The Morphology and Phonology of Infixation

by

Alan Chi Lun Yu

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Committee in charge:

Professor Sharon Inkelas, Chair
Professor Andrew Garrett
Professor Johanna Nichols
Professor Juliette Blevins

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The dissertation of Alan Chi Lun Yu is approved:

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Chair Date

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Date

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ABSTRACT

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Professor Sharon Inkelas (Chair)

The subject matter of this study is the formal properties of infixes. This study begins with a catalogue of the placement properties of infixation in Chapter 1, showing that there is a bias for infixes to target edge constituents. This edge bias is explained in Chapter 4 in terms of the Exogenesis Theory of Infixation, which advocates the view that edge infixes originate from historical prefixes and suffixes; an infix's original peripheral position is reflected in its edge profile today. A synchronic theory of infixation, Generalized Phonological Subcategorization (GPS), which allows non-prosodic units to enter into subcategorization relations, is proposed in Chapter 2 to encode the subcategorization requirement of an infix. Past theories of infixation are reviewed also in Chapter 2, with particular attention focused on the Hybrid Models which account for the prominence-driven infixes in terms of Prosodic Subcategorization while promoting Displacement Theory (DT) as a mean to explain the distribution of the edge-oriented infixes. Arguments on both theoretical and empirical grounds are summoned against DT's view

that edge infixes result from the movement of an underlying prefix or suffix acquiescing to certain phonological or morphological constraints. I advance the Subcategorization Non-violability Hypothesis, epitomized in the universal constraint ranking schema, M_{ALIGN} >> P, in Chapter 3 to supplement GPS by restricting the way morphological subcategorization requirement interacts with phonological constraints in the grammar; coerced affix movement (i.e. DT) is ruled out by virtue of the fact that constraints on morphological subcategorization must outrank all phonological constraints. Other typological aspects of infixation are reviewed in Chapter 5.

To my parents

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The process of writing a dissertation is never an individual enterprise; this dissertation is no exception. Thus it is with my deepest regret that I will not be able to thank every single individual who has contributed, directly, unintentionally or perhaps even unwillingly, to the ideas presented in this dissertation. I thank them collectively.

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Sharon first introduced me to the joy of working on morpho-phonology during my undergraduate years at Berkeley. This interest has ultimately culminated in this dissertation. Her intelligence and her penetrating insights on phonological and morphological issues have consistently served as a source of inspiration in my own work and as a phonologist. Her influence on this study and much of my other work, while not visible to the naked eye, is considerable. Much of the ideas presented in this work originated in discussions with her. Naturally, she should not be blame for any shortcomings that finds their ways into this study. On a more practical note, one could not ask for a better advisor than Sharon. Her patient and nurturing personality has made graduate school and the arduous dissertation-writing process a much more enjoyable experience than it would have been otherwise.

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Chapter 1: Introduction

The subject matter of this study is the formal properties of infixes, morphs such as those highlighted in (1)-(3), in the languages of the world.

(1) English expletive infixation (McCarthy 1982)

together	to-***bloody***-gether
advance	ad-***bloody***-vance
enough	e-***bloody***-nough
important	im-***fuckin***-portant
Tatamagouchee	Tatama-***fuckin***-gouchee

(2) Atayal animate actor focus (Egerod 1965:263-6)

qul	q**m**ul	‘snatch’
kat	k**m**at	‘bite’
kuu	k**m**uu	‘too tired, not in the mood’
hŋuʔ	h**m**ŋuʔ	‘soak’
skziap	k**m**ziap	‘catch’
sbil	s**m**bil	‘leave behind’

(3) Koasati punctual reduplication (Kimball 1991:325)

aló:tkan	alot**ló:**kan	'to be full'
copóksin	copok**có:**sin	'to be a hill'
lapátkin	lapat**ló:**kin	'to be narrow'
polóhkin	poloh**pó:**kin	'to be circular'
talásban	talas**tó:**ban	'to be thin'

The term **INFIX** is defined as *an overt continuous morph that appears within a derived discontinuous morph that exists in a continuous form independent of the infixed form, and the individual parts of this resultant discontinuous morph must not be continuous morphs themselves*. This study is dedicated to exemplifying, clarifying and explaining this morphological phenomenon. The main original contributions are a large-scale cross-linguistic study of infixation and a detailed investigation of the diachronic sources of infixes. This rich factual material is brought to bear on significant issues of considerable debate. The new generalizations that emerge from the typological and diachronic study are discussed and explanations are provided.

In this chapter, I map out the formal variation found in infixation, identifying seven pivots, the reference points of infixation, that cluster in two locations. Most infixes are edge-oriented, appearing near the beginning or the end of a stem. For instance, Chamorro has an actor focus marker that appears before the first vowel (e.g., *tristi* 'sad'/ *tr**um**isti* 'becomes sad'), and an intensive reduplicant that appears after the final vowel (*métgot* 'strong' / *métgo**got*** 'very strong'). Others are prominence-driven, congregating near or

within a stressed domain. For example, Samoan has a plural reduplicant that lodges before the stressed foot (e.g., *to ʔulu*/ *to **ʔu** ʔulu* 'fall, drop').

Chapter 2 offers a comprehensive overview of the main theoretical debates concerning the placement properties of infixation. Two frameworks of infix placement, Phonological Subcategorization and Displacement Theory, are reviewed in detail. I argue for the theory of *Generalized Phonological Subcategorization*, which sees infixation as a matter of a morph aligning with respect to some phonological unit, including CV units, and conclude that Displacement Theory is inadequate on both theoretical and empirical grounds. A proper theory of infixation must also distinguish between two types of infixes. I argue that while all infixes have subcategorization frames that target some phonological unit, a GENUINE INFIX has an additional requirement of non-peripherality, which prevents it from ever being realized at the periphery of a stem. For instance, the English Homeric infix *-ma-* generally appears after a trochaic disyllabic foot (e.g., *saxophone* → *saxo-**ma**-phone*). However, if the word is disyllabic, *-ma-* does not appear as a suffix; the word is expanded so that *-ma-* appears as an infix on the surface. (e.g., *oboe* → *oba-**ma**-boe* never **oboe-**ma***). By contrast, a PHONOLOGICAL AFFIX does not have such a requirement and may surface at the periphery, thus giving an impression of being prefixing or suffixing. For example, in Kugu Nganhcara, the plural VC(C) reduplicant appears before the first vowel of the stem (e.g., *pukpe* 'child' → *p**uk**ukpe*). When the stem is vowel-initial, the reduplicant appears 'prefixing' (e.g., *iiru-ma* 'here-EMPH' → ***iir**iiru-ma*).

Chapter 3 follows up on the theory advanced in Chapter 2, proposing a model of morpho-phonological interaction where morphological alignment is never violated. I

offer three case studies to illustrate the viability of this non-Displacement approach. The first study deals with the case of Atayal actor focus *-m-* infixation, focusing on the intricacies of alignment evaluation. A study of English *ma*-infixation follows, illustrating how the non-peripherality of a genuine infix is handled using bidirectional subcategorization. The final study deals with a case of internal reduplication in Washo, arguing that the placement of the reduplicant is intimately connected to the property of stress assignment in the language.

Chapter 4 deals with the problem of explaining the synchronic typology of infixation, particularly, the fact that infixes are predominately edge-oriented. I first explore the role that acquisition plays in the emerged typology of infix, showing that the set of infixal pivots coincides with the set of psycholinguistically prominent positions. However, I argue that this convergence is the result of the historical development of infixes, rather than an intrinsic property of infixation *per se*. A theory, called Exogenesis Theory of Infixation, is advanced, arguing that edge-oriented infixes originate from historical adfixes. To support this theory, an overview of the diachronic typology is presented. Four pathways are identified: entrapment, reduplication mutation, phonetic metathesis, and prosodic stem association. The diachronic typology shows that infixes are predominately edge-oriented since they were historical prefixes and suffixes. This chapter ends with a discussion on the relation between the results of the diachronic typology and the formal theory proposed in Chapter 2.

Chapter 5 concludes with discussions on other typological aspects of infixation, focusing particularly on several additional asymmetries in the phonology and meaning of infixation.

1.1 Locating the infixes: A typology of infix position

Since this work is a study of infixation from a typological perspective, a well-constructed typological database is needed; a theory of infixation is empirically vulnerable without a map of what types of infixation exist in the world's languages. The typology presented in this work relies heavily on the notion of the PIVOT. The term PIVOT refers to the morphological and/or phonological unit to which an infix attaches.[1] There are several descriptive advantages in adopting the notion of pivot. Take, for example, the prominence pivot, the stressed foot. In the case of English expletive infixation, the expletive appears to the left of a stressed foot.

(4) English expletive infixation (McCarthy 1982)

togéther	to-***bloody***-gether
advánce	ad-***bloody***-vance
Bhowáni	Bho-***bloody***-wani
perháps	per-***bloody***-haps
enóugh	e-***bloody***-nough
impórtant	im-***fuckin***-portant
Kalamazóo	Kalama-***fuckin***-zoo
Tatamagóuchee	Tatama-***fuckin***-gouchee
Winnipesáukee	Winnipe-***fuckin***-saukee

[1] Kiparsky 1986 uses the term 'pivot' to refer to the portion of a root over which an infix 'skips'. The Kiparskyan understanding of the pivot is analogous to that of negative circumscription (McCarthy and Prince 1990a). A pivot is treated as a unit ignored for the purpose of affixation. The notion of pivot adopted here is similar to that of positive circumscription. A pivot is treated as the circumscribed constituent to which an affix attaches.

Infixation to the right of a stressed foot is also possible. For example, the construct state (CNS) markers in Ulwa, a Misumalpan language spoken in Nicaragua and Honduras, is affixed to the right edge of an iambic foot.

(5) Ulwa construct state (Green 1999: 64)

súːlu	súː**-ma**-lu	‘dog-CNS2’
áytak	áy-**mana**-tak	‘paper-CNS22’
alá:kum̥	alá:**-ka**-kum̥	‘Muscovy duck-CNS3’
waráẁwa	waráẁ**-kana**-wa	‘parrot sp.-CNS33’
káːsiráːmah	káː**-ki**-siráːmah	‘lizard sp.-CNS1’

The classification scheme proposed here groups both the English and the Ulwa cases under the same pivot, namely the stressed foot. This approach not only provides an efficient mechanism to reduce the complexity of the typology, but also illuminates potential generalizations that might be missed under previous approaches. For example, Ultan (1975), who based his survey on seventy-five languages, suggests that there are basically eight patterns of infixation. The same typology is adopted in Moravcsik 2000.

(6) Ultan 1975 inventory of infixation

After initial consonant

After initial vowel

After initial syllable

Before second consonant

After second consonant

After second syllable

Before final consonant

Before final syllable

Under Ultan’s classification, the English and Ulwa patterns would appear under distinct categories (i.e. English under before a stressed foot; Ulwa under after a stressed foot).

The pivot approach also restricts the description of a pattern to purely pre-theoretical notions; the pivot is intended as a classification unit only. For example, in the case of Paiwanic bimoraic foot reduplication, the reduplicant can be analyzed as suffixing if the final consonant is treated as extrametrical. However, under the pivot approach, the reduplicant is treated as appearing after the final vowel. No special stipulation about the nature of the final consonant is needed.

(7) Paiwan (Chen & Ma 1986)

kupu	‘tea cup’	kupu**kupu**	‘a kind of small tea cup’
kuva	‘a type of bean’	kuva**kuva**	‘large bean’
daŋas	‘upper’s side’	daŋa**daŋa**s	‘bedside’
kadzn̥aj	‘a small basket’	kadzn̥a**kadzn̥a**j	‘very small basket’
kadzn̥uŋ	‘bamboo water basket’	kadzn̥u**kadzn̥u**ŋ	‘a kind of bee’
l̥uʔul	‘coffin’	l̥uʔu**l̥uʔu**l	‘a little box’

One of the main goals of this typological survey, besides the search for generalizations and asymmetries, is to devise a descriptively adequate system for the purpose of infixation classification. The admittance of theory-specific abstract devices such as extrametricality into the discussion not only complicates the description and creates needless distraction, but also dramatically reduces the empirical value of the typology, as theoretical devices could be modified, and even abandoned, over time.

Seven pivots are found based on a survey of 141 infixation patterns from 101 languages of 25 different phyla and isolates. A summary of this survey (see Appendixes II & III) and the methodology used in data sampling (see Appendix I) can be found in Appendixes.[2] These seven pivots can be subdivided into two categories: edge vs. prominence pivots. Edge pivots, as the name suggests, are units that appear at either the beginning or the end of a stem, while the prominence pivots are units defined with respect to stress.

(8) Attested pivot inventory

a. *Edge pivots*

First consonant (§1.2.1)

First vowel (§1.2.2)

Final syllable (§1.2.3)

Final vowel (§1.2.4)

[2] Appendix I also provide a breakdown of the languages according to the phyla classification.

b. *Prominence pivots* (§1.2.4)

Stressed syllable

Stressed foot

Stressed vowel

A quick comparison with Ultan's inventory of infixation patterns suggests that there are certain discrepancies. Discussions of the differences will appear in section 1.2.6. However, it should be noted that a thorough comparison between the results of the present survey and that of Ultan and Moravcsik's is confounded by ambiguous supporting data exemplifying the patterns reported in the earlier surveys, making their distributional statements difficult to assess. For example, Ultan asserts that some infixes appear after the second consonant. This characterization is ambiguous since an infix that appears after a biconsonantal cluster also appears after the second consonant, assuming the counting goes from left to right. Similarly, as noted even by Ultan himself, some infixes characterized as following the first syllable could also be alternatively viewed as following the first vowel (Ultan 1975:165). Thus, without concrete illustration of each of these patterns, it is difficult to access the validity of the distributional statements. The pivot examples presented in the next section are a first step toward remedying this state of affairs.

1.2 Introductory exemplification

Before diving into the exemplification of the different types of infixation patterns, several disclaimers must be stated. This study involves much 'bisection' of categories. The first

and most important 'cut' distinguishes internal reduplication from fixed segment infixation. Internal reduplications have also been referred to as infixal, infixing or medial reduplication. Fixed segment infixes are infixes that have a more-or-less constant shape, although it should not be taken as suggesting that the shape of fixed infixes must remain constant at all times; allomorphy is commonly observed in cases of fixed infixation.

The notion of ***pivot*** is designed to be orthogonal to the notion of ***base***. In this study, the term, ***base***, will be reserved for discussion specific to reduplication. The term *base* will be taken as the morphological and/or phonological unit from which the reduplicant copies.[3] For example, in the Pama-Nyungan language, Uradhi, pluractionality is marked by (C)CV reduplication (9).

(9) Uradhi pluractional reduplication (Crowley 1983:364)

wi.li	wi-**li**-li	'run'
a.ŋa	a-**ŋa**-ŋa	'dig'
i.pi.ɲi	i-**pi**-piɲi	'swim'
wampa	wa-**mpa**-mpa	'float'
i.kya	i-**ki**-kya	'speak'
u.ɲɟa	u-**ɲɟa**-ɲɟa	'sleep, lie down'
u.ŋya	u-**ŋi**-ŋya	'eat'

[3] This dichotomy has been implicitly and explicitly assumed in the previous literature as the distinction between affix location and the direction of association (e.g., Marantz 1982, Broselow and McCarthy 1983:40, Clements 1985, Kiparsky 1986).

Following the present terminological scheme, the pivot of internal reduplication is after the first vowel or the first syllable; the base of reduplication is to its right (see (10)).

(10) ROOT → PIVOT-***RED***-BASE

uŋya → u-***ŋi***-ŋya 'eat.PLR'

Thus, in addition to identifying the pivot, in the case of internal reduplication, the base of reduplication is noted as well.

No investigation can be completely devoid of theoretical presuppositions; this study is no exception. In what follows, the pivots are described in terms of linguistic units already familiar to most linguists including subsyllabic units (e.g., C and V), syllables, and other higher metrical/prosodic units.

Finally, the use of the terms 'first' and 'final' deserve some qualification here also. Many earlier studies have invoked these terms. It is perhaps implicitly understood but never explicitly stated what the reference domain is. The notions of 'first' and 'final' are defined relative to the root or the stem to which the infix attaches, not to its position in a fully-formed word.[4] The notions of 'first' and 'final' refer to some unit that is closest to the left and the right edges of a stem respectively, although they need not be edge-most. With these disclaimers in mind, I begin the survey with a discussion of the first consonant as a pivot.

[4] In theoretical terms, this characterization amounts to a cyclic analysis of morphology in which an infix is positioned phonologically with respect to the morphological constituent that it combines with.

1.2.1 First consonant

Much research on syllable structure has suggested that the internal complexity of the syllable onset matters little phonologically. However, in the case of infixation, the distinction between the initial consonant versus onset cluster is an indispensable one. For example, an infix may appear to the right of the first consonant. For instance, in Kamhmuʔ and Mlabri, both Mon-Khmer languages, the nominalizing morpheme *-rn-* appears after the first consonant of the stem (11)a. When the stem begins with a consonant cluster, the allomorph *-r-* is used (11)b. When the initial contains a rhotic, the allomorph *-n-* is used instead (11)c.

(11) Mlabri nominalization (Rischel 1995: 85)

a.	gɯh	‘to ablaze’	g**rn**ɯh	‘flames’
	kap	‘to sing’	k**rn**ap	‘singing, song’
	peelh	‘to sweep the ground/floor’	p**rn**eelh	‘a broom’
	tɛk	‘to hit’	t**rn**ɛk	‘a hammer’
b.	kwɛl	‘to be rolled up’	k**r**wɛl	‘spiral’
	glaʔ	‘to speak’	g**r**laʔ	‘speech, words’
	pluut	‘to peel’	p**r**luut	‘layer’
	klaap	‘to hold	k**r**laap	‘forceps of split bamboo’
	gwɛɛc	‘to poke’	g**r**wɛɛc	‘finger’
c.	chrɛɛt	‘to comb’	ch**n**rɛɛt	‘a comb’

In Atayal, an Austronesian language spoken in Taiwan, the animate actor focus marker *-m-* appears after the first consonant of the stem, even if the first consonant is part of a consonant cluster (12)b.

