant form, allomorphy, and so on (McCarthy & Prince 1994).

[11] Of course, these constraints may be part of GEN, and not CON. One could add the requirement that κ and χ must both be potentially active in some grammar. A constraint that is violated equally by all candidates

- *Caveat 2: Mutual inactivation*

A further condition on the typological schema in (29) is that κ and χ cannot render each other inactive. Constraint κ renders χ inactive if (a) κ outranks χ and (b) χ can make no contentful division of the set of winners produced by κ.[12] For example, suppose that κ is *[+voice] and χ is *[-voice]. *[+voice] will eliminate all candidates except for those that have voiceless segments. If *[+voice] outranks *[-voice], then *[-voice] will make no further subdivision in the set of remaining candidates because no candidate will violate *[-voice]. Therefore, *[-voice] is rendered inactive by *[+voice].

If both κ and χ are *mutually* inactivating (i.e. κ renders χ inactive and χ renders κ inactive) then there can be no grammar in which both κ and χ are active (i.e. 29a). However, it is not enough for only one constraint to render the other inactive: if κ renders χ inactive but χ does not render κ inactive, then both can be active in a language through the ranking ‖ χ » κ » ℂ ‖ where ℂ stands for all constraints that individually or collectively render χ and κ inactive.

- *Do mutually inactivating ('perfectly opposite') constraints exist?*

It is difficult to find examples of pairs of constraints that render each other inactive in all situations.

A pair of constraints like *[+voice] and *[-voice] render each other inactive in the large majority of situations, assuming that every segment is specified for voicing. For example, if *[+voice] outranks *[-voice], *[+voice] will produce a set of winners that only include voiceless segments. *[-voice] will therefore be almost always unable to make any further division in the set of winners – thus, *[-voice] is rendered inactive. In this situation, the prediction of Universality is thwarted: while potentially there are grammars with one or the other of the constraints active, there can be none where both are active.

The situation is complicated by fixed rankings. In general, fixed rankings are irrelevant to the present issue: if κ does not render χ inactive, then the fixed ranking ‖ κ » χ ‖ does not ban a grammar where both κ and χ are active.[13] However, if κ does render χ inactive and κ is in a fixed ranking over χ, then χ is effectively inactive. For example, if

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in every situation will always be inactive, and so never produce types (29a,b,c). Of course, there will never be any evidence that a perpetually inactive constraint exists, so this issue never arises in practice.

[12] More precisely, κ renders χ inactive iff (a) ‖ κ » χ ‖ and (b) for all sets of candidates CAND, κ(CAND)→W and for all w⊆W, χ(w)→w. CAND is a set of winning candidates produced by application of all constraints ranked higher than κ. Condition (b) states that for every possible competition, χ is inactive if the set of winners produced by κ (i.e. W) contains no subset that χ can further subdivide into a set of winners and non-null set of losers. χ takes w as an argument rather than W to allow for intervening constraints between κ and χ.

[13] The same point holds for pairs of constraints in a stringency relation (Prince 1997, de Lacy 2002). At first glance, the ranking ‖ *{α,β} » *α ‖ may seem to render *α inactive. However, it does not: if all candidates but [α] and [β] have been eliminated, then *α is active, crucially favoring [β] over [α]. Thus, *{α,β} does not render *α inactive in every situation, so there can be some grammar where both are active.

*[+voice] universally outranks *[-voice], then *[-voice] is effectively universally inactive. Universality would only predict two types of grammars in relation to this pair of constraints: one in which *[+voice] is active, and one in which *[+voice] is inactive. On the other hand, if a constraint is universally inactive, there can be no positive evidence for its existence, so this issue is moot.

However, *[+voice] and *[-voice] are not mutually inactivating in every competition. The one situation in which both can be active is when the null parse [∅] remains in the candidate set (Prince & Smolensky 1993). The null parse satisfies both *[+voice] and *[-voice], so if both constraints outrank all constraints that require retention of segments (i.e. MAX), both constraints will be active. In such a grammar, *[+voice] eliminates all but candidates with voiceless segments and [∅], and *[-voice] divides this set into the winner [∅] and the losers – all those candidates with voiceless segments.

A more likely example involves the pair of constraints *voiced_obstruent and *voiceless_obstruent. Both can be active in a grammar, with the result that all candidates with obstruents are eliminated (i.e. obstruents are banned on the surface). More generally, the possibility of deletion as a response to markedness violations effectively prevents any pair of markedness constraints from being mutually inactivating.

An important point is that many schema-derived pairs of constraints that differ in just one argument are not mutually inactivating, though at first glance they may seem so. For example, ANCHOR-L($Hd_{PrWd}$,PrWd) and ANCHOR-R($Hd_{PrWd}$,PrWd) seem to be mutually inactivating – if main stress is leftmost, it cannot be rightmost (or only vacuously, as in the case of monosyllabic forms) and vice-versa. However, if both constraints outrank MAX, they can both be active, forcing inputs to truncate to form monosyllabic words. This example is discussed further below (see tableau (31)). Again, deletion and other repairs supply a way for both constraints to be active. Thus, they are not 'perfectly opposite' constraints in the sense of mutual inactivation.