(12) Atayal animate actor focus (Egerod 1965:263-6)

a.	qul	q**m**ul	‘snatch’
	kat	k**m**at	‘bite’
	kuu	k**m**uu	‘too tired, not in the mood’
b.	hŋuʔ	h**m**ŋuʔ	‘soak’
	skziap	k**m**ziap	‘catch’
	sbil	s**m**bil	‘leave behind’

In Maricopa, a Hokan language, the plural *-uu-* appears after the first consonant, regardless whether the first consonant is part of a cluster or not.[5]

(13) Maricopa

shmank	sh**uu**manshlk	‘get up’	(Thomas-Flinders 1981)
shtuutyk	sh**uu**tuutyk	‘pick’	(Thomas-Flinders 1981)
chmii-m	ch**uu**miish-k	‘put’	(Gordon 1986: 96)
kmii-m	k**uu**miish-k	‘bring’	(Gordon 1986: 96)

[5] The infixation of *-uu-* is only one of many markers of verbal dual/plural stem formation in Maricopa. Others possibilities include prefixation, suffixation, ablaut or various combinations of all these devices. See Gordon 1986 section 2.14 for more discussion.

In all these cases, when a root begins with a consonant cluster, the infix invariably appears to the right of the first consonant, thus breaking up the onset cluster.

No unequivocal cases of a reduplicative infix appearing to the right of the first consonant are found. All potential instances of infixing a reduplicant after the first consonant can equally well be analyzed as appearing to the left of the first vowel. For example, in many of the Australian languages, plurality and adjective intensification is marked by VC(C) reduplicant (14).

(14) a. Mangarayi (Merlan 1982, Kurisu & Sanders 1999)

gurjag	g**urj**urjagji	'having a lot of lilies'
gabuji	g**ab**abuji	'old person'
yirag	y**ir**irag	'father'
waŋgij	w**aŋg**aŋgij	'child'
jimgan	j**im**imgan	'knowledgeable one'

b. Yir Yoront (Fabricius 1998, Alpher 1973:266-7, Alpher 1991:45)

ken	'cough'	k**el**en	'cough-CONT NPAST'
wornt		w**orn**ornt	'rustle'

c. Djingili (Fabricius 1998, Chadwick 1975:16)

wanga	'alive, live one'	w**ang**anga	'alive, live ones'
jabandja	'young'	j**ab**abandja	'the young ones'
maɭuga	'old man'	m**aɭ**aɭuga	'old men'

ŋamuɭa	'big'	ŋ**am**amuɭa	'very big'
badaura	'good'	b**ad**adaura	'very good'

Two interpretations are possible here. The reduplicant could be described as appearing after the first consonant (15)a or before the first vowel (15)b, as schematized below. The examples, *badaura* 'good' and *badadaura* 'very good', are taken from Djingili, a West Barkly language in Australia.

(15) a. ROOT → PIVOT-**RED**-BASE

badaura → b-**ad**-adaura

b. ROOT → **RED**-PIVOT/BASE

badaura → b-**ad**-adaura

As there are no initial consonant clusters or vowel-initial roots in Djingili, it cannot be ascertained whether the pivot is the first consonant or the first vowel.

Many Salishan languages have a VC reduplicant that marks out-of-control. Some examples from Lushootseed, a Central Salish language are given in (16).

(16) Lushootseed (Urbanczyk 2000:56)

ʔuluɬ	'travel by water'	ʔ**ul**uluɬ	'boat riding'
s-ɬadəyʔ	'woman'	s-ɬ**ad**adəyʔ	'woman living along'
wəliʔ	'be visible'	w**əl**əliʔ-il	'become visible'

ʔəχid ‘what happened’ ʔu-ʔ**əχ**iχ-əd ‘What’s he done?’

Two possible interpretations of this pattern are found in the literature. The morphological analysis adopted here is that the VC reduplicant appears either after the first consonant or before the first vowel (see also Kiparsky 1986: 162-163). However, Urbanczyk (2000) advocates a morphological analysis that views the Out-of-Control infix as a VC reduplicant appearing after the initial syllable. There is no language-internal evidence that allows one to choose one morphological analysis over the other. Urbanczyk’s analysis cannot be stated straightforwardly in terms of a unique pivot, mainly due to the behavior of the VC infix in CVCC roots, which shows the reduplicant appearing before the final consonant, rather than after the final consonant cluster.

(17) Lushootseed CVCC roots in Out-of-Control

haʔk^{w}	‘for a long time’	h**aʔ**aʔk^{w}	‘a little while ago’
hawɬ-əd	‘improvise’	h**aw**awɬ-əd	‘improvise’

This fact forces her to resort to highly elaborate Optimality-Theoretic machinery to account for the data. There appear to be exactly two counterexamples to the infixal analysis (18), although these examples are also counterexamples to Urbanczyk’s suffixal analysis. It is also noteworthy that both of these ‘counterexamples’ begin with *ʔə-*, suggesting that they might be better analyzed as prefixed roots.

(18) dx^{w}-ʔəhad ‘talk’ dx^{w}-ʔəhádad ‘discuss’

ɬu-ʔək^{w}yiq^{w} ‘great-great-grandparent/grandchild’

ɬu-ʔək^{w}iq^{w}iq^{w}əb ‘will have great-great-grandchildren’

As mentioned earlier, the notion of pivot is designed to eliminate any directional bias in classification. That is, given a particular pivot, one should not rule out the possibility of an infix appearing before or after this pivot *a priori*. Certain reduplication cases exemplify infixes that appear to the left of the first consonant. Most such cases are found in the Niger-Congo languages. For examples, in SiSwati (19)a and Kinande (19)b, both within the Bantu family, the infixing pluractional bimoraic foot reduplicant appears before the first consonant of the stem. Thus, when the root is vowel-initial, the reduplicant is infixed between the first vowel and the first consonant.

(19) a. SiSwati pluractional formation (Downing 1999:74)

-enyéla	-e-**nyelá**-nyela	‘be hurt’
-engetisa	-e-**ngeti**-ngetisa	‘cause to increase’
-endlulána	-e-**ndlula**-nldulána	‘pass by each other’
-etsaméla	-e-**tsame**-tsaméla	‘bask’
-tfutséla	-**tfutse**-tfutséla	‘move for’
-khulúma	-**khulu**-khulúma	‘talk’
-kála	-**kalá**-kala	‘weigh’

b. Kinande pluractional formation (Downing 1999:64)

-ohera	o-**hera**-hera	‘pick for’
-esera	e-**sera**-sera	‘play for’
-huma	-**huma**-huma	‘beat’

A similar case is also found in Pangasinan, a Malayo-Polynesian language, spoken in the Philippines. Two patterns of infixing reduplication are found. In the case of plural formation, a CV reduplicant appears before the first consonant of the stem. Thus, when the stem is vowel-initial, the reduplicant appears as an infix (20)b.

(20) Pangasinan plural formation (Benton 1971:151)

a.	singular	plural	gloss
	kanayon	**ka**kanayon	‘relative’
	libro	**li**libro	‘book’
	niog	**ni**niog	‘coconut’
	plato	**pa**plato	‘plate’
	balbas	**ba**balbas	‘beard’
b.	amigo	a**mi**migo	‘friend’

Pangasinan also has a case of reduplication that applies to numerals which signals the meaning of ‘only’. The reduplicant is bimoraic and appears before the first consonant. As with the plural, when the stem is vowel-initial, the reduplicant appears as an infix (21)b.

(21) Pangasinan ‘only’ formation (Benton 1971:151)

	Numeral	‘only’	gloss
a.	sakey	**sak**sakey	‘one’
	talo	**tal**talora	‘three’
	siam	**sia**siamira	‘eight’
b.	apat	a**pat**patira	‘four’
	anem	a**nem**nemira	‘five’

As stated above, the goal here is to achieve maximal descriptive generality. Thus, the identification of the initial consonant as the pivot provides the most general way to unify the reduplicative behaviors of the consonant-initial and vowel-initial roots.

1.2.2 First vowel

Another common pivot for infixation is the first vowel, with examples coming from from Austronesian languages. For example, in Toratan, the past tense agent voice marker *-um-* appears before the first vowel, even when the stem is vowel-initial, in which case the allomorph *m-* is used instead.

(22) Toratan (Ratahan) Agent Voice in Past Tense (Himmelman & Wolff 1999:13, 41)

kukuk	‘cry out’	k**um**ukuk
suq	‘enter’	s**um**úq
lompuq	‘go out’	l**um**ompuq
empo	‘sit’	**m**empo

In Chamorro, the actor focus infix *-um-* appears before the first vowel, even when the stem begins with a consonant cluster.

(23) Chamorro verbalizer, actor focus (Topping 1973:185, Anderson 1992:208)

ipeʔ	'to cut'	**in**ipeʔ	'thing cut' from
epanglo	'hunt crabs'	**um**epanglo	'to look for crabs'
gupu	'to fly'	g**um**upu i paharu	'the bird flew'
tristi	'sad'	tr**um**isti	'becomes sad'
planta	'set the table'	pl**um**anta	'sets (table) (nom. wh-agreement form)'

A similar case is found in Yurok, an Algic language spoken in northwestern California. The intensive infix *-eg-* appears before the first vowel when the stem is consonant-cluster initial. There are no vowel-initial roots in this language.

(24) Yurok intensive (Garrett 2001)

Base		Intensive
laːy-	'to pass'	l**eg**aːy-
koʔmoy-	'to hear'	k**eg**oʔmoy-
tewomeł	'to be glad'	t**eg**ewomeł
łkyork^{w}-	'to watch'	łky**eg**ork^{w}-
trahk-	'to fetch'	tr**eg**ahk-

Another example of infixing before the first vowel is found in the Fehan dialect of Tetun, an Austronesian language of West Timor. Tetun adjectival nominalization involves lodging an *-aC-* reduplicant before the first vowel.

(25) Ferhan Tetun nominalization (van Klinken 1999:79)

beik	'stupid'	b**ab**eik	'stupidity
katar	'itchy'	k**ak**atar	'itchiness'
soi	'rich'	s**as**oi-n	'wealth, possessions'
susar	'be in difficulty'	s**as**usar	'difficulties'
krakat	'angry, wild'	kr**ar**akat	'anger, wildness'
ktodan	'heavy'	kt**at**odan	'weight'
kleur	'long (time)'	kl**al**eur	'length (time)'

Some qualification is needed regarding this morphological analysis. Van Klinken (1999) analyzes Tetun adjectival nominalization as a case of *-Ca-* reduplication. Thus, in the case where the stem begins with a single consonant, the reduplicant appears as a prefix.

(26) Ferhan Tetun nominalization (van Klinken 1999:79)

beik	'stupid'	**ba**beik 'stupidity	
katar	'itchy'	**ka**katar	'itchiness'
soi	'rich'	**sa**soi-n	'wealth, possessions'
susar	'be in difficulty'	**sa**susar	'difficulties'

The problem with this analysis is that when the root begins with a consonant cluster, the reduplication appears after the initial consonant (27). Van Klinken notes that initial clusters always begin with *k*-, suggesting that there is something special about these clusters.

(27) krakat ‘angry, wild’ k**ra**rakat ‘anger, wildness’
ktodan ‘heavy’ k**ta**todan ‘weight’
kleur ‘long (time)’ k**la**leur ‘length (time)’

While van Klinken’s analysis is not implausible, however, the *-aC-* analysis provides a unified analysis between the cluster-initial and regular forms without appealing to special mechanism, such as initial-*k* extrametricality.[6]

As noted in the preceding section, many cases of internal reduplication after the first consonant could also be classified as appearing before the first vowel. However, in the Australian language, Kugu Nganhcara, the plural VCC reduplicant cannot be analyzed as infixing after the first consonant since vowel-initial stems exist in this language. In such cases, the reduplicant appears before the first vowel in vowel-initial stems (28)b.

(28) Kugu Nganhcara plural (Smith & Johnson 2000: 382)
a. thena ‘stand’ th**en**ena
pukpe ‘child’ p**uk**ukpe

[6] The initial *k*- is likely to be a separate morpheme historically that later fused with the root (van Klinken 1999: 31). Consequently, the reduplicant appears infixing due to entrapment (see further discussion on entrapment in Chapter 4).

nunpa ‘run’ n**unt**unpa
b. iiru-ma ‘here-EMPH’ **ii**riiru-ma *iiruru-ma
ungpa ‘break’[7] **ungk**ungpa *ungpangpa

Given the potential ambiguity in terms of locating the pivot, it is logical to assume that some languages could exploit this ambivalence and allow both interpretations. An example is found in Tagalog’s agentive focus infixation.

(29) Tagalog focus construction (Orgun and Sprouse 1999)

gradwet	gr**um**adwet	~	g**um**radwet	‘to graduate’
plantsa	pl**um**antsa	~	p**um**lantsa	‘iron’
preno	pr**um**eno	~	p**um**reno	‘to brake’

Here, the infix *-um-* can appear after the first consonant or before the first vowel. A similar, but more complicated pattern is observed with respect the perfective affix *-in-* in Tagalog. Avery and Lamontagne 1995 report that *-in-* may appear after the first consonant or before the first vowel of the stem. However, this variation is partly conditioned by the placement of stress. Two patterns are reported in particular. Avery and Lamontagne describe Pattern A as follows: “(i)f the base-accent is an odd number of syllables from *-in-*, *-in-* will occur after $C_1$and an epenthetic vowel appears immediately

[7] Kugu Nganhcara reduplication may exhibit the reduction of the labial in root-internal heterorganic stop+labial sequence (e.g., *pukpe* → *pukukpe* ‘child’; *wegbe* → *wegegbe* ‘keep’). Also, in heterorganic nasal+labial stop clusters, the labial in the reduplicated cluster is replaced by a stop homorganic with the nasal (e.g., *nunpa* → *nuntunpa* ‘run’; *thanpa* → *thantanpa* ‘cough’; *wunpa* → *wuntunpa* ‘gather, get’). These additional complications are not relevant to the point made here.

following *-in-*." An epenthetic vowel is capitalized in Avery and Lamontagne's transcription.

(30) Pattern A of Tagalog perfective infixation (Avery & Lamontagne 1995)

plahiyó	p-**in**-Alahiyó	'plagiarized'
premyuhán	p-**in**-Iremyuhán	'rewarded'
plántsa	p-**in**-Alántsa	'ironed'
drówing	d-**in**-U-rówing	'drew'
príto	i-p-**in**-I-ríto	'fried'

Pattern B shows that "if the base-accent is an even number of syllables from *-in-*, *-in-* will occur after either C_1 or C_2. If it occurs after C_1, metathesis may apply [see (31)b, AY]."

(31) Pattern B of Tagalog perfective infixation (Avery & Lamontagne 1995)

a.	prenúhan	pr-**in**-enúhan	'braked'
	gradúhan	g-**in**-radúhan	'graded'
	klipán	k-**in**-lipán/kl-**in**-ipán	'cremated'
	promót	p-**in**-romót/pr-**in**-omót	'promoted'
b.	trabáho	t-**in**-arbáho	'worked'

Variable infixation is the consequence of loanword borrowing, as the native Tagalog lexicon lacks initial consonant clusters. Thus, a speaker of Tagalog must make a, perhaps arbitrary, decision when confronted with the need to perform infixation on loanwords

with initial consonant cluster. Since either placing after the first consonant or before the first vowel is consistent with the existing pattern of perfective infixation, both possibilities appear to be entertained by the speakers.[8] In light of these results, one must be vigilant when confronted with cases where multiple pivots can be invoked. Given the often brief description of infixation in most grammars, the necessary test cases might not always be available.

Unequivocal cases of infixing after the first vowel are hard to find. Some examples are given below. In the Muskogean language, Alabama, the mediopassive *-l-* must surface after the first vowel of the stem, regardless of whether the first vowel is followed by a coda or not.

(32) Alabama mediopassive (Martin & Munro 1994)

tak.co	'rope (v.)'	ta**l**ikco	'be roped'[9]
hoc.ca	'shoot	ho**l**icca	'be shot'
o:ti	'make a fire'	o:**l**ti	'kindling'
a-hica	'watch over'	a-**l**hica	'be taken care of'

In Quileute, a Chimakuan language, nominal plural is marked by the infixing of a CV(V) reduplicant after the first vowel of the stem, regardless whether the first vowel is followed by a consonant cluster or not (33)b.

[8] A similar, but formal, treatment of the same fact can be found in Zuraw 1998. She introduces the notion of floating constraints in Optimality Theory, whose ranking has never been crucial to the language in question until the proper test case is introduced, for example, in loanword borrowing (see also Antilla 1997).

[9] According to Martin & Munro 1994, an epenthetic *i* is inserted before consonant clusters in Alabama and Koasati.

(33) Quileute plural (Andrade 1933:188, Broselow & McCarthy 1983:44)

	Singular	Plural	Gloss
a.	qa:wat^{s}	qa:**qe:**wat^{s}	‘potato’
	t’a:dax	t’a**t’e:**dax	‘tail (of a bird)’
	haha:	ha**hi**haʔ	‘tree’
	wesaʔt^{s}’o:pat	we**wi**saʔt^{s}’opat	‘woman’
b.	k’aʔt’la	k’a**k’e:**t’la	‘stones’
	deq’deq’	de**di**q’deq’	‘mallard duck’

In Miskito, the second conjugation marker, which mainly applies to inalienable nouns, surfaces after the first vowel of the stem, regardless of whether the first vowel is part of a heavy closed syllable or not.

(34) Miskito 2nd conjugation 1 person *-i-* (Rouvier 2002)

bya.ra	‘abdomen’	bya**i**ra
na.pa	‘tooth’	na**i**pa
kar.ma	‘throat’	ka**i**rma
kak.ma	‘nose’	ka**i**kma
klah.kla	‘arm’	kla**i**hkla

In Yuma, one way of indicating distributive object is by infixing *-t-* or *-c-* after the first vowel, regardless whether the first syllable is closed or open. The distribution of these

two allomorphs depends on the prefix-stem theme: *-t-* is used with prefix-stem themes containing a prefix *t-*, *š-*, *n-*, *s-*, or *k^{w}an-*, *-c-* is used elsewhere, including the simple-stem themes. For discussions on the function of these thematic prefixes, see Halpern 1947a.

(35) Distributive object marking in Yuma (Halpern 1947b)

an^{y}uv	‘to fight’	a**c**nyuv	‘to be a fighter’
x-al^{y}.qíc	‘to grasp’	xa**ca**l^{y}qíc[10]	‘to grasp with both hands’
u:-kaðóm	‘to point to something towards there’	u:**c**kaðóm	‘to send in different directions’
a:-t-ax^{w}ín^{y}	‘to kindle’	a:ta**t**x^{w}ín^{y}	‘to kindle in several places’
š-al.wáx	‘to punch a hole with the finger’	š-a**ta**lwáx	‘to punch holes with the finger’

Other cases that may fall into this category could equally well have been classified under infixing after the first syllable, mainly due to the fact that it is not possible to ascertain whether infixation happens after the first vowel or after the first syllable if a language lacks word-internal syllable codas. The right edge of the first vowel co-occurs with the right edge of the first syllable. Consider the following example from Bole, a Chadic language spoken in Nigeria.

[10] When the infix precedes a consonant cluster of the stem, an inorganic vowel *a* is inserted after the infix; this vowel may also occur when the infix precedes a single consonant. Halpern (1947b:fn.3) suggests that this vowel insertion is irregular.

(36) Bole pluractional (Gimba 2000: Ch. 10)

ngórúu	ngò**gĭ**rúu	‘tied’
’yórúu	’yò**gĭ**rúu	‘stopped’
ngáɗ	ngà**gĭ**ɗúu	‘eat (meat)’
kàráa	kà**gĭ**ráa	‘slaughter’
’àwáa	’à**gĭ**wáa	‘open’

In Bole one of the possible indicators of pluractionality is the infix *-gi-*. Since all possible stems that take this infix have an initial open syllable, the infix could be considered as appearing after the first vowel or after the first syllable. Many cases show this ambiguity. For example, in Budukh, a Daghestanian language, the durative marker *-r-* appears after the first vowel of the stem, which also coincides with the first syllable.

(37) Budukh durative (Alekseev 1989:273)

čošu	čo**r**šu	‘to stab (downwards)’
saq’a	sa**r**qʔar	‘to die’
čuqul	ču**l**q’u	‘to rinse’
saʔa	sa**r**ʔar	‘to become dry’
ʕaq’al	ʕa**l**q’al	‘to fall’

In Uradhi, an Australian language, a CV reduplicant that appears after the first vowel indicates pluractionality.

(38) Uradhi pluractional reduplication (Crowley 1983:364)

wili	wi**li**li	‘run’
aŋa	a**ŋa**ŋa	‘dig’
ipiŋi	i**pi**piŋi	‘swim’
wamp	wa**mpa**mpa	‘float’
ikya	i**ki**kya	‘speak’
uɲʲa	u**ɲʲa**ɲʲa	‘sleep, lie down’
uŋya	u**ŋi**ŋya	‘eat’

In Quileute, a Chimakuan language, the pluractional reduplicative marker is a single consonant that appears after the first vowel.

(39) Quileute pluractional (Andrade 1933:188, Broselow & McCarthy 1983:44)

qaːleʔ	‘he failed’	qa**q**leʔ	frequentative
tˢiko	‘he put it on’	tˢi**t**ˢko	frequentative
kʷeːtˢaʔ	‘he is hungry’	kʷeː**kʷ**tˢaʔ	‘several are hungry’
tukoːyoʔ	‘snow’	tu**t**koːyoʔ	‘snow here and there’

In Dakota, a Siouan language spoken in the northern area of the United States and its neighboring regions in Canada, there are more than twenty inflectional infixes that appear after the first vowel (Boas & Deloria 1941; Shaw 1980). What is interesting about Dakota

is that the first vowel may be followed by a consonant sequence. However, such a cluster is parsed as the onset of the following syllable, thus, the right edge of the first vowel is effectively the right edge of the first syllable.

(40) Dakota 1st person (Moravcsik 1977:95-6 based on Boas & Deloria 1941)

ća.pa	'stab'	ća.**wa.**pca	'I stab'
ʔi.kto.mi	'Iktomi'	ʔi.**ma.**ktomi	'I am Iktomi'
ma.nų	'steal'	ma.**wa.**nų	'I steal'
na.pca	'swallow'	na.**wa.**pca	'I swallow it'
la.k^{c}ota	'Lakota'	la.**ma.**k^{c}ota	'I am a Lakota'
na.wizi	'jealous'	na.**wa.**wizi	'I am jealous'

Infixes that appear in stems that are invariably monosyllabic are also difficult to classify. For example, in Tzeltal, a Mayan language, the intransitivizing marker *-h-* appears after the root vowel.

(41) Tzeltal (Slocum 1948, Nida 1948:68)

puk	'to divide among'	pu**h**k	'to spread the word'
kuč	'to carry'	ku**h**č	'to endure'
k'ep	'to clear away'	k'e**h**p	'to be clear'

Similarly, in Tzutujil, another Mayan language, the simple passive, *-j-* (42)a, and the mediopassive, *-ʔ-* (42)b, must surface after the root vowel.

(42) Tzutujil simple passive/mediopassive (Dayley 1985:55, 113-4)

a.	loq'	'buy'	lo**j**q'ik	'to be bought'
	ch'ey	'hit'	xch'e**j**yi	'it was hit'
b.	toj	'pay'	to**ʔ**jik	'to be paid'
	k'is	'finish'	k'i**ʔ**seem	'to end, finish'
	tij	'eat, consume'	ti**ʔ**jik	'to be paid'

In Ancient Greek, some present stems are formed partly by infixing a homorganic nasal after the root vowel.

(43) Greek present stem formation (Garrett 2003:6)

Aorist stem	Present stem	Gloss
e-dak-	da**ŋ**k-an-	'bite'
e-lab-	la**m**b-an-	'take'
e-lat^{h}-	la**n**t^{h}-an-	'escape notice'
e-lip-	li**m**p-an-	'leave'
e-pat^{h}-	pa**n**t^{h}-an-	'suffer'
e-put^{h}-	pu**n**t^{h}-an-	'inquire'
e-p^{h}ug-	p^{h}u**ŋ**g-an-	'flee'
e-t^{h}ig-	t^{h}i**ŋ**g-an-	'touch'

e-mat^{h}- ma**n**t^{h}-an- ‘learn’

Since roots are monosyllabic in these languages, the infix may be described as appearing after the first or the last vowel of the root.

1.2.3 Final syllable

Another pivot of infixation is the final syllable. For example, in KiChaga, a Bantu language spoken in Tanzania, the intensive is formed by infixing a nasal before the final syllable. The intensifying nasal infix assimilates in place to a following velar. In the following examples, the adjectives are monomorphemic; the verbs end in a final vowel suffix, *-a*; the last form has a reciprocal *-an-* before the final vowel.

(44) KiChaga intensive (Lioba Moshi, p.c. to Sharon Inkelas1986)

	Plain	*Intensive*	*gloss*
a.	u.wi.ni	uwi-**n**-ni	
	lyi.an.gu	lyian-**n**-gu	‘light’
	mu.il.i	mui-**n**-li	‘white’
	-ka.pa	-ka-**n**-pa	‘hit’
	-o.lon.ga	-olon-**n**-ga	‘point’
b.	mu.i.u	mui-**n**-u	‘black’
	-aam.bi.a	-aambi-**n**-a	‘look at’
	-aam.bi.a.na	-aambia-**n**-na	‘look at each other’

In Koasati, a Muskogean language, one strategy for forming verbal pluralization is by infixing *-s-* before the final syllable. The forms in (45) are cited in their third person indicative form, followed by the switch-reference marker *-n*. When the penultimate syllable is light (CV), the vowel is lengthened in the indicative and usually marked with a high pitch accent, indicated by the acute accent. Koasati is a pitch-accent language; the metrical phonology of this language is not well-studied; it is conceivable that the infix might be analyzed as appearing after the accented vowel.

(45) Koasati verbal plurality (Kimball 1991)

Singular	Plural	Gloss
akás:non	aká**s**non	‘to be hungry’
akopí:lin	akopí**s**lin	‘to knock something away’
imanó:kan	imanó**s**kan	‘to be winded’
maká:lin	maká**s**lin	‘to open the eyes’
stipí:lan	stipí**s**lan	‘to be sexually attractive.

The punctual reduplicant in Koasati is a *-Co-* sequence where the consonant is a copy of the first consonant of the stem. This reduplicant must appear before the final syllable of the stem. It might be possible to reanalyze this as a matter of the reduplicant being attracted to the stressed position itself (e.g., like Washo reduplication; see Chapter 3). Since the pitch accent is generally on the penult, it is difficult to ascertain which analysis

is accurate. The reduplicant appears heavy due to an independent effect of penultimate lengthening associated with the indicative.

(46) Koasati punctual reduplication (Kimball 1991:325)

aló:tkan	alot**ló:**kan	‘to be full’
cofóknan	cofok**có:**nan	‘to be angled’
copóksin	copok**có:**sin	‘to be a hill’
lapátkin	lapat**ló:**kin	‘to be narrow’
polóhkin	poloh**pó:**kin	‘to be circular’
taháspin	tahas**tó:**pin	‘to be light in weight’
talásban	talas**tó:**ban	‘to be thin’

It is sometimes difficult to determine whether certain cases should be classified under attaching before the final syllable or after the final vowel. The output is often indistinguishable. Thus, for example, in Ineseño Chumash, a Hokan language, infixation could be described as the placement of a CV reduplicant before the final syllable (i.e. *ta**šu**šun* ‘to be fragrant’) or after the final vowel (i.e. *tašu**šu**n* ‘to be fragrant’). The function of this reduplication pattern is unclear.

(47) Ineseño Chumash (Applegate 1976:275)

tašušun	‘to be fragrant’
iwawan	‘to cut with a sawing motion’

oxyoyon	‘to be crazy’
yuxwowon	‘to be high, tall’
muc’uc’uʔ	‘kind of very small bead’ (muc’uʔ ‘young, small’)
mixixin	‘to be hungry’ (mixin ‘to be hungry’)

In Sonora Yaqui, the reduplicant might be analyzed as appearing before the final syllable or before the final foot.

(48) Sonora Yaqui intensive (Dedrick & Casad 1999)

tekipanoa	tekipa**pa**noa/ teki**pa**panoa	'to work'
naamuke	naamu**mu**ke/ naa**mu**muke	'to get drunk'

The classification of these patterns remains ambiguous since the available data does not provide conclusive evidence to argue for one interpretation over the other.

1.2.4 Final vowel

The final vowel as a pivot is most relevant to cases of internal reduplication. For example, in many of the Austronesian languages spoken in Taiwan, plurality is marked by reduplicating the final C(V)CV of the stem. When the stem is consonant-final, the reduplicant appears as an infix.

(49) a. Amis (Ho et al. 1986)

lumaʔ	‘house’	lum**aluma**ʔ	‘houses’
kaput	‘group’	kapu**kapu**t	‘groups’
wiłaŋ	‘friend’	wiła**wiła**ŋ	‘friends’
łaŋka	‘sesame’	łaŋka**ŋka**	‘pile of sesame’
lamlu	‘dice’	lamlu**mlu**	‘dices’
pawti	‘bag’	pawti**wti**	‘bags’
ʔuŋtʃuj	‘rock’	ʔuŋtʃu**ŋtʃu**j	‘pile of rocks’
taŋkuj	‘winter melon’	taŋku**ŋku**j	‘winter melons’
tamław	‘person’	tamła**mła**w	‘people’
ʃamału	‘card’	ʃamału**mału**	‘cards’
niaruʔ	‘village home’	niaru**aru**ʔ	‘village homes’[11]

b. Thao (Chang 1998)[12]

agqtu	‘to contemplate’	agqtu**qtu**	‘think about’
m-arfaz	‘to fly, be flying’	m-arfa**rfa**z	‘to keep flying around’
m-armuz	‘to dive’	m-armu**rmu**z	‘to dive repeatedly’
patihaul	‘a spell, a curse’	matihau**hau**l	‘to cast a speel on s.o.’
quliuʃ	‘long’	mia-quliu**liu**ʃ	‘to straighten, stretch out’
kikałi	‘to ask’	ma-kikałi**kałi**	‘to ask around’

[11] Vowel clusters are treated as vowel-sequences in Amis. The syllabification of *niaru* ‘village home’ is *ni.a.ru*, for example.
[12] Examples are presented in IPA transcription, rather than in the orthographic convention assumed in the source. Particularly, IPA [ɬ] is represented as ‘lh’, while [ʃ] as ‘sh’ in the source.

buqnur	‘anger, hatred’	mia-bugnu**qnu**r	‘to be irritable’
ma-kutnir	‘compact’	mia-kutni**tni**r	‘to harden’

In Kamaiurá, the disyllabic plural reduplicant appears after the final vowel. When the stem is consonant-final, the reduplicant appears as an infix.

(50) Kamaiurá plural reduplication (Everett & Seki 1985; McCarthy & Prince 1993a)

omotumuŋ	omotumu**tumu**ŋ	‘He shook it repeatedly’
omokon	omoko**moko**n	‘He swallowed it frequently’
ohuka	ohuka**huka**	‘He kept on laughing’
ojeʔapah^{w}at	ojeʔapah^{w}a**pah^{w}a**t	‘He rolls himself up repeatedly’
jeumirik	jeumiri**miri**k	‘I tie up repeatedly’
oetun	oetu**etu**n	‘He keeps on smelling’
apot	apo**apo**t	‘I jump repeatedly
oekɨj	oeki**ekɨ**j	‘He pulls repeatedly’

A similar pattern is found in Korean. Onomatopoeic reduplication involves infixing a CV copy of the right edge of the stem after the final vowel.

(51) Korean Onomatopoeic (Kim 1984, Jun 1994, Lee & Davis 1993)

culuk	cul**lu**k	‘dribbling’
allok	allo**lo**k	‘mottled’

tʰak	tʰa**ta**k	‘with a slap’[13]
t’aŋ	t’a**ta**ŋ[14]	‘bang’
wacak	waca**ca**k	‘munching’

These cases are often treated as mere suffixing reduplication, with the final consonant viewed as extrametrical, thus not relevant for reduplication. However, as noted above, for the present purpose of descriptive generality, these cases will be considered as infixing after the final vowel.

Infixation before the final vowel is rare, but some examples are found. For example, in Levantine Arabic, a copy of the initial consonant appears before the final vowel.

(52) Levantine Arabic intensification (Cowell 1964, Broselow & McCarthy 1984)

barad	bar**b**ad	‘shaved unevenly’
šaraħ	šarša**ħ**	‘criticized severely’
ħalat	ħal**ħ**at	‘sheared unevenly’
daħal	daħ**d**al	‘rolled gradually’

Similarly, in Zuni, a copy of the stem-initial consonant appears before the final syllable marks medio-passive and repetitive.

[13] Note that the aspirated and fortis onsets are lost in the reduplicant.
[14] [’] refers to the tenseness, rather than ejection.

(53) Zuni (Newman 1965:55, Broselow & McCarthy 1983:43)

čolo	‘to make the sound of crackling paper’
čol**č**o+ʔa	‘it makes irregular crackling sounds (ʔa=PRES)’
tomo	‘to strike the skin drum’
čuwapi tom**t**o+k’+e+ʔa	‘who is making noises on the skin drum (-k’=CAUS, -e = CONT)

Cases of fixed infixation after the final vowel are rare and potentially ambiguous. For example, in Huave, a Huavean language spoken in Mexico, the indefinite actor morpheme can be treated as either appearing after the first vowel or after the final vowel of the root since the size of the roots is monosyllabic.

(54) Huave indefinite actor (Stairs & Hollenbach 1969:52)

šom	‘to find’	šo**r**a**a**m	‘to find’
haw	‘to know’	a-ha**r**a**a**w	‘someone knows it’
ndok	‘to fish’	a-ndo**r**o**o**k	‘somebody fishes it’
ndig	‘to string’	a-ndi**r̈**:**e**g	‘somebody string it up’

Examples of this infixing construction are scarce since the more common indefinite actor marker is the suffix allomorph *-aran*.

1.2.5 Stress and related metrical units

Units of stress may serve as the pivot of infixation also. Examples from English and Ulwa have already been discussed earlier. In English expletive infixation, the expletive must appear to the left of a trochaic foot. In Samoan, a Polynesian language, plural is marked by reduplicating the penultimate, thus stressed, syllable. Syllables are always open, thus the reduplicant is CV in shape. When the stem is more than two syllables long, the reduplicant appears to infix before the stressed syllable. In the following examples, stress-marking is indicated to facilitate the presentation, even though it is not marked in the source.

(55) Samoan plural (Mosel & Hovdhaugen1992:221-222)

ˈtoa	‘brave’	**to**ˈtoa
ˈmaː	‘ashamed’	**ma**ˈmaː
aˈlofa	‘love’	a**ːlo**ˈlofa
gaˈlue	‘work’	ga**ːlu**ˈlue
aːˈvaga	‘elope’	a**ːva**ˈvaga
ataˈmai	‘clever’	ata**ma**ˈmai
maʔaˈlili	‘cold, feel cold’	maʔa**li**ˈlili
toˈʔulu	‘fall, drop’	to**ʔu**ˈʔulu

It is not immediately obvious whether the pivot should be construed in terms of the stressed foot or the stressed syllable. In the case of Samoan, either characterization is

possible. However, this distinction appears to be relevant in the case of Ulwa distributive reduplication. The CV reduplicant copies the head syllable of an iambic foot (56)a. When the root is disyllabic, the reduplicant appears infixed (56)b.

(56) Ulwa adjective distributive reduplication (Green 1999: 51)

a.	yám-ka	‘good-ADJ’	**ya**yámka
	páw-ka	‘red-ADJ’	**pa**páwka
	píː-ka	‘extinguished-ADJ’	**pi**píːka
	bara-ka	‘dark-ADJ’	ba**ra**ráːka
	bisíː-ka	‘small-ADJ’	bi**si**síːka
b.	ihír-ka	‘erect-ADJ’	i**hi**hírka
	walaŋ-ka	‘corpulent’	wa**la**láŋka
	barás-ka	‘black-ADJ’	ba**ra**ráska
	burím-ka	‘firm-ADJ’	bu**ri**rímka
	saháw-ka	‘nake-ADJ’	sa**ha**háwka

The reduplicant would appear as a prefix when the root is disyllabic if the pivot were the stressed foot. The fact that it is infixed suggests that the stressed syllable is the pivot.