So, for all practical purposes, the typology in (29) is valid for all pairs of constraints. Therefore, to show that Universality is false, one only has to show that for *any* pair of constraints, one of the options in (29) does not exist. For example, if there were no language where both ANCHOR-L(XP,PPh) and ANCHOR-R(XP,PPh) are active (i.e. no Māori) then Universality would be incorrect.

- *The subtypes of (29a)*

To clarify the 'inactivation relation' between constraints, two subtypes of (29a) – where both constraints are active in a grammar – can be identified.

In one type, κ and χ are 'complementarily active', and has been discussed in detail by Samek-Lodovici (1998b): for some language L, while κ is active in some competitions in L and χ is active in others, there is no competition in L in which both κ and χ are active (also see McCarthy 2002a§3.1.5.2).

Schematically, this type involves a ranking || κ » χ ||. κ usually renders χ inactive; so for most competitions, χ is inactive. However, for some competitions, either (a) a higher-ranked constraint ξ renders κ inactive, but does not affect χ or (b) there are some environments in which all relevant candidates incur equal violations of κ (i.e. conflation – de Lacy 2002). In these situations, χ's effects can emerge. In short, both κ and χ are active in a global sense: there is some competition in the language in which κ is active, and some competition in which χ is active. In a more limited sense, though, κ and χ's activity is complementary: there is no competition for which both κ and χ are active in the language.

As an example, suppose there are two constraints ANCHOR-L($Hd_{PrWd}$,PrWd) and ANCHOR-R($Hd_{PrWd}$,PrWd); the former requires main stress to be leftmost in a PrWd, while the latter requires it to be rightmost. After McCarthy (2002b), the constraints are categorical: i.e. [batáka] and [bataká] incur the same violations of ANCHOR-L($Hd_{PrWd}$,PrWd). If ANCHOR-L($Hd_{PrWd}$,PrWd) outranks its ANCHOR-R counterpart, the ANCHOR-R constraint will be rendered inactive for most competitions. However, suppose there is a higher-ranked constraint against stressed schwa (*σ́/ə). With *σ́/ə outranking ANCHOR-L($Hd_{PrWd}$,PrWd), ANCHOR-R($Hd_{PrWd}$, PrWd) will be active when the initial syllable is a schwa, as shown in tableau (31).

(31)

| /bətaka/ | *σ́/ə | ANCHOR-L($Hd_{PrWd}$,PrWd) | ANCHOR-R($Hd_{PrWd}$,PrWd) |
|---|---|---|---|
| (a) bə́taka | *! | | * |
| (b) bətáka | | * | *! |
| ☞ (c) bətaká | | * | |

ANCHOR-L($Hd_{PrWd}$,PrWd) is rendered inactive in this competition: it fails to make any contentful subdivision of the candidate set. In short, even though ANCHOR-R($Hd_{PrWd}$,PrWd) is rendered inactive by ANCHOR-L($Hd_{PrWd}$,PrWd) in the majority of cases, it is active in some competitions in the language – i.e. whenever ANCHOR-L($Hd_{PrWd}$, PrWd) is rendered inactive, so it fits into type (29a).

The other subtype of (29a) is when κ and χ are 'freely active': i.e. there is some competition in which both κ and χ are both active. To use the constraints above, both ANCHOR-L($Hd_{PrWd}$,PrWd) and ANCHOR-R($Hd_{PrWd}$,PrWd) can be active in this way in a language. If they both dominate MAX, segments will delete to form PrWds that consist of a single stressed syllable. Tableau (32) illustrates the effect of this ranking: words truncate to form a single stressed syllable.

(32)

| /taka/ | ANCHOR-L($Hd_{PrWd}$,PrWd) | ANCHOR-R($Hd_{PrWd}$,PrWd) | MAX |
|---|---|---|---|
| (a) (táka) | | *! | |
| (b) (taká) | *! | | |
| ☞ (c) (ták) | | | * |

In the competition in (32), both ANCHOR-L($Hd_{PrWd}$,PrWd) and ANCHOR-R($Hd_{PrWd}$,PrWd) are active (despite being 'opposite' constraints in the sense of Samek-Lodovici 1998b). This system occurs in languages which only allow one heavy syllable per PrWd (e.g. various Chinese languages – Duanmu 1990).

More generally, if constraints with the form ANCHOR-L($Hd_\alpha$,$\alpha$) and ANCHOR-R($Hd_\alpha$,$\alpha$) are both active, the language requires every $\alpha$ to contain a single node of level $\alpha$-1 (i.e. the next lowest node below $\alpha$); the same point can be made for the schematic pair ANCHOR-L($Hd_\alpha$,$\alpha$) and ANCHOR-R($Hd_\alpha$,$\alpha$). While this prediction must be examined for each pair of related constraints, by no means does it seem a priori unwarranted. In short, while there is an initial appeal to the idea that schema-related constraints are mutually exclusive, grammars in which both are active can offer unexpectedly desirable results.