Ulwa also provides an example of infixing after the stressed syllable. Nouns in Ulwa have two forms: bare vs. affixed. The affixed variant is referred to as the construct state. The construct state may appear as either an infix or a suffix, depending on various factors including the length of the stem and its morphological makeup. Suffixation is generally possible even if there is also a valid infixed form. When the construct state morpheme is

infixed, it surfaces after the first iambic foot of the stem. Disyllabic roots may have either initial or final stress. However, when in the construct state, stress is always iambic (57)b.

(57) Ulwa construct state (Green 1999: 61, 64)

a.	sú:lu	sú:-**ma**-lu	‘dog-CNS2’
	áytak	áy-**mana**-tak	‘paper-CNS22’
	alá:kum̯	alá:-**ka**-kum̯	‘Muscovy duck-CNS3’
	waráw̯wa	waráw̯-**kana**-wa	‘parrot sp.-CNS33’
	ká:sirá:mah	ká:-**ki**-sirá:mah	‘lizard sp.-CNS1’
b.	awa, awá:	awá:-**ki**	‘silkgrass-CNS1’
	súru, surú:	surú:-**kina**	‘log-CNS11’
	(?)yápu, yapú:	yapú:-**kana**	‘crocodile-CNS3’
	(?)ábu, abú:	abú:-**ma**	‘stingray-CNS2’

Infixes appearing after a stressed vowel are rare. The only clear examples are found in the Interior Salish languages. For example, in Shuswap, diminutive is marked by infixing a reduplicative copy of the pretonic consonant after the stressed vowel, regardless of whether the stressed syllable is open or closed.

(58) Shuswap diminutive (Anderson 1992:209, van Eijk 1990:231)

pésəłkʷe	‘lake’	pé**p**səłkʷe	‘small lake’
cq’éłp	‘tree’	cqé**q’**łp	‘small tree’

sqéx̌he	‘dog’	sqé**q**x̌he	‘little dog’
qéʔce	‘father’	ɣnqé**q**ʔece	‘my father’
səp’-ús	‘hit-face’	səpú**p’**skn	‘I am hit in the face’[15]

Chamorro continuative CV reduplication is a possible instance of infixing after the stressed vowel.

(59) Chamorro continuative reduplication (Topping 1973:259)

Noncontinuative		Continuative		Traditional analysis
ˈsaga	‘stay’	ˈsa**sa**ga	‘staying’	ˈ**sa**saga
huˈgando	‘play’	huˈga**ga**ndo	‘playing’	huˈ**ga**gando
ˈtaitai	‘read’	ˈta**ta**itai	‘reading’	ˈ**ta**taitai
ˈeggaʔ	‘watch’	ˈe**ʔe**ggaʔ	‘watching’	ˈ**e**ʔeggaʔ

The traditional analysis of Chamorro reduplication assumes that the reduplicant appears before the final disyllabic foot (e.g., *hu(gando)* → *hu**ga**(gando)*; Broselow & McCarthy 1983; see also De Lacy (1997)’s analysis of Maori reduplication). Unlike Samoan, however, the final foot of the continuative in Chamorro does not coincide with the stressed foot as stress is on the antepenult.[16] Consequently, previous analyses rely on the

[15] Interestingly, Shuswap demands the use of the diminutivized form of the verb when the subject is first person singular for politeness sake.

[16] Note that the unreduplicated form has penultimate stress (e.g., *huˈgando* ‘play’ vs. *huˈgagando* ‘playing’). Non-lexical antepenultimate stress appears to be specific to continuative reduplication pattern only as fixed affixes cause stress-shift to the default penultimate position (e.g., nána ‘mother’ vs. naná-hu ‘my mother’).

notion of a final disyllabic prosodic stem, defined specifically for the purpose of reduplication only. However, the post-stressed vowel analysis of the continuative reduplicant avoids this *ad hoc* device completely.

The fact that units of stress serve as pivots of infixation raises the question of whether secondary stress may also play a role in infix placement. If secondary stress does play a role, for a given language, the possible landing site of an infix increases as the number of secondary stress increases. English provides one such example of variation in infix placement.

(60) English expletive infixation (McCarthy 1982)

ˌPopoˈcatepetl	Popo-**fuckin**-catepetl	or	Popocate-**fuckin**-petl
anˈticipaˌtory	anticipa-**fuckin**-tory	or	an-**fuckin**-ticipatory
ˌTatamaˈgouchee	Tata-**fuckin**-magouchee	or	Tatama-**fuckin**-gouche
ˌWinniˈpesaukee	Winni-**fuckin**-pesaukee	or	Winnipe-**fuckin**-saukee
ˌKalamaˈzoo	Kala-**fuckin**-mazoo	or	Kalama-**fuckin**-zoo

As pointed out in McCarthy 1982, the expletive may appear to the left of a foot boundary, which explains why, for example, the word *Popocatepetl* should have two possible expletive-infixed variants; there are two possible left edges of foot boundary.

(61) (* .)(* .)(* .)
Popo cate petl

1.2.6 Other potential pivots

Thus far, the discussion has focused on infixation that falls into one or more of the established pivot categories. The set of well-attested pivots are given below:

(62) Attested pivot inventory

a. *Edge pivots*
First consonant
First vowel
Final syllable
Final vowel

b. *Prominence pivots*
Stressed syllable
Stressed foot
Stressed vowel

An asymmetry is apparent within the set of edge pivots. Given that the first consonant is a pivot, *a priori*, a mirroring final consonant pivot should be possible. In fact, both Ultan and Moravcsik admit infixes before the final consonant as a possibility. It should also be noted that the infixes that appear before or after the final vowel are not among the set of possible infixation patterns reported in Ultan 1977 or Moravcsik 2000, suggesting that such patterns might be subsumed under their category of infixing before the final

consonant. However, convincing patterns of infixation referring to the final consonant are hard to find. The only potential example is the case of Takelma frequentative reduplication. Here, instead of identifying the reduplicant by boldface, the reduplicating string is underlined instead.

(63) Takelma frequentative (Sapir 1922, Broselow & McCarthy 1983:71)

hemg-	'take out'	hememg-	(freq.)
masg-	'put'	mats!aasg-	(freq.)
baxm-	'come'	baxaaxm-	(freq.)
t!üülg-	'trail'	t!ülüülg-	(usit.)
süümt-a	'boil it!'	ts!ümüümt-a	'he boils it;

Many researchers in the past have noticed that the VC infix appears after the initial CVC in CVCC stems, suggesting that the VC infix appears before the final consonant of the root (e.g., *hem-**em**-g*). However, the VC reduplicant might also be analyzed as lodging after the initial consonant (e.g., *h-**em**-emg*). Given that there is no example of vowel-final roots cited in the source, it is impossible to differentiate these two analyses.

Another potential example is found in Hausa, a Chadic language spoken in Niger, Nigeria and neighboring countries (64). Here, one type of plural marking has the shape *aaCee*, where *C* is a copy of the root-final consonant, when the root is *CVC* (e.g., *kar* → *kàràarée* 'corn stalk'; Leben 1980, Newman 2000) (64)a. However, when a root ends in a consonant cluster, the *-aa-* portion of the plural morpheme appears to have infixed within the consonant cluster (64)b. The final consonant thus occupies the C slot of the

aaCee plural morpheme (e.g., *kask* → *kàsàakée* 'bowl'). The problem with claiming that the plural marker is infixed before the final consonant is that such an analysis cannot be extended to roots without final consonant clusters. Rather than viewing Hausa plural formation as a matter of infixation, other authors (e.g., Rosenthall 1999) have suggested that Hausa plural formation is actually a matter of prosodic template satisfaction, similar to the broken plural in Arabic (McCarthy and Prince 1990).

(64)

	root	singular	plural	gloss
a.	kar	káráa	kár**àaréé**	'corn stalk'
	dam	dámóo	dám**àa**m**éé**	'land'
b.	birn	birnii	bír**àan**é**é**	'city'
	kulk	kúlkíi	kúl**àa**k**é**	'cudgel'
	kask	káskóo	kás**àa**k**éé**	'bowl'

There are other reported cases of infixing before the final consonant, but all are reanalyzable as infixing after the final vowel. For example, in Amis, an Austronesian language spoken in Taiwan, plural is indicated by bimoraic reduplication.

(65) Amis (Ho et al. 1986)

łaŋka	'sesame'	łaŋka**ŋka**	'pile of sesame'
lamlu	'die'	lamlu**mlu**	'dice'
pawti	'bag'	pawti**wti**	'bags'

	ʃamału	‘card’	ʃamału**mału**	‘cards’

However, when the root ends with a consonant, the reduplicant appears to come before the final consonant (66).

(66)	luma**ʔ**	‘house’	luma**luma**ʔ	‘houses’
	kaput	‘group’	kapu**kapu**t	‘groups’
	wiłaŋ	‘friend’	wiła**wiła**ŋ	‘friends’
	ʔuŋtʃuj	‘rock’	ʔuŋtʃu**ŋtʃu**j	‘pile of rocks’
	taŋkuj	‘winter melon’	taŋku**ŋku**j	‘winter melons’
	tamław	‘person’	tamła**mła**w	‘people’
	niaruʔ	‘village home’	niaru**aru**ʔ	‘village homes’

The problem with this characterization is that it does not extend naturally to V-final roots and would have erroneously predicted that the reduplicant appears before the last syllable of a V-final root (e.g., *pawti* ‘bag’ → **paw**pawti*).[17]

Another infixation pattern reported in Ultan and Moravcsik but not appealed to here is the first syllable. Such a pivot should be logically possible, particularly given the need of a final syllable pivot. Some potential instances of infixing after the first syllable are found. For example, in Koasati, one method of marking punctual plural is by lodging *-ho-*

[17] Note that the same logic was invoked earlier for reclassifying certain cases of infixing after the initial consonant as before the initial vowel.

after the initial syllable of the stem. The data reproduced in (67) are all that were cited in Kimball 1991.

(67) Koasati punctual plural (Kimball 1991:326)

ok.cay.yan	‘to be alive’	ok**ho**cayyan
ok.cák.kon	‘to be blue’	ok**ho**cákkon
ak.łát.lin	‘to be oversize’	ak**ho**łátlin
stok.hát.kan	‘to be gray’	stok**ho**hátkan

Several peculiarities of this set of data must be noted. The general method of marking punctual plural in Koasati is infixing reduplication (see (46) above). The *-ho-* infix is used only when the initial syllable of the stem is closed. The range of coda consonants is vast in Koasati, and no special restriction on the coda inventory of the initial syllable is reported. Thus, the fact that stems that admit *h*o-infixation all begin with a syllable that ends in *k* raises suspicions that the initial syllable might be a separate morpheme or that *k* might be an infix itself.

Two other potential examples of infixing after the initial syllable are found in Cantonese and Mandarin, languages commonly viewed as having little morphology. Crucially, the roots here cannot be analyzed as compounds, as neither syllable is freestanding in the respective languages.

(68) Cantonese (Matthews & Yip 1994:43)

lœntsœn	'clumsy'	lœn-**kwai**-tsœn	'downright clumsy'
jʊksyn	'ugly'	jʊk-**kwai**-syn	'downright ugly'

Mandarin (Chau 1968)

hwudu-de	'muddled'	hwu-**li**-hwudu-de	'good and muddled'

This set of data is problematic for two reasons. First, the Cantonese pattern may also be classified under the final syllable pivot category since the inputs are always disyllabic. Second, while the syllables above might not be freestanding, it remains possible to analyze them as bound morphemes; 'infixation' in this case might better be viewed as interfixation.

1.2.7 Infixation in word games

Infixation is often employed in language games or disguises. As shown below, while the set of pivots for language game infixation is within the set of pivots required by grammatical infixation, language game pivots seems to be more restricted; language game infix seems to favor vocalic pivots, rather than consonantal ones. For example, in Estonian, one word game involves the insertion of a syllable /pi/ after the first vowel of the word.

(69) Estonian word game (Lehiste 1985)

a.	saḍa	saˈ**ḅi**ḍa	'Q1, hundred'
b.	laulus	laˈ**ḅi**ulus	'Q2, in the song inessive sg.'
	seadus	seˈ**ḅi**aḍus	'Q3, law, nom. s.g.'
	kauṷa	kaˈ**ḅi**uṷa	'Q2, for a long time, adv.'
	haige	haˈ**bi:**ge	'Q3, sick, nom. sg.'
	maiɻas	maˈ**ḅi:**ɻas	'Q2, fond of sweets, nom. sg.'

As is well-known, Estonian has three types of quantity: Q1(short), Q2(long), Q3(overlong). The first notable fact is that when a word contains a diphthong, /pi/ is inserted after the first element, thereby forming a diphthong with the second element (69). Long vowels are never segmented into two parts by /pi/ insertion. They are treated as if they were short vowels (70).

(70)

saḍa	saˈ**ḅi**ḍa	'Q1, hundred'
sa:ḍa	saˈ**ḅi:**ḍa	'Q2, send, 2sg. imper.'
sa:ḍa	saˈ**ḅi:**ḍa	'Q3, get, *-da* infinitive'

In Hausa, one game involves inserting *-bV-* after the vowel of each word-internal syllable. The vowel of the infix is a copy of the preceding vowel. Two aspects of this word game are noteworthy. The infix *-bV-* appears after a vowel, regardless of whether that vowel is followed by a coda consonant or not. The pivot of this infix is any vowel in

the word, except the final ones, suggesting that the infix cannot be peripheral; the issue of non-peripherality of an infix is discussed in Chapter 2 and 3.

(71) Hausa word game (Newman 2000:297)

gidā	gi**bĭ**ida	'house'
maskī	ma**bà**ski	'oily'
Màimunà	Mai**bài**mu**bù**na	'Maimuna (name)'
hatsī	ha**bà**tsi	'grain'
tà̆barmā	ta**ba**ba**ba**rma	'mat'

Tigrinya has two play languages, both involving the insertion of *-gV-* after each vowel, where V is a copy of the preceding vowel.

(72) Tigrinya (Bagemhl 1988)

Natural Lg	Play Lg 1	Play Lg 2	
s'ăhifu	s'ă**gă**hi**gi**fu**gu**	s'ă**gă**hi**gi**fu**gu**	'he wrote'
bĭč'a	bĭ**gĭ**č'a**ga**	bĭ**gĭ**č'a**ga**	'yellow'
ʔĭntay	ʔĭ**gĭ**nta**ga**y	ʔĭ**gĭ**nĭ**gĭ**ta**ga**yĭ**gĭ**	'what'
k'arma	k'a**ga**rma**ga**	k'a**ga**rĭ**gĭ**ma**ga**	'gnat'

In Play Language 1, the infix appears after each vowel of the original word. Word-internal consonant clusters are left intact. In Play Language 2, however, an epenthetic *ĭ* is

inserted, transforming the syllable structure of the original form into an output with open syllables only. This transformed output serves as the input to the word game.[18]

Another interesting and elaborate game of infixation is the so-called *Prokem* slang in Indonesian, adopted by teenagers and students, mostly in Jakarta, the capital city of Indonesia. Prokem has even found its way into printed literature. In this slang the final rhyme of a word is first truncated; the infix *-ok-* is then inserted before the final vowel of the truncatum (Slone 2003).

(73) Indonesian *Prokem* slang

bapak	b**ok**ap	'father'
malu	m**ok**al	
pembantu	pamb**ok**at	
rumah	r**ok**um	
begitu	beg**ok**it	

Finally, in Tagalog, the infix *-gVVdV-* is inserted after the vowel of each syllable. The unspecified vowels of the infix copy the adjacent vocalism of the basic form (Conklin 1956, 1959)

(74) Tagalog *baliktad* speech disguise game (Conklin 1956)

hindíʔ	hi**gíid**indi**gíidi**ʔ	'not, not'
taŋháaliʔ	ta**gáada**ŋha**gáada**li**gíidi**ʔ	'noon'

[18] For an in-depth discussion of Tigrinya play languages and their phonological implications, see Bagemihl 1988.

Grammatical infixation and infixation found in word games differ in two important respects. First, infixes in word games can be applied multiple times, as in the Hausa and Tagalog cases. Multiple infixing of the same morph is not found in grammatical infixation. Second, it was observed earlier that genuine cases of infixation after the initial vowel or before final vowel are rare. Yet, in all of the word games surveyed above, the infix takes the vowel as the pivot (i.e. after initial vowel in Estonian, before final vowel in Indonesian *Prokem* slang, and after each word-internal vowel in Hausa, Tagalog and Tigrinya).

1.3 Summary

In the preceding section, the range of attested infixation patterns is reviewed. A summary of the different possible infix positions, accompanied by the languages that instantiate the patterns, appears in 0. Two sets of pivots are found: edge and prominence pivots. There are four types of edge pivots and three types of prominence pivots.

Pivot	**Location**	**Examples discussed above**
First consonant	Before	SiSwati & Kinande pluractional, Pangasinan plural
	After	Atayal actor focus *-m-*, Mlabri nominaling *-rn-*, Maricopa plural *-uu-*
First vowel	Before	Toratan agent voice *-um-*, Chamorro actor focus *–um-*, Yurok intensive *-eg-*, Ferhan Tetun nominalizing *-aC-*, Kugu Nganhcara plural
	After	Alabama mediopassive *-l-*, Quileute plural, Miskito 2nd conjugation
Final syllable	Before	KiChaga intensive *-n-*, Koasati verbal plural *-s-* & punctual CV-reduplication
	After	Not attested
Final vowel	Before	Levantine Arabic intensive reduplication, Zuni mediopassive reduplication
	After	Amis, Thao, & Kamaiurá plural reduplication, Korean onomatopoeic reduplication
Stressed syllable	Before	Ulwa distributive adjective CV-reduplication
	After	Chamorro continuative CV-reduplication
Stressed vowel	Before	*Not attested*
	After	Shuswap diminutive C-reduplication
Stressed foot	Before	Samoan plural CV-reduplication, English expletive
	After	Ulwa construct state, English Homeric infixation

Besides those cases summarized above, there are instances where multiple pivot analyses are suitable, as summarized below:

(75) ***After first consonant or before first vowel***

Mangarayi, Yir Yoront, & Djingili plural reduplication, Lushootseed out-of-control reduplication, Tagalog actor focus -um- & perfective -in-

After initial vowel or after initial syllable

Bole pluractional, Budukh durative -r-, Uradhi pluractional CV-reduplication, Quileute pluractional C-reduplication, Dakota inflections,

After initial vowel or final vowel

Huave indefinite actor -ra-, Greek present -n-, Tzeltal intransitive -h-, Tzutujil simple passive -j- & mediopassive -ʔ-,

Before final syllable after final V

Ineseño Chumash & Sonora Yaqui reduplication

This survey also shows that certain logical possible pivots (e.g., first syllable or final consonant) are not needed to describe the full range of infixation attested. Chapter 4 provides an explanation as to why the set of pivots are restricted to the set attested. In the

next chapter, Chapter 2, a formal treatment is infixation is offered, which is exemplified in Chapter 3 by three case studies.

Chapter 2: Theoretical approaches to infixation

We shall not cease from exploration
And the end of all our exploring
Will be to arrive where we started
And know the place for the first time.
Little Gidding, T. S. Eliot

Theoretical models of infixation can be divided into two archetypes: ***Phonological Subcategorization*** **(P-SUBCAT)** and ***Hybrid Models***. Both P-SUBCAT and the Hybrid models make use of alignment, that is, the ordering specification between two entities. These approaches differ as to what essential category infixes are aligned to. P-SUBCAT-based theories see infixation as a type of P-affixation, i.e. affixation to a phonological domain. P-SUBCAT theories differ with each other in terms of what phonological units can be admitted in a subcategorization relation. Hybrid Models, on the other hand, see infixation as a two-prong problem. Like P-SUBCAT, Hybrid Models account for *prominence-driven* infixation in terms of P-affixation. However, *edge-oriented infixes* received an entirely different treatment, which I call the Displacement Theory (DT). DT advocates the view that edge-oriented infixes are underlyingly M-affixes, i.e. they are affixed to morphological categories like root, stem or word; according to DT, infixation

results when an M-affix acquiesces to the "demands" of higher prosodic, phonotactic, or morphological considerations by surfacing inside a stem or a root. This dichotomy highlights the fact that *the Hybrid Model is not a unified theory of infixation*; it consists of two components, one of which shares the same mechanism as a P-SUBCAT model (see below for further discussion).

P-SUBCAT and Hybrid Models also differ in terms of how the distribution of edge-oriented infixes is explained. A Hybrid Model restricts the motivation for edge-infixation within the bounds of the synchronic grammar, while P-SUBCAT makes no *a priori* commitment as to whether the motivation is internal or external to the grammatical system *per se*.

(1)

Model:	**P-SUBCAT**	**Hybrid Model**
Formalism	Generalized Alignment	Generalized Alignment
Edge-oriented infixation	P-Subcategorization Alignment w.r.t. {PrWd, FT, σ, μ, C, V}	DT Alignment w.r.t. {root, stem}
Prominence-driven infixation		P-Subcategorization: Alignment w.r.t. {PrWd, FT, σ, μ}
Explanation for edge-oriented infixation	External or Internal (e.g., diachronic, learning bias)	Internal (e.g., prosodic, phonotactic)

This chapter will explore in detail the predictions of P-SUBCAT and Hybrid approaches. I will first propose and defend a particular version of Phonological Subcategorization, called ***Generalized Phonological Subcategorization***. The basic tenet of this theory appears in Section 2.1. An explication and a detailed critique of DT approaches appear in Section 2.2.

2.1 Infixation as Phonological Subcategorization

Generalized Phonological Subcategorization (GPS) is a family of well-formedness constraints, couched within the formalism of Generalized Alignment (McCarthy & Prince 1993a).

(2) Generalized Phonological Subcategorization (GPS)

Align $(Cat_1, Edge_1, Cat_2, Edge_2) =_{def}$

$\forall$ Cat_1 $\exists$ Cat_2 such that $Edge_1$ of Cat_1 and $Edge_2$ of Cat_2 coincide.

Where $Cat_1 \in$ MorphCat {morphemes, morph}

$Cat_2 \in$ PhonCat {ProsCat, C, V}

$Edge_1, Edge_2 \in$ {Right, Left}

As defined in (2), the set of PhonCat includes not only the categories within the Prosodic Hierarchy (i.e. ProsCat), but also units on the CV tier. A GPS constraint demands that a designated edge of a morphological constitutent of type CAT_1 coincide with a designated edge of a phonological constituent of type CAT_2.

Thus, for example, the actor focus infix *-m-* in Atayal can be treated as subcategorizing for the first consonant. Using the GPS model, this can be formalized as follows:

(3) Atayal actor focus infix *-m-*

SUBCAT of *-m-*: $_{stem}$[C ___

ALIGN (L, *-m-*, R, C_{first})

'The left edge of the actor focus marker *-m-* is aligned to the right edge of the first consonant.'

Ulwa construct noun infix *-ka-*

SUBCAT of *-ka-*: FT']___

ALIGN (L, *ka*, R, FT')

'The left edge of the construct noun marker *-ka-* is aligned to the right edge of a stressed foot.'

Several aspects of this theory are significant. First, while GPS inherits the insight of earlier P-SUBCAT-based works on *prosodic subcategorizati*on (also known as prosodic alignment (McCarthy & Prince 1986, 1993)) and the *Bi-dependent* approach to infixation (Inkelas 1989, Kiparsky 1986) which considers infixation as involving the alignment of a morphological entity with respect to a phonological one. Following the lead of earlier work by Kiparsky (1986) and Inkelas (1989), GPS breaks with the assumption of *Prosodic* Subcategorization that only genuine prosodic categories can participate in a

morpho-phonological alignment relationship. As defined in (2), segmental units must also be allowed. This feature of GPS feeds into another significant feature of the theory.

2.1.1 GPS as a unified account of infixation

GPS differs from most earlier approaches in that it unifies the treatment of edge-oriented infixation and prominence-oriented infixation under a single formalism (i.e. (2)), thus avoiding the pervasive problem of ***Artificial Bifurcation***. As noted above, previous approaches to infixation insist that the two classes of infixes should be treated differently (e.g., Broselow & McCarthy 1983, McCarthy and Prince 1986). For example, within the theory of Prosodic Morphology, McCarthy and Prince (1990, 1993ab) argue that prominence-driven infixes should be analyzed in terms of positive operational prosodic circumscription, and edge-oriented infixes in terms of negative operational prosodic circumscription. *Operational prosodic circumscription* is a factoring function that allows a peripheral constituent to be parsed from a string; some operation can then be performed on that element (positive circumscription) or on the remainder (negative circumscription). Let us first consider an example of positive circumscription. In Yidiŋ, a Pama-Nyungan language spoken in Queensland, Australia, the shape of the reduplicant depends on the foot structure of the base (4).

(4) a.

Singular	Plural	(Dixon 1977 cited in McCarthy 2000)	
$[mula]_{Ft}$ ri	mula-$[mula]_{Ft}$-ri	'initiated man'	vs. *[mular]-[mula]ri
$[t^{j}ukar]_{Ft}$ pa	t^{j}ukar-$[t^{j}ukar]_{Ft}$ pan	'unsettled mind'	vs. *$[t^{j}uka]$-$[t^{j}ukar]$pan

b. i. O: Φ($[múla]_{Ft}$ ri) = O($[múla]_{Ft}$ ri:Φ) * $[múla]_{Ft}$ ri/Φ

ii. = O($[múla]_{Ft}$) * ri

iii. = $[múla]_{Ft}$ $[múla]_{Ft}$ * ri

iv. = $[múla]_{Ft}$ $[múla]_{Ft}$ ri

Under positive prosodic circumscription, one first selects the prosodic constituent to be copied (represented by the function Φ), in this case, a stressed foot (step i). The Φ-delimited portion of the word is assembled with the non-Φ-delimited part of the stem (step ii). The reduplicative prefix *O* is then affixed to this circumscribed foot (step iii), followed by the reassembling in step iv.

Negative prosodic circumscription is essentially the logical counterpart of positive prosodic circumscription. For example, according to McCarthy 2000, in Timugon Murut, an Austronesian language spoken in Malaysia, an initial onsetless syllable, if any, is circumscribed. The circumscribed prosodic constituent, rather than serving as the base of affixation, is stripped away temporarily, while the reduplicative morpheme is attached to the residue (see (5)b for a step-wise illustration of this operation).

(5) Timugon Murut (Prentice 1971: McCarthy 2000)

a.

bulud	**bu**-bulud	'hill/ridge'
limo	**li**-limo	'five/about five'
ulampoy	u-**la**-lampoy	no gloss
abalan	a-**ba**-balan	'bathes/often bathes'

ompodon om-**po**-podon 'flatter/always flatter'

b. Circumscriptional analysis

Φ(Onsetless Syllable, Left), O = Prefix σ_{μ} (reduplicative prefix)

O/Φ(ompodon) = O(ompodon/Φ) * ompodon:Φ

= O(podon) * om

= popodon * om

= ompopodon

At this point, the question of what motivates the bifurcation assumption in the first place must be addressed. To the extent that there is any mention of this topic in the literature, there are two main reasons behind this "bifurcation" assertion.

A general reason behind the bifurcated treatment stems from the idea that edge-oriented infixes are too close to the edges to be treated on the same par as cases of prosodic subcategorization, which typically involve the infixing of a morpheme deep inside a stem. As such, the logical move is to find grammar-internal motivations to rationalize this seemingly non-accidental observation of edge-oriented infixes. This attitude has eventually culminated in the conjecture that there is a causal relationship between the shape of an infix and where it appears, which serves as the basis of Displacement Theory.

The other reason for this bifurcation has to do with what I called the ***Sub-prosodic Constituent Problem***. The theory of Prosodic Morphology, first articulated in McCarthy

& Prince 1986, requires morphological processes that interact with phonology to refer to genuine prosodic constituents. The basic tenets of this theory are given in (6).

(6) Basic tenets of Prosodic Morphology (McCarthy & Prince 1993b:109)

- **Prosodic Morphology Hypothesis**: Templates are defined in terms of the authentic units of prosody: mora (μ), syllable (σ), foot (Ft), prosodic word (PrWd).
- **Template Satisfaction Condition**: Satisfaction of templatic constraints is obligatory and determined by the principles of prosody, both universal and language-specific.
- **Prosodic Circumscription of Domains**: The domain to which morphological operations apply may be circumscribed by prosodic criteria as well as by the more familiar morphological ones.

The extension of prosodic subcategorization to edge-oriented infixes would have constituted an embarrassment to the theory of Prosodic Morphology since the units referred to by such affixes often do not match the units licensed by the Prosodic Hierarchy (e.g., onset, initial vowel, etc.). For example, in the case of Sundanese plural formation, the infix *-ar-* must refer to the first consonant of the stem.

(7) Plural *ar* infixation in Sundanese (Robins 1959, McCarthy & Prince 1986)

Singular	Plural	Gloss
niʔis	n**ar**iʔis	'to cool oneself'
naho	n**ar**aho	'to know'

The problem here is that the first consonant is not a recognized prosodic constituent under any theory of Prosodic Phonology. However, the Sub-prosodic Constituent Problem is a Prosodic Morphology-internal problem. In the next section, I provide both empirical and theory-internal arguments for the need to refer to sub-prosodic constituents in other phonological phenomena, thus demonstrating that the Sub-prosodic Constituent Problem is an artificial one.

2.1.2 Evidence of non-prosodic units in phonology

Much research in the past decades has revealed that speakers are aware of certain sub-prosodic units. Thus, in speech error studies, many have found that consonants and vowels within words are often exchanged.

(8) a. Consonantal exchange (Fromkin 1980)

*my **h**etter **b**aff (My **b**etter **h**alf)*

*Can I **m**orrow your **d**otes? (Can I **b**orrow your **n**otes?)*

*The **F**olden **G**leece award (The **G**olden **F**leece award)*

b. Vocalic exchange (Shattuck-Hufnagel 1986)

Error (target)

f[ɪ]t the b[ʊ]ll (foot the bill)

st[ɪ]rred the sh[i]p (steered the ship)

al[i]minum an' st[u]l (aluminum an' steel)

ch[i]ps 'n tw[ɚ]ts (chirps 'n tweets)

Such independent awareness of consonants from vowels is also observed in poetic devices such as alliteration and assonance.

(9) *Alliteration*:

In cliches: ***s**weet **s**mell of **s**uccess, a **d**ime a **d**ozen, **b**igger & **b**etter, **j**ump for **j**oy*

Wordsworth: *And **s**ings a **s**olitary **s**ong That **w**histles in the **w**ind.*

Assonance:

'fl**ee**t f**ee**t sw**ee**p by sl**ee**ping g**ee**ks.'

Language game and language disguise evidence are also some of the most useful techniques for investigating cognitive representations in sound structures (Lehiste 1985, Vago 1985, Campell 1986, Hombert 1986, Bagemihl 1988). Such evidence has been argued as supporting the existence of sub-syllabic constituents (e.g., mora, onset/rhyme, CV skeleton). For example, as mentioned in Chapter 1, a language game in Tigrinya inserts a sequence *-gV-*, where *V* is a copy of the preceding vowel, after every vowel in the word (10)a. A similar game, also mentioned in chapter 1 is found in Hausa (10)b.

(10) a. Tigrinya (Bagemihl 1988)

Natural Lg	Play Lg 1	
s'ăhifu	s'ăgăhigifugu	'he wrote'
bĭč'a	bĭgĭč'aga	'yellow'
ʔĭntay	ʔĭgĭntagay	'what'
k'arma	k'agarmaga	'gnat'

b. Hausa word game (Newman 2000:297)

gidā	gibĭda	'house'
maskī	mabàski	'oily'
Màimunà	Maibàimubùna	'Maimuna (name)'
hatsī	habàtsi	'grain'
tȁ̀barmā	tabababarma	'mat'

More dramatic examples are cases of apparent segmental and sequence exchange in language disguise cited in Bagemihl 1995:704.

(11) Segmental exchanges

Tagalog: **d**i**to** > d**o**t**i** 'here' (Conklin 1956)

Javanese: **sat**us > **tas**us '100' (Sadtano 1971)

Sequence exchanges

Hanunoo: **rignu**k > **nugri**k 'tame' (Conklin 1959)

Thai: kh**ab** r**od** > kh**od** r**ab** 'to drive' (Surintramont 1973)

Mandarin: ma > m**a** k**ey**> m**ey** k**a** (Yip 1982, Bao 1990)

These phenomena support the idea that sub-syllabic units have some psychological reality in the mind of the speaker. A theory that bans such possibilities *a priori* is far too restrictive. However, besides the external evidence, there are also theory-internal reasons that point to the need to refer to subsyllabic units, even within Prosodic Morphology and Optimality Theory.

The need to refer to specific segmental units, like consonant and vowel, in the formulation of alignment is not new. Prosodic constraints such as ONSET or NOCODA, have been given a GA formulation (Prince & Smolensky 1993: section 6; McCarthy & Prince 1993a, Ito & Mester 1999), as illustrated below:

(12) ALIGN (σ, L, C, L) 'ONSET'

ALIGN-RIGHT (σ, R, V, R) 'NOCODA'

Formally, the subcategorization requirement of an infix is no different from these syllable alignment constraints. C or V will still occupy the existentially-quantified argument. The only distinction is that, in a morphological constraint, the morph occupies the universally-quantified first argument, rather than a syllable.

Another example of segment-based alignment is found in recent work by John McCarthy. In an attempt to rule out hyperinfixation (see below in §2.2.2.3), McCarthy (2002) posits a family of quantized alignment constraints. Some examples are given below:

(13) Quantized ALIGN (Ft, Wd, R) (McCarthy 2002: 3)

a. ALIGN-BY-FT(Ft, Wd, R)

No foot stands between the right-edge of Ft and the right-edge of Wd.

b. ALIGN-BY-σ(Ft, Wd, R)

No syllable stands between the right-edge of Ft and the right-edge of Wd.

c. ALIGN-BY-SEG(Ft, Wd, R)

No segment stands between the right-edge of Ft and the right-edge of Wd.

What is relevant here is the introduction of the segmentally-quantized alignment constraint, ALIGN-BY-SEG. In order to account for Tagalog *um*-infixation, McCarthy invokes the constraint, ALIGN-BY-SEG(-*um*-, Wd, L), which says that no segment stands between the right edge left edge of -*um*- and the left-edge of Wd, thus demonstrating that the notion of the segment in alignment is alive and well even within today's Prosodic Morphology.

Another significant feature of GPS concerns the nature of the infixal pivots, namely, the predominance of edge-pivots.

2.1.3 Pivot peripherality

Chapter 1 illustrates that infixes occur in two general contexts (14)—the edges of a root/stem or around some prosodically prominent unit, such as the stressed syllable. The set of possible pivots is reproduced below:

(14) Potential pivots of infixation

Edge pivots

First consonant/onset

First vowel/nucleus

First syllable

Final syllable

Final vowel/nucleus

Prominence pivots

Stressed foot

Stressed syllable

Stressed vowel/nucleus

Hidden beneath the apparent simplicity is a puzzle to be wrestled with: given the fact that there is a multitude of infixes in languages of the world, one would expect there to be a diverse inventory of potential pivots of infixation; yet they all seem to converge to two locales. Each of the pivots also corresponds to a single phonological constituent (see also Moravczik 1977). Even more curious is the fact that infixes are predominately edge-

oriented. Of the 139 patterns surveyed in this work, more than 126 (i.e. 91%) of infixes are edge-oriented. This asymmetric distribution of infixes, or ***edge bias***, must be accounted for in any explanatory theory of infixation.

(15) Distribution of edge-oriented and prominence-driven infixes

	Fixed	RED	Total
Edge-oriented	85	43	128
Prominence-driven	3	10	13
Total			141

DT accounts for the peripheral distribution of edge-oriented infixes by stipulating that such infixes are underlying prefixes and suffixes; movement from its original edge position is minimal, hence the peripheral distribution. Negative Prosodic Circumscription and other Invisibility-based theories of infixation account for peripherality by restricting the element circumscribed to be at the edge of a domain (Poser 1986).

While the issue of infixal pivot peripherality was not directly addressed, Inkelas (1989: Ch. 6) argues that peripherality of invisible element, defined as an element of a morphological constituent that is not included in any corresponding prosodic constituent, can be derived based on two independently motivated factors in phonology. The Generalized Focus Determinant Adjacency Condition (GFDAC), an expansion of a proposal advanced in Poser 1985, restricts the content of the invisible element to a single phonological constituent.