To summarize, while constraint $\kappa$ may cause constraint $\chi$ to be inactive in some competitions, this does not mean that both $\chi$ is globally inactive – i.e. inactive in every competition submitted to the grammar. As Samek-Lodovici (1998b) has shown, they may be 'complementarily' active.

As a final note, it is not necessarily a straightforward matter to determine that Universality makes the wrong predictions. If there can be no grammar in which two constraints $\kappa$ and $\chi$ are both active, then it is possible that one or both of $\kappa$ and $\chi$ do not exist. In this way, Universality can also act as a method of determining the validity of constraints.

### 3.1 Parametric Theories and Universality

The predictions of Universality seem unremarkable for pairs of unrelated constraints: there is no a priori reason why a language could not have both ONSET and NOCODA as active constraints, for example. The surprising consequence of Universality is its predictions for pairs of closely related constraints: they can both be active in the same grammar. The term 'related' can be made formally precise here: constraints are related if they are derived from the same constraint schema, and are even more closely related if they differ in just one argument. In this terminology, ANCHOR-L(XP,PPh) and ANCHOR-R(XP,PPh) are 'closely related'.

It is by no means obvious that closely related constraints must be allowed to exist in the same grammar. It is easy to imagine theories in which a language could select a subset of CON's constraints, or in a more constrained theory, theories that only permit a language to contain a proper subset of constraints derived from the same schema. In such a theory, it would be possible to force grammars to choose between one or the other of ANCHOR-L(XP,PPh) and ANCHOR-R(XP,PPh), so predicting that the Māori system could not exist. As Samek-Lodovici (1996, 1998a,b) observes, standard parametric theories are exactly of this type – they force a decision to be made between related constraints/restrictions.

For example, the parameter in (33) offers one of two choices: either left or right XP-edge alignment with PPhs. Significantly, it is impossible to require both edges of XP to align with PPhs (see esp. Selkirk 1986, Chen 1987, Selkirk & Shen 1990:319).

(33) XP-PPh Parameter: The {left, right} edge of XPs and PPhs must coincide.

So, if parameter (33) existed, a system like Māori's could not exist. More generally, standard parameters require a choice between two conditions; they therefore predict that no system can impose both conditions. In this sense, such theories deny the validity of Universality: while some languages may have an active restriction κ and others an active restriction χ, no grammar may impose both κ and χ.

The Māori system shows that parameter (33) is incorrect. However, this language does not strike a fatal blow against parametric theories in general. A particular type of parametric theory that approximates Universality is still possible. This type does not require a choice between two conditions, but instead imposes a choice between having the condition and not having it. For example, (33) would be replaced by two separate parameters – in (34a) and (34b).

(34) (a) Left XP-PPh parameter: The left edge of XPs and PPhs must coincide [ON/OFF]
(b) Right XP-PPh parameter: The right edge of XPs and PPhs must coincide [ON/OFF]

Māori would be a language in which both (34a) and (34b) are set to ON. In short, Universality's predictions in Optimality Theory can be approximated by the ON/OFF theory of parameters. However, the ON/OFF theory still does not generate the full range of systems as OT. While it can produce systems that where both κ and χ are active in the same competitions, Samek-Lodovici (1998a,b) shows that it cannot produce the 'complementary active' type of system, where κ usually causes χ to be inactive, except when κ is blocked by a higher-ranked constraint.

In contrast, it is not possible for OT with Universality to replicate parameters like those in (33). It is simply impossible to exclude systems where both conditions are active. If constraint κ is active in some language and constraint χ is active in another, then Universality and OT predict that there can be a language in which both are active.

## 4. Conclusions

The aim of this paper was to explore the implications of Universality for constraint interaction. Universality predicts that for every pair of constraints κ and χ there are four types of language: one in which only κ is active, one in which only χ is active, one in which neither are active, and one in which both κ and χ are active. The only situation for which this typology does not hold is when κ and χ mutually inactivate each other, or when either constraint is perpetually inactive or active.

The predictions of Universality were explored in regard to the syntax-phonology interface. The constraints discussed were ANCHOR-L(XP, PPh) and ANCHOR-R(XP,PPh), requiring alignment of syntactic phrase edges of lexical categories with phonological phrase edges. This paper showed that Māori is a language in which both constraints are active, as predicted by Universality.

As emphasized in section 3, Universality is not a necessary part of Optimality Theory. In fact, it is a potentially straightforward task to show that it is not valid: one only needs to show that there is some pair of constraints that do not have the full typology outlined in (29). From another perspective, Universality provides a way to determine the validity of constraints: if a pair of constraints $\mathbb{C}_1$ and $\mathbb{C}_2$ do not produce the four predicted systems in (29), then one or both constraints do not exist in CON.

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