(16) Generalized Focus Determinant Adjacency Condition (Inkelas 1989)

Each phonologically constrained element must be adjacent to each constraining element.

GFDAC in conjunction with the fact that invisible elements must be placed with respect to the edge of a domain forces invisible elements to be single peripheral elements. Since the notion of an infixal pivot replaces the earlier notion of elements of invisibility in Inkelas 1989, the peripherality of invisible element should extend to the peripherality of infixal pivots as well.

Despite the fact that GPS is compatible with the GFDAC/Domains Theory approach to peripherality of the edge-pivots, nonetheless, I contend that the formalism (i.e. GPS) *per se* does not, and in fact should not, prescribe such information. The ultimate source of peripherality of infixal pivots emerges out of the diachronic pathways that lead to the development of an infix. Particularly, I advance the Exogenesis Theory of Infixation, which argues that edge-infixes originate from historical prefixes or suffixes. A detailed explication of this theory appears in Chapters 4.

2.1.4 P-affixation vs. Genuine Infixation

Above, I argue against the need to partition the set of infixation patterns in theoretical terms; edge-oriented infixes should be modeled the same way prominence-driven infixes are handled. Here, based on empirical factors, I propose that infixation is not entirely a homogeneous set of phenomenon; the dichotomy is not a traditional one, however.

By assuming that infixes are generally affixes that subcategorize for an edge of some pivot, GPS differs from the *Bi-dependent* approach to infixation which assumes ***all*** infixes subcategorize for two entities simultaneously (Inkelas 1989, see also Kiparsky 1986). That is, infixes subcategorize for some prosodic constituent (i.e. the frame-internal [ ]$_p$ in (17)) and the material across which they are attached (i.e. the X in (17)).

(17) [X __ [ ]$_p$]$_p$

Thus, for example, the subcategorization frame of the Atayal actor focus *-m-* is treated as [C __ [ ]$_p$]$_p$; *-m-* left-subcategories for a consonant and right-subcategorizes for a prosodic stem.

Here, I propose to differentiate two types of infixes: ***P-affixes*** are 'infixes' that subcategorize for only one dependent, namely, the pivot, in the sense articulated in Chapter 1. For example, the Chamorro actor focus *-um-* has the subcategorization requirement, ALIGN (R, *-um-*, L, V_1). Such an affix might sometimes appear as at the periphery, sometimes within the stem. For example, when the stem is C-initial, the Chamorro *-um-* appears infixing (e.g., *tr**um**isti* 'becomes sad'); when the stem is V-initial, *-um-* appears prefixing (e.g., ***um**epanglo* 'to look for crabs'). The fact that a P-affix might appear within a stem or a root is not a requirement of its subcategorization *per se*; 'infixation' falls out naturally from the phonological property of the stem. In the case of the Chamorro *-um-*, the morpheme surfaces internal to the stem due to the fact certain stems are C-initial. No special mention of this fact is requirement of the subcategorization frame.

By contrast, *bi-dependent subcategorization* is reserved for what I called ***Genuine Infixes***, that is, affixes that MUST appear internal to a stem, never peripheral. An example of genuine infixation is found, interestingly, in English. The following infixation pattern (popularized by the character Homer in the television series *The Simpsons*®) is found in the speech of some speakers of Vernacular American English.

(18)	a.	ˈσσˌσ	ˈσσ-ma-ˌσ	c.	ˌσσˈσσ	ˌσσ-ma-ˈσσ
		saxophone	saxo-ma-phone		Mississippi	Missi-ma-ssippi
		telephone	tele-ma-phone		Alabama	Ala-ma-bama
		wonderful	wonder-ma-ful		dialectic	dia-ma-lectic
	b.	ˈσσˌσσ	ˈσσ-ma-ˌσσ	d.	ˌσσˈσσσ	ˌσσ-ma-ˈσσσ
		feudalism	feuda-ma-lism		hippopotamus	hippo-ma-potamus
		secretary	secre-ma-tary		hypothermia	hypo-ma-thermia
		territory	terri-ma-tary		Michaelangelo	Micha-ma-langelo

The precise nature of this infixation pattern will be investigated fully in due course. Briefly, the infix *-ma-* must appear after a disyllabic trochaic foot. This case is interesting for several reasons. As noted earlier, infixes that appear to the right of a stressed foot appear to be quite rare; the syllable immediately preceding *-ma-* is never stressed. However, the most striking aspect of this construction is the fact that *-ma-* can never appear peripherally. Consider the follow examples:

(19)

oboe	*oboe-ma
opus	*opus-ma
party	*party-ma
piggy	*piggy-ma
purple	*purple-ma
scramble	*scramble-ma
stinky	*stinky-ma
table	*table-ma

If *-ma-* were merely an affix that left-subcategorizes for a disyllabic trochaic foot, one would expect it to appear finally. Such outputs are, however, not possible. Instead, the infix induces the expansion of the stem, rendering it just large enough to support the infixing pattern on the surface.

(20)

oboe	oba-ma-boe	washing	washa-ma-shing
opus	opa-ma-pus	water	wata-ma-ter
party	parta-ma-ty	wonder	wonda-ma-der
piggy	piga-ma-gy	aura	aura-ma-ra
purple	purpa-ma-ple	music	musa-ma-sic
scramble	scramba-ma-ble	Kieran	Kiera-ma-ran
stinky	stinka-ma-ky	joking	joka-ma-king
table	taba-ma-ble	listen	lisa-ma-sten
tuba	tuba-ma-ba		

The fact that *-ma-* can never be realized as a suffix or prefix means that it must be an ***infix*** in the output. This state of affairs is a clear departure from most of the infixes considered so far, where the subcategorization requirement is always unidirectional; that is, an infix appears either to the left or to the right of a pivot. On the one hand, the Homeric infix has a leftward pivot that is a trochaic foot, a requirement so robust that an epenthetic schwa is recruited to satisfy it. Thus, *lively* [ˈlajvlɪ] yields *live-ama-ly* [ˈlaj-və-mə-lɪ] not **live-ma-ly* *[ˈlajv-mə-lɪ]. However, the satisfaction of the leftward pivot is not enough, since **lively-ma* *[ˈlajvlɪ-mə] is not possible even though *lively* [ˈlajvlɪ] is a well-formed disyllabic trochee. This non-peripherality requirement of genuine infixes is discussed in detail in Chapter 3.

Thus, in this section, I introduce a distinction between P-affixation and genuine infixation, showing that genuine infixation must come with a non-peripherality requirement that is not characteristic of P-affixes. Unlike the bifurcation discussed above which is motivated by purely theoretical reasons, the distinction between P-affixation and genuine infixation is an empirical one. Genuine infixation holds a special characteristic that is not true of P-affixation, namely, the non-peripherality requirement. I should also highlight the need to distinguish between an infix that never appears as an adfix because the nature of stem in the language precludes such a possibility (e.g., Tagalog pluractional *-ŋa-* infixation, Lezgic class infixation etc.) and an infix that is otherwise expected to appear suffixing but is banned from doing so, as in the case of the Homeric infix. The latter is a genuine infix, as defined here, while the former should be classified as a P-affix.

Thus far, I have advanced the Generalized Phonological Subcategorization approach to infixation, expanding the earlier prosodic subcategorization analysis to include sub-prosodic unit such as C & V. The above discussion also highlighted the differences between GPS and earlier approaches. In particular, GPS handles both edge- and prominence-based infixes in a uniform fashion without special stipulation or sub-theory to account for these infixation patterns. The next section turns to the Hybrid Model of infixation. Recall that all Hybrid Models make use of two theoretical mechanisms: Phonological Subcategorization and DT. Since Phonological Subcategorization is shared by both P-SUBCAT and Hybrid Models, by Occam's Razer, P-SUCAT, which does not invoke any phenomenon-specific mechanism such as DT, should be preferred over a Hybrid Model if DT can be demonstrated to be neither necessary nor sufficient.

2.2 Displacement Theory: A critical analysis

Two types of Displacement-based theories are prevalent in the literature: ***Derivational DT*** vs. ***Optimality Theoretic DT***. These two approaches have in common the rejection of edge-oriented infixation as a type of P-affixation; that is, these theories claim that an "edge-infixing" morph or morpheme is underlyingly of the M-affix type, *i.e.* that it is either a prefix or a suffix. In most derivational accounts, the appearance of edge-infixation is due to the result of some late phonological rules. An Optimality Theoretic approach, on the other hand, sees 'infixation' as a matter of morphological alignment yielding to higher ranking prosodic or phonotactic constraints. In what follows, a detailed examination of each of these approaches is presented, demonstrating that neither of these theories is adequate as a general theory of infixation.

2.2.1 Derivational DT

The derivation-based DT approach to infixation is best exemplified in recent work by Halle. Halle (2001) argues, for example, that the so-called VC infixes in many Austronesian languages are in fact CV prefixes. The apparent surface-infixing pattern is a matter of onset metathesis. Take, for example, the [+realis] construction in Tagalog, as illustrated by the data below taken from Schachter and Otanes 1972 (370):

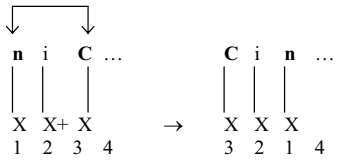
(21)	/in, ʔawi/	→	ʔ-in-awit	'sang'
	/in, bigy, an/	→	b-in-igy-an	'gave to'
	/ʔi, in, bilih/	→	ʔi-b-in-ilih	'bought for'
	/ʔi, in, ka-takoh/	→	ʔi-k-in-a-takoh	'caused to run for'

Contrary to Schachter and Otanes' morphological analysis, Halle 2001 proposes that the [+realis] morpheme is underlying a CV prefix *ni-*. The prefix appears to be infixed due to a rule of onset metathesis.

(22)	/ni, ʔawit/	→	ʔi-nawit	'sang'
	/ni, bigy, an/	→	bi-nigy-an	'gave to'
	/ʔi, ni, bilih/	→	ʔi-bi-nilih	'bought for'
	/ʔi, ni, ka-takboh/	→	ʔi-ki-na-takboh	'caused to run for'

Schematically, Halle's *Onset Metathesis* analysis of infixation can be stated as follows:

(23) Onset Metathesis



Two problems militate against such a treatment of infixation. First, Onset Metathesis cannot account for what happens when the stem begins with a cluster. As discussed in the last chapter (see section 1.2.2), two possible outcomes are possible when the stem begins with a consonant cluster (e.g, *p-**in**-romót*/*pr-**in**-omót* 'promoted'). Onset Metathesis predicts only one of the two outcomes but not both. Moreover, while the analysis above may account for the behavior of the particular morpheme in question, it is a treatment that cannot be extended to all cases of infixation. Take, for example, the case of Budukh prohibitive formation.

(24) Budukh prohibitive (Alekseev 1994: 279)

Root	Gloss	Prohibitive
yeči	'to arrive'	ye**me**či
yixər	'to be'	yi**mə**xər
yuc'u	'to give'	yu**mo**c'u

Here, the infix *-mE-* always appears after the initial vowel of the stem. Onset metathesis would predict the wrong results (e.g., ***mə**+yixər → ***yə**mixər, not yi**mə**xər). Therefore, while isolated treatment of a particular infixation phenomenon as metathesis is no doubt possible, it is ultimately disfavored in light of a single unified analysis, as the one outlined above.

In the next section, the focus of discussion turns to the Optimality Theory-based theory of Displacement.

2.2.2 Optimality Theoretic DT

OT-based DT has two variants: Prosodic Optimization and Edge Correspondence. ***Prosodic Optimization*** treats infixation as a consequence of constraints on adpositional morphological alignment yielding to prosodic or phonotactic pressures. ***Edge Correspondence*** sees infixation as the result of faithful correspondence between input and output edges of the stem. In what follows, I present a critical review of the assumptions and predictions of the Displacement approach in general. Four problems are identified in particular:

(25) Summary of assessment of Displacement Theory

- DT is not explanatory, as claimed by its proponents (§2.2.2.1)
- DT has limited coverage (§2.2.2.2)
- DT over-generates (§2.2.2.3)

In the next section, I first explore one of the basic claims of DT; that is, the explanatory value of DT.

2.2.2.1 On the explanatory value of Displacement Theory

As noted earlier, one of the main claims of DT is its ability to explain the location of infixation by way of the shape of the infix itself. Two interpretations of this claim are possible: the Strong Explanatory Hypothesis and the Weak Explanatory Hypothesis. The ***Strong Explanatory Hypothesis*** holds that the shape of an affix directly influences its ultimate placement; that is, DT predicts *whether* an affix of a given shape will be an infix. On the other hand, the ***Weak Explanatory Hypothesis*** maintains that *given* that an affix can be infixed, the theory predicts where the possible infixation sites are. The next section explores first the validity of the Strong Explanatory Hypothesis.

2.2.2.1.1 The case against Strong Explanatory Hypothesis

If the Strong Explanatory Hypothesis were correct, it is not only important for DT to demonstrate that a particular infix should be infixed due to some dominating prosodic/phonotactic requirements, but also that other affixes in the same language ***cannot*** be infixed because there are no prosodic improvements to be gained. This prediction is clearly not borne out. Take, for example, the situation in Ilokano, an Austronesian language spoken in the Philippines. Like Tagalog, Ilokano also has the infix *-um-* (26).

(26) Ilokano *-um-* infixation (Vanoverbergh 1955:137)

isem	umisem	'(threatens to) smile'
kagat	kumagat	'(threatens to) bite'

Thus, like the treatment of *-um-* infixation in Tagalog, one could claim that *-um-* is infixed in Ilokano due to the drive to avoid coda consonants. Now, consider another instance of VC-affixation in this language (27).

(27) Ilokano *ag-* prefixation (Vanoverbergh 1955)

isem	**ag**-isem	'(actually) smiles'	(132)
kagat	**ag**-kagat	'(actually) bites'	(137)

Here, a VC affix is prefixed to the verb, even though infixing it would certainly reduce the number of coda consonants in the output. The puzzle here is why *-um-* should be forced to migrate inward while *ag-* is allowed to stay put. Zoll (1996), who recognizes this problem, suggests that it is due to the fact that the alignment constraint that governs the placement of *ag-* is ranked above NOCODA, the constraint that penalizes the occurrence of coda consonants, while the alignment constraint of *-um-* is ranked lower than it (28).

(28) ALIGN-*ag*>> NOCODA >> ALIGN-*um*

While this constraint ranking accounts for the distribution of *ag*- and -*um*-, it fails to ***explain*** why *ag*- should be high ranked in the first place. The fact that the ALIGN-*ag* is ranked high while ALIGN-*um* is ranked low relative to NOCODA is a stipulation rather than a principled prediction of DT. Since coda-creating prefixes and suffixes are in the majority in the language, it seems rather anomalous to suggest that -*um*- is infixed due to the effect of coda-minimization.

The claim that DT is ***strong-explanatory*** is further undermined in light of examples of homophonous affixes that nonetheless have different subcategorization requirements in the same language (see also Blevins 1999). For example, in Pangasinan, an Austronesian language spoken in the Philippines, the placement of -*in*- signifies different functions of the passive construction (Benton 1971:130-131). The prefixing of *in*- signifies either intentional passive or benefactive, while the infixing of -*in*- after the first consonant indicates neutral passive.

(29) Passive (intentional)

a. **in**paltóg ‘was fired’

insúlat ‘was written (rather than e.g., read)’

inbása ‘was read (rather than, e.g., sung)’

b. Benefactive

insoliwán ‘was bought for’

ingawaán ‘was done for’

inpesakán ‘was laundered for’

c. Passive (neutral)

p**in**altóg ‘was shot’

s**in**úlat ‘was written’

b**in**ása ‘was read (no assumptions made about alternative)’

t**in**áwag ‘was called’

A similar example is found in Atayal, another Austronesian language, spoken in Taiwan. Both actor focus and the reflexive are marked by the segment -*m*-. As shown in (30), the actor focus marker, -*m*- is infixed, while the reflexive marker is prefixed. A strong interpretation of DT is incapable of providing a principled explanation as to why this state of affairs should exist.

(30) Atayal -*m*- infixation and prefixation (Egerod 1965:266-7)

Root	Gloss	Actor focus	Reciprocal/Reflexive
kaial	‘talk’	k**m**aial	**m**kaial[1]
qul	‘snatch’	q**m**ul	**m**qul
sbil	‘leave behind’	s**m**bil	**m**sbil
siuk	‘give back’	s**m**iuk	**m**siuk
spuŋ	‘meausre’	s**m**puŋ	**m**spuŋ
suliŋ	‘burn’	s**m**uliŋ	**m**suliŋ

[1] Li 1977 and Egerod 1999 argue that even though a svarabhakti [ə] is often heard within the initial consonant clusters, prevocalic consonant sequences should nonetheless be treated as complex onset clusters phonologically.

hkaŋiʔ ‘search’ h**m**kaŋiʔ **m**hkaŋiʔ

A pattern must fall out naturally from independently-motivated mechanisms within the grammar if such an account is to be considered *strong-explanatory*; DT could only claim to be explanatory if it were able to predict infixation of a morpheme based purely on its shape. The presence of homophonous morphemes that have different distributional properties argues against such a strong interpretation of DT. A Strong-Displacement Theoretician might counter this argument by appealing to the fact that OT always allows the possibility of positing two alignment constraints (e.g., M_1 and M_2) for each homophonous morpheme and that each alignment constraint is ranked differently with respect to some P constraint (e.g., $M_1 > P > M_2$). This solution is consistent with the Weak Explanatory Hypothesis, which is evaluated in the next section.

2.2.2.1.2 The case against the Weak Explanatory Hypothesis

The ***Weak Explanatory Hypothesis*** holds that, *given* that an affix can be infixed, DT predicts where the possible infixation sites are. This section reviews reasons why even this weak interpretation of DT is untenable.

As mentioned above, when two homophonous morphemes showing divergent distribution, weak-DT may stipulate that the alignment constraints governing the two morphemes are ranked different with respect to some phonotactic constraints (e.g., $M_1 > P > M_2$; see also the Ilokano example discussed in the last section). Such a ranking scenario presents an interesting learnability problem, which I called the ***Identical Twin Paradox***. The paradox can be illustrated in the following thought-experiment: Let’s

assume that there exist two homophonous morphemes, M_1 and M_2, which have identical subcategorization requirements (i.e. matching alignment constraints). From a formal perspective, the shape and the alignment property of these morphemes are identical. Presumably, the phonological grammar has no access to the morpho-semantic information of each of these morphemes. How then does a grammar-learning system learn the proper ranking of the two alignment constraints when the input offers conflicting information? That is, the realization of M_1 satisfies phonological constraint P while the realization of M_2 does not; how does a learner arrive at the ranking $M_1 > P > M_2$ when M_1 and M_2, are formally identical?

Another problem with the Weak Explanatory Hypothesis concerns a prediction of the theory. As noted, one of the main arguments for a Displacement account of infixation is its ability to capture the link between the shape of an infix and where it surfaces. For example, McCarthy and Prince 1993a argue that the focus marker is infixed in Tagalog because it yields better syllable structure in the output. Similar observations have been made repeatedly in the literature (Anderson 1972, Cohn 1992). If this motivation for infixation were valid, two predictions should ensure.

First, one would expect to find an abundance of V(C) infixes after the onset; the infixing a VC morpheme after the onset presents the creation of additional codas and an onsetless syllable. Thirty cases of V(C) infixation after the onset are found within the set of eighty-seven fixed segment infixes; however, nineteen are from the Austronesian languages, ten are from Austro-Asiatic languages (i.e. ten cases), while only three are from elsewhere (i.e. Chontal *-olh-*, Maricopa *-uu-*, Yurok *-eg-*). In contrast, thirty-eight cases of mono-consonantal infixes are found which accounts for more than 43% of all

attested fixed segment infixation patterns. Of these thirty-eight coda or clustering generating infixes, five are from Austronesian and three from Austro-Asiatic. DT offers no explanation as to why this distribution should be expected.

(31) Break-down of fixed segment infixes by shape (and position)

	Austronesian	Austro-Asiatic	Elsewhere	Total
VC after onset	19	8	3	30
VC elsewhere	0	0	7	7
C	5	3	30	38
CV	2	0	17	19

Following DT's view that edge-infixes are always prosodically optimizing, one would not expect to find instances of infixation that yield more marked structures than their prefixing or suffixing potential counterparts, in accordance to the dictum of the Emergence of the Unmarked (McCarthy & Prince 1994) embodied in the ranking schema P >> M. This observation has prompted Buckley (1994:14) to remark: 'why aren't there any CV infixes which occur after the onset?'

Blevins (1999) reports just such a case in Leti, an Austronesian language spoken on the island of Leti, east of Timor.[2] Leti nominalizing affixation has eight distinct phonological forms: three infixes *-ni-*, *-n-*, *-i-*; the three prefixes *ni-*, *i-*, *nia*; the parafix *i-+-i-*; and a zero allomorph. Each of these allomorphs has very specific distribution. The infix *-ni-* appears before the first vowel of the stem when the stem has an initial non-nasal

[2] Consonants [t, n, s] are dental in Leti, while [d, l, r] are alveolar. Following Blevin's transcription, v = [β]; è = [ɛ]; ò = ɔ.

or non-alveolar consonant followed by a non-high vowel (32)a. The infix *-ni-* is realized as *-n-* when the stem contains a high vowel after the initial consonant (32)b.

(32) Nominalizing *-ni-* in Leti (Blevins 1999)

a.	kaati	'to carve'	k-**ni**-aati	'carving'
	kasi	'to dig'	k-**ni**-asi	'act of digging'
	kakri	'to cry'	k-**ni**-akri	'act of crying'
	pèpna	'to fence'	p-**ni**-èpna	'act of fencing, fence'
	polu	'to call'	p-**ni**-olu	'act of calling, call'
	n-sai	'to climb, rise, III (3SG)'	s-**ni**-ai	'act of climbing, rising'
	n-teti	'to chop, III (3SG)'	t-**ni**-eti	'chop, chopping'
	n-vaka	'to ask (for), III (3SG)'	v-**ni**-aka	'act of asking, request'
b.	kili	'to look'	k-**n**-ili	'act of looking'
	kini	'to kiss'	k-**n**-ini	'act of kissing, kiss'
	surta	'to write'	s-**n**-urta	'act of writing, memory'
	tutu	'to support'	t-**n**-utu	'act of supporting, support'
	n-virna	'to peel, II (3SG)'	v-**n**-irna	'act of peeling'

Another allomorph of *-ni-* is *-i-*, which surfaces before the first vowel of the stem when the initial consonant is a sonorant or an alveolar consonant.

(33) Nominalizing *-i-* in Leti

davra	'cut'	d-**i**-avra	'act of cutting, cut'
dèdma	'to smoke'	d-**i**-èdma	'act of somoking'
l-lèvra	'to disperse s.t.'	l-**i**-èvra	'dispersal'
l-lòi	'to dance'	l-**i**-òi	'act of dancing'
mai	'to come'	m-**i**-ai	'arrival'
n-nasu	'to cook'	n-**i**-asu	'cooking'
n-navu	'he sows'	n-**i**-avu	'the act of sowing'
n-resi	'to win'	r-**i**-esi	'victory'
n-ròra	'to draw (a line)'	r-**i**-òra	'line'

The fact that the nominalizing morph, *-ni-*, is infixed invariably is puzzling within DT, given the fact that it both creates an initial onset cluster and produces a vowel-vowel sequence. In particular, Prosodic Optimization should predict the prefixing of *-ni-* instead.

Consider now the case of lateral infixation found in the Pingding dialect of Mandarin Chinese. As in most Mandarin dialects, Pingding has a diminutive/hypocoristic affixation process. However, unlike the other dialects, where this process is marked by the suffixing of a retroflexed morpheme (i.e. *-er*), the cognate morpheme in Pingding, realized as a retroflex lateral *-l-*, is infixed between the onset and the rhyme of a syllable.

(34) Pingding ɭ-infixation (Xu 1981; Lin 2002, Yu to appear)

mən	tuɤŋ	+	ɭ	→	mən	tɭuɤŋ	'hole on the door'
lɒɔ	tʰɤu	+	ɭ	→	lɒɔ	tʰɭɤu	'old man'
ɕiɒɔ	pɤŋ	+	ɭ	→	ɕiɒɔ	pɭɤŋ	'small notebook'
xɤu	mɤŋ	+	ɭ	→	xɤu	mɭɤŋ	'back door'
ɕiɒɔ	kuɤ	+	ɭ	→	ɕiɒɔ	kɭuɤ	'small wok'
xuɑŋ	xuɑ	+	ɭ	→	xuɑŋ	xɭuɑ	'yellow flower'
	ŋɤ	+	ɭ	→		ŋɭɤ	'moth'

The general markedness of onset clusters notwithstanding, infixation in a so-called isolating language is unexpected. Outside the domain of infixation, Pingding Mandarin has the canonical Chinese syllable structure, CGVC where G stands for a glide. The very fact that onset clusters should be tolerated just in the case of infixation should be evidence enough to reject outright the hypothesis that infixation is a matter of prosodic optimization. Lin (2002) notes that there is at least one redeeming aspect of *ɭ*-infixation. That is, the resulting cluster conforms to the Sonority Sequencing Constraint (e.g., Blevins 1995). However, recent work on the positional markedness effects of retroflexion (Steriade 1995) has convincingly demonstrated that retroflexion is perceptually most salient in post-vocalic positions.[3] As argued in Yu to appear, Pingding infixation was the

[3] This pattern of infixation also poses an interesting challenge to any approach to phonology that assumes speakers have knowledge of what is marked or unmarked in speech (e.g. Steriade 1995, 1997, 2001). That is, presumably at the point when the suffixing diminutive suffix *-er* was reinterpreted as infixing, the speakers of Pingding Mandarin not only opted for a novel way of doing affixation in Chinese, namely, infixation, but also allowed the creation of onset clusters in the process, even though alternatives were

result of rhotic metathesis. The resulting retroflex lateral is the outcome of several perceptual factors. Thus, the metathesis of [l̩] to post-consonantal position only endangers the identification of the retroflex feature, rather than enhancing it.[4]

The flip-side cases of infixation that create marked structure are cases of infixation that result in no improvement or worsening of the output. For example, as already seen in Budukh, a Daghestanian language spoken the Kubinsky region of Azerbaijan, the prohibitive marker *-mE-* is infixed after the first vowel of the root. *E* is a non-high vowel that harmonizes with the following vowel in terms of lowness and backness.

(35) Budukh prohibitive (Alekseev 1994: 279)

Root	Gloss	Prohibitive
yeči	'to arrive'	ye**me**či
yɨxər	'to be'	yɨ**mə**xər
yuc'u	'to give'	yu**mo**c'u

In Hua, a Papuan language of the Eastern Highlands of New Guinea, the negative morpheme *-ʔa-* appears before the final syllable.

readily available that were less typologically 'marked' (or more optimizing, prosodically or phonetically speaking). This example is indeed nature's own version of an experiment on what speakers know in speech perception.

[4] Notice that the fact that onset clusters are only allowed in the case of infixation could be seen as a TETU effect. The problem here is, of course, onset clusters are not at all unmarked either typologically or language-internally.

(36) Hua negative formation (Haiman 1980)

zgavo	zga**ʔa**vo	'not embrace'
harupo	haru**ʔa**po	'not slip'

What these cases illustrate is the fact that infixation can occur for no particular prosodic or phonotactic reasons. Prosodic Optimization provides no principled explanation as to why such infixation patterns should exist at all. While Edge Avoidance can certainly ***describe*** these patterns, such an analysis makes no connection between the shape of the infix and where it appears, thwarting the main appeal of DT.

To the extent that there might be a tendency for infixes to create less marked structures than prefixing or suffixing the same morpheme, it is best to view either as a reflex of the infix's history, or epiphenomenonal. The significance of this conclusion cannot be stressed more forcefully. Given the fact that the very foundation on which DT was built rests on the assumption that there exists a relationship between the location of an infix and its shape, a refutation of this premise becomes a refutation of the theory. The next two sections focus on other predictions of DT, demonstrating that DT is simultaneously too weak and too powerful.

2.2.2.2 Under-generation: Empirical inadequacy of DT

Generalized Phonological Subcategorization (GPS) is superior to DT in that all Displacement-based theories invariably run into the problem of Artificial Bifurcation. By design, DT provides no insight into the treatment of prominence-driven infixes. What is surprising is the fact that neither Prosodic Optimization nor Edge Avoidance can account

for the full range of edge-oriented infixes, either, which presents a problem of ***UNDER-generation***. To understand this argument, one must understand the specific mechanism of each of these models.

Prosodic Optimization was developed as the result of the union of Optimality Theory and the theory of Prosodic Morphology.[5] In particular, McCarthy and Prince, in a series of very influential papers (1993ab, 1995), argue that Optimality Theory not only readily incorporates the basic insights of Prosodic Morphology but also improves upon many recalcitrant problems in the derivational version of Prosodic Morphology. The basic tenets of OT-Prosodic Morphology can be summarized as follows:

(37) Prosodic Morphology within Optimality Theory (McCarthy & Prince 1993b:110)

a. Prosodic Morphology Hypothesis

Templates are constraints on the prosody/morphology interface, asserting the coincidence of morphological and prosodic constituent.

b. Template Satisfaction Condition

Templatic constraints may be undominated, in which case they satisfied fully, or they may be dominated, in which case they are violated minimally, in accordance with general principles of Optimality Theory.

c. **Ranking Schema**

P >> M

[5] Some familiarity with Optimality Theory is assumed on the part of readers. For detailed expositions of Optimality Theory, several textbooks are now available (Kager 2000, Archangeli and Langendoen 1997, McCarthy 2002a). Further elaborations on the formalism of OT will be introduced where necessary.

The main innovation of this conception of Prosodic Morphology lies in (37)c, which embodies the idea that all interactions between morphological and phonological units is a matter of prosodic constraints (P) outranking morphological ones (M).

Take the often-cited case of *-um-* infixation in Tagalog, for example. As described by McCarthy and Prince, the infix appears after the initial consonant when the root is consonant-initial and prefixes to vowel-initial roots.[6] McCarthy and Prince argue that this focus marker is essentially a prefix that appears infixed in consonant-initial roots in order to avoid creating unnecessary codas. That is, for example, the *um*-prefixing output, **um.grad.wet*, would have more codas than the infixing output, *gru.mad.wet*.

(38) Tagalog focus construction

abot	**um**abot	‘reach for’
aral	**um**aral	‘teach’
tawag	t**um**awag	‘call’
sulat	s**um**ulat	‘write’
gradwet	gr**um**adwet	‘graduate’

This intuition can be naturally captured in Optimality Theory by assuming that the NOCODA constraint outranks the alignment constraint for *-um-*.

[6] Two disclaimers are needed here. First, Tagalog has no genuine vowel-initial roots, as such roots actually begin with a phonemic glottal stop. This point can be illustrated by the fact that the glottal stop is retained even after prefixation (e.g., *ʔaral* ‘to study’ → *mag-ʔaral* ‘X studies’). Second, alternative Displacement-Theoretic analyses of *-um-* infixation in Tagalog that also take into account more data (e.g., the ONSET-driven account of Orgun and Sprouse 1999 and McCarthy 2002b) have been proposed in the literature in recent years and will be considered in due course. In the mean time, the analysis proposed in the reference cited will be reproduced faithfully.

(39) EDGEMOST(L, *um*)

The morpheme *um* is located at the left edge; is a prefix.

NOCODA

Syllables are open.

When a root begins with a consonant cluster, the focus marker appears after the consonant cluster, instead of within the cluster (see candidate (40)b).[7] The constraint ranking explains this naturally. If the focus marker were infixed within the consonant cluster, it would create an extra coda, thus incurring an extra violation of the NOCODA constraint. Therefore, such a candidate is less optimal than the winning candidate (40)c, which maintains the coda count between the input and the output. Moreover, the fact that the focus marker appears close to the left edge, seemingly preserving its 'inherent' prefixing nature, is explained by the urge to minimize alignment violations. Infixing the morpheme further to the right would necessitate that it be further away from the left edge, thus incurring more violations of the EDGEMOST(L, *um*) constraint (see the failing candidate (40)d).

[7] Orgun and Sprouse (1999) point out that *gumradwet* is considered well formed by some speakers, a fact which prompted them to advocate an ONSET-driven account of *um*-infixation.

(40) NOCODA >> EDGEMOST(L, *um*)

Candidates		NOCODA	EDGEMOST(L, *um*)
a.	[-**um**.grad.wet.	***!	
b.	[g-**um**.rad.wet.	***!	*
c. ☞	[gr-**u.m**ad.wet.	**	gr
d.	[grad.w-**u.m**et.	**	gradw!

In the case of a vowel-initial stem, the focus marker is prefixed since infixing *-um-* does not create more harmonic structure.

(41)

Candidates		NOCODA	EDGEMOST(L, *um*)
a. ☞	[-**u.m**a.ral.	*	
b.	[a.-**um**.ral.	**!	a
c.	[a.r-**u.m**al.	*	ar!
d.	[a.ra.-**um**l.	*	ara!
e.	[a.ra.l-**um**.	*	aral!

As noted earlier, one of the central insights of *Prosodic Optimization* (i.e. that a prosodic constraint, e.g., NOCODA, may outrank morphological alignment e.g., EDGEMOST(L, *um*)), is the direct link between the shape of the infix and where it is realized. If the VC affix were to be prefixed to the stem, it would not only create an additional coda in the output, but also an onsetless initial syllable. Since both codas and onsetless syllables are prosodically marked, both cross-linguistically and language-internally, the infixing of the

VC morpheme after the first consonant is 'explained' as the consequence of the drive to improve syllable structure of the output.

Prosodic Optimization also eliminates an embarrassing aspect of negative prosodic circumscription (see section 2.1 above). Previously, an infix such as Tagalog *-um-* is taken to be the result of the negative circumscription of the initial consonant of the root, (see the case of Sundanese in section 2.1). The need to make reference to the initial consonant is inconsistent with the basic tenets of Prosodic Morphology since 'initial consonant' is not recognized as a prosodic unit under any theory of prosodic phonology. This problem vanishes under Prosodic Optimization.

Two problems confront Prosodic Optimization, however. The first problem concerns the issue of ***infix immobility***. The logic of Prosodic Optimization dictates that affix movement occurs only if the result of infixation produces a more well-formed prosodic output; otherwise, an affix remains at the periphery. The existence of non-prominence-driven infixes that have no prefixing or suffixing variant is unexpected according to Prosodic Optimization. For example, in Alabama, a Muskogean language, the mediopassive *-l-* must surface after the first vowel of the stem, regardless of whether the stem is consonant- or vowel-initial.

(42) Alabama mediopassive (Martin & Munro 1994)

takco	'rope (v.)'	ta**l**ikco	'be roped'[8]
hocca	'shoot	ho**l**icca	'be shot'

[8] According to Martin & Munro 1994, an epenthetic *i* is inserted before consonant clusters in Alabama and Koasati.

o:ti	'make a fire'	o:**l**ti	'kindling'
a-hica	'watch over'	a-**l**hica	'be taken care of'

If the medio-passive were analyzed as an underlying prefix, the morpheme would be prefixing with the vowel-initial stems. A similar case is found in Archi, a Daghestanian language spoken in the Caucasus. Here, the number/class markers, *-w-*, *-r-*, and *-b-*, always appear after the first vowel of the stem, regardless of whether the stem is vowel-initial or vowel-final (Kibrik & Kodzasov 1988).

(43) Archi

daχi	'to churn'	da**b**χdi	'to churn (AOR., III)'	(K & K 1988:33)
ak'a	'to drive'	a**b**k'u	'to drive (AOR., III)'	(K & K 1988:33)
aχa	'to lie down'	a**b**χu	'to lie down (AOR., III)'	(Kibrik 1998:458)

Once again, a Prosodic Optimization account predicts the infix should appear as a prefix to a vowel-initial stem.[9]

Another striking counterexample to the non-mobile aspect of infixation comes from Tagalog pluractional formation.

[9] A prefixal variant of these class markers is available. However, it is only used when the post-initial vowel position is filled, for example by the durative infix *-r-* (e.g., *ak'ar* 'to drive' → *ark'ar* 'to drive, DUR' → ***b-ark'ar*** 'to drive, DUR, III'). This would suggest that the infixal allomorph should be the default variant, while the prefixal one is only used when infixation is not possible.

(44) Tagalog pluractional (Schachter & Otanes 1972:335)

mag-luto	'cook'	ma**nga**gluto	'cook (pl.)'
mag-ʔaral	'study'	ma**nga**gʔaral	'study (pl.)'
magsi-kanta	'sing (pl.)	ma**nga**gsikanta	'sing (pl.)'
magsi-pangisda	'go fishing (pl.)	ma**nga**gsipangisda	'go fishing (pl.)'

Tagalog allows an optional pluralized verb formation that occurs only with a plural topic. The pluralized verbs are marked by either or both the prefixing of *magsi-* and the infixing of *-nga-*. The infix *-nga-* always appears after the first vowel of the stem. Given that the shape of the pluractional morpheme is CV, there is no prosodic motivation for the morpheme to 'migrate' inward. Thus, from the perspective of Prosodic Optimization, it is puzzling that a prefixing variant of this process is not available.

The second issue that confronts Prosodic Optimization occurs when no prosodic advantage can be adduced to the result of infixation. In such cases, *Edge Avoidance* must be invoked. For example, in Mangarayi, an Aboriginal language spoken in the Northwest Territory of Australia, the VCC reduplicant is analyzed as infixing after the initial consonant of the base (45).

(45) Mangarayi nominal reduplication (Merlan 1982:213-6)

Base form	gloss	reduplicated form	gloss
ɟalwaji	'mud'	ɟ-alw-alwaji	'very muddy'
baŋgal	'egg'	b-aŋg-aŋgalji	'having a lot of eggs'
waŋgiɟ	'child'	w-aŋg-aŋgiɟ	'children'

gurjag	'lily'	g-urj-urjagji	'having a lot of lilies'

Kurisu & Sanders 1999 propose that the infixing of the VCC reduplicant is motivated by the desire to satisfy the undominated ANCHL-IO constraint, which requires the left edges of the input and output to correspond, even though such satisfaction would violate the ALIGN-RW constraint, which requires the left edge of the reduplicant to be aligned to the left edge of a prosodic word. Similarly, McCarthy and Prince 1993b propose that the constraint that dominates the morphological alignment constraint of the reduplicant is ROOT-ALIGN:

(46) ROOT-ALIGN (Mangarayi)

Left edge of ROOT coincides with the left edge of PrWd.

The main point illustrated by the Mangarayi case is that Prosodic Optimization is insufficient to account for the full range of edge-oriented infixation. Consequently, Stemberger & Bernhardt (1998) propose to consider Edge Avoidance a separate class of infixation that is morphologically-driven.[10]

However, there are cases of edge-oriented infixation where even Edge Avoidance is inadequate. In Kugu Nganhcara, a Middle Paman language of the Cape York Peninsula in

[10] Edge Correspondence to infixation is similar to the treatment of second position clitics. Anderson (2000) and Legendre (2000) independently advocate that the reason why second position clitics surface in the second position is due to the dominance of a NON-INITIAL (clitic, D) constraint (e.g., the clitic should not be initial within a domain *D*) over the Edge-avoidance constraint of the clitic. As argued by the above authors, this edge-avoidance approach not only draws on the symmetry with the commonly invoked NON-FINALITY constraint (i.e. certain things cannot occur in final positions), but also allows for the parameterizing of domains, similar to the Generalized Alignment constraints.

North Queensland, the first vowel and the immediately following consonant(s) are reduplicated, similar to what is found in Mangarayi.

(47) Kugu Nganhcara Reduplication (Smith & Johnson 2000: 382)

munji	m**unj**unji	'swim'
yumpi	y**ump**umpi	'do'
mungga	m**ungg**ungga	'eat'
thena	th**en**ena	'stand'
ngaya	ng**ay**aya	'I (1sgNOM)'

Unlike Mangarayi, however, vowel-initial roots are found in Kugu Nganhcara and they also participate in reduplication.

(48)	iiru-ma	**iir**iiru-ma	'here-EMPH'	***iir**uru-ma
	ungpa	**ungk**ungpa	'break'[11]	***ung**pangpa

Here, the Edge-avoidance approach fails in an unexpected and ironic way. Assuming that the demand for edge-coincidence is dominant, one would expect the initial vowel of the forms in (48) to stay put while the following consonant(s) and vowel are reduplicated, as illustrated by the starred forms in (48). Yet, the attested forms in (48) are precisely the

[11] There are some additional features in Kugu Nganhcara reduplication. For example, the reduction of the labial in root-internal heterorganic stop+labial sequence (e.g., *pukpe* → *pukukpe* 'child'; *wegbe* → *wegegbe* 'keep') and in heterorganic nasal+labial stop clusters, and the labial in the reduplicated cluster is replaced by a stop homorganic with the nasal (e.g., *nunpa* → *nuntunpa* 'run'; *thanpa* → *thantanpa* 'cough'; *wunpa* → *wuntunpa* 'gather, get'). These additional complications, however, are not relevant to the point made here.

type of examples that motivate Displacement Theory in the first place. That is, all else being equal, in the absence of any advantage to infixation, one should expect the underlying nature of the affix to surface. In the present case, one would expect that the reduplicant ought to appear as prefixing when the stem is vowel-initial since the reduplicant is assumed to be an underlying prefix. Therefore, it is ironic that the Edge-avoidance approach should rule out the very forms that it was originally designed to capture.

This discussion shows that DT is insufficient as a general theory of infixation for two reasons. Not only is DT irrelevant for cases of prominence-driven infixation (i.e. a reflection of the Artificial Bifurcation bias), it is not sufficient to account for the full range of edge-based infixes either. GPS is a clearly superior theory since only a single formalism is called for. While in this section I have concentrated on the issue of under-generation of DT, the problem of over-generation is the focus of the next section.

2.2.2.3 Hyperinfixation: a problem of over-generation

Hyperinfixation refers to a prediction of Prosodic Optimization whereby a morpheme can be displaced theoretically indefinitely far from its underlying edge position due to high-ranking prosodic or phonological forces. Consider the following hypothetical situation, which will be referred to as pseudo-Tagalog. Following Orgun and Sprouse 1999 and McCarthy 2002b, in pseudo-Tagalog, *-um-* is treated formally as a prefix and is infixed to avoid word-initial onsetless outputs (49).

(49) DEP-C, ONSET >> NOCODA, ALIGN

/um, tata /	DEP-C	ONSET	NOCODA	ALIGN
☞a. t**um**ata				*
b. ʔ**um**tata	*!		*	
c. tat**um**a				*!**
d. **um**tata		*!	*	

Like Tagalog, the grammar of pseudo-Tagalog bans the occurrence of *-um-* after a labial sonorant (i.e. OCP-*um*). The difference comes from the fact that pseudo-Tagalog allows the grammar to generate a winning optimal candidate, while genuine Tagalog yields absolute ungrammaticality judgments (see Orgun and Sprouse 1999 for a detailed discussion). Take, for example, the infixation of *-um-* in the word *wawana*. From the perspective of Prosodic Optimization, the expected winning candidate ought to be (50)a, had it not been for the constraint OCP-*um*, which prohibits *-um-* to appear after a labial sonorant. Following the logic of DT, the next best candidate is expected to be one that infixes *-um-* further inward to avoid potential OCP-*um* (e.g., (50)c). As it happens, the medial consonant of the input form is also a labial sonorant, thus, candidate (50)c fares no better than (50)a. The winning candidate is (50)d, which incurs no violation at all of the two high rank constraints. Interestingly, the winning candidate renders *-um-* to appear "suffixed" on the surface.

(50) OCP-*um*, DEP-C, ONSET >> NOCODA, ALIGN

/um, wawan/	OCP-*um*	DEP-C	ONSET	NOCODA	ALIGN
a. w**um**awan	*!				
b. ʔ**um**wawan		*!		*	
c. waw**um**an	*!				***
d. wawan**um**				*!	*****

Partly as an attempt to address this problem, McCarthy (2002) reconceptualizes the nature of Alignment constraints, proposing a set of quantized constraints (see (13)). For example, ALIGN-BY-SEG(*-um-*, Wd, L), which requires that no segment comes between the left edge of *-um-* and the left edge of a word, must be evaluated categorically.

(51)

/um, wawan/	OCP_{um}	DEP_C	ALIGN-BY-σ	*CODA	ALIGN-BY-SEG
☞a. w**u.m**a.wan	*			*	*
☹ b. wa.wa.n**um**			*	*	*
c. ʔ**um.**wa.wan		*!		**	
d. wa.w**u.m**an	*!		*	*	*

However, as illustrated by the evaluation in (51), quantized alignment predicts hyperinfixation regardless. McCarthy (2002) argues that hyperinfixation can be avoided if MPARSE(*-um-*), a constraint that demands the realization of *-um-*, were ranked under ALIGN-BY-σ but above ALIGN-BY-SEG. In this case, the null parse candidate, (52)c, wins

out over the two predicted outputs in (51), since (52)c vacuously satisfies all high ranking constraints.

(52)

/um, wawan/	OCP_{um}	$ALIGN_{BY\text{-}\sigma}$	MPARSE	*CODA	$ALIGN_{BY\text{-}SEG}$
☞a. w**u.m**a.wan	*!			*	*
b. wa.wa.n**um**		*!		*	*
c. ∅			*!		

While hyperinfixation can be ruled out by recruiting additional mechanisms into OT, such as MPARSE, the question remains why hyperinfixation requires such a remedy. The failure of quantized alignment alone to rule out hyperinfixation is to be expected. The logic of DT dictates that the dominating prosodic/phonological constraint must be satisfied at all cost, regardless of how severely a candidate violates morphological alignment. Thus, hyperinfixation remains a theoretical possibility, yet it is unattested in the present survey. To foreshadow a little, the theory advocated in this study (see Chapter 3 for detail) rules out hyperinfixation intrinsically since morphological alignment constraints are assumed to always dominate phonological constraints. A theory, such as DT, that necessarily predicts hyperinfixation should be avoided if possible.

2.3 Conclusion

This chapter advances the theory of Generalized Phonological Subcategorization, arguing that it is superior to earlier theories of infixation. To begin with, GPS offers a unifying formalism, unlike DT which is designed to handle edge-oriented infixes only; DT handles

prominence-driven infixation in terms of Prosodic Subcategorization, just like GPS. DT also predicts that an infix must always have a peripheral counterpart (i.e. prefixal or suffixal), yet many examples of invariant infixation exits. The overgenerating capacity of DT is illustrated by the prediction of hyperinfixation. This type of infixation is unattested. GPS, which disavows morpheme movement completely, accommodates such invariant infixation handily. I also discuss the main premise of DT, namely, the claim that there is a causal relationship between the shape of an infix and where it appears. Strong empirical evidence demonstrates that such a presupposition is unfounded, thus severely weakening the appeal of DT. Finally, it is shown that DT cannot be an explanatory theory since it fails to predict which type of morpheme can be infixed and which cannot. Based on the reasons reviewed above, it is concluded that DT is not a viable theory of infixation.

In the next chapter, I further the conclusions of this chapter, motivating an alternative theory of morphology-phonology interaction. Three case studies follow: Katu nominalization in §3.1, English Homeric infixation in §3.2, and Washo plural formation in §3.3. These case studies not only demonstrate the viability of GPS and the new theory of morphology-phonology interface, but also illustrate how infixation is integrated within the phonology and morphology of their respective languages.

Chapter 3: Case studies

In Optimality Theory, Displacement Theory follows from the OT-Prosodic Morphology constraint schema P >> M. As argued in the preceding chapter, DT must be abandoned for both theoretical and empirical reasons; I propose to bar DT altogether by adopting the following universal constraint ranking:

(1) Fixed universal ranking on morphology-phonology interaction

M_{ALIGN} >> P

Here, M_{ALIGN} is understood to define a class of constraints on morphological alignment, while P stands for any phonotactic or prosodic constraints. The dominance of M_{ALIGN} over P signifies the fact that morphological alignment is never violated for the purpose of phonotactic or prosodic constraint satisfaction. I refer to this the ***Subcategorization Non-violability Hypothesis (SNH)***. The actual locus of the interface between morphology and phonology is in the interaction between constraints on prosody/phonotactics and faithfulness. Particularly, phonologically-conditioned allomorphy occurs when prosodic/phonotactic constraints outrank the faithfulness constraints (i.e. P >> FAITH). If proven correct, the elimination of the constraint schema P >> M should serve as an

important step toward a more restrictive theory of grammar within OT. Thus, the following case studies serve two functions: (i) to provide concrete illustrations of the modeling of infixation using Generalized Phonological Subcategorization and (ii) to demonstrate how infixation can be accounted for while being consistent with the M_{ALIGN} >> P schema. By demonstrating that such a restrictive account of morphology-phonology interaction is possible, I hope to provide the necessary impetus for future reexamination of other purported examples of P >> M not involving infixation.

The organization of this chapter is as follows: Section 3.1 presents a study of active indicative infixation in Atayal, an instance of P-affixation. This case study also resolves a potential challenge to the SNH. A detailed analysis of Homeric infixation in English appears in section 3.2, demonstrating how genuine infixation is handled by GPS. An analysis of Washo plural formation is presented in section 3.3, exemplifying the GPS treatment of internal reduplication.

3.1 Atayal active indicative infixation

A prediction of the SNH is that all instance of the same infix should have the same pivot; unlike DT, the Non-violability Hypothesis does not allow the grammar to select different placements of the same infix in different contexts, according to phonological well-formedness. Atayal represents an apparent challenge to this prediction; however, on closer inspection Atayal turns out instead to support the hypothesis.

This case study is organized as follows: the general distribution of the active indicative marker is introduced in section 3.1.1. An Optimality Theoretic analysis appears in section 3.1.2. Some concluding remarks appear in section 3.1.3.

3.1.1 Introduction

Atayal is an Austronesian language spoken in Taiwan. The consonant and vowel inventories of the language are given below (Egerod 1999: vi-vii):

(2)

p	b[β]	m		w
t	r	n	s	
c [ts]	z [ʒ]	l		
k	g[ɣ]	ŋ	x	
q			h	
ʔ				

i [i, iː][1]	u [u, uː]
ii [iː]	uu [uː]
e [ɛ, ɛː]	o [ɔ, ɔː]
a [a, aː]	

/c/ is pronounced [tʃ] before [i], otherwise [ts]. /z/ is always [ʒ]. All consonants, except /b, r, z, g/ which only occur prevocalically, occur in both prevocalic (i.e. as singleton and in clusters) and postvocalic (only as singleton) positions. As noted in Chapter 2, the

[1] Single vowels are long in a nonfinal syllable, short in a final syllable. /ii/ and /uu/ are [iː] and [uː] in final position and [iːj] and [uːw] before a vowel.

segment *m* signifies active indicative when it is infixed, while indicating intransitivity or reciprocity when it is prefixed.[2] This study focuses on the distribution of the active indicative infix.

The Atayal active indicative marker, *-m-*, appears generally after the initial consonant of a root.[3]

(3)

hului	h**m**ului	'pull'	(Egerod 1965: 266)
kaial	k**m**aial	'talk'	(Egerod 1965: 266)
kamil	k**m**amil	'scratch will nail'	(Egerod 1965: 266)
kuu	k**m**uu	'too tired, not the mood'	(Egerod 1965: 266)
qalup	q**m**alup	'hunt'	(Egerod 1965: 266)
qes	q**m**es	'make boundary'	(Egerod 1965: 266)
quax	q**m**uax	'wash (things)'	(Egerod 1965: 266)
qul	q**m**ul	'snatch'	(Egerod 1965: 266)
siuk	s**m**iuk	'give back, reciprocate'	(Egerod 1965: 266)
sual	s**m**ual	'accept'	(Egerod 1965: 267)
tapeh	t**m**apeh	'beckon'	(Egerod 1965: 267)
cinun	t**m**inun[4]	'weave'	(Egerod 1965: 265)
heriq	h**m**eriq	'break, demolish'	(Egerod 1965: 265)
hop	h**m**op	'stab'	(Egerod 1965: 265)
hului	h**m**ului	'pull'	(Egerod 1965: 265)

[2] The fact that intransitive and reciprocal share the same active marker is not surprising since one of the characteristics of reciprocity is the reduction of an argument, which is similar to intransitivization (e.g., in Russian).
[3] The term 'root' here refers to the monomorphemic forms to which the active indicative marker attaches.
[4] Phonetic [ti] sequences are not allowed in Atayal. [t] is affricated in front of [i].

When the root begins with a consonant cluster, the active indicative marker surfaces after the initial consonant:

(4)	sgagai	s**m**gagai	'take leave'	(Egerod 1965: 265)
	qziuʔ	q**m**ziuʔ	'contagious'	(Egerod 1965: 266)
	sbil	s**m**bil	'leave behind'	(Egerod 1965: 266)
	spuŋ	s**m**puŋ	'measure'	(Egerod 1965: 267)
	hkaŋiʔ	h**m**kaŋiʔ	'search.ACT'	(Egerod 1965: 266)

When a root begins with a glottal stop, labial or rhotic, *m-* replaces the initial consonant.

(5)	ʔagal	**m**agal (*ʔmagal)	'take'	(Egerod 1965: 263)
	ʔaras	**m**aras (*ʔm)	'take along'	(Egerod 1965: 263)
	bazii	**m**azii (*bm)	'buy'	(Egerod 1965: 263)
	bihii	**m**ihii (*bm)	'beat'	(Egerod 1965: 263)
	bikiʔ	**m**ikiʔ (*bm)	'bend'	(Egerod 1965: 264)
	buiau	**m**uiau (*bm)	'wade'	(Egerod 1965: 264)
	paŋaʔ	**m**aŋaʔ (*pm)	'carry'	(Egerod 1965: 264)
	pgiai	**m**giai (*pm)	'run away'	(Egerod 1965: 265)
	phau	**m**hau (*pm)	'to fine'	(Egerod 1965: 265)
	rahau	**m**ahau (*rm)	'trap'	(Egerod 1965: 265)

(s)ruruu	**m**uruu (*rm)	'push'	(Egerod 1965: 265)

3.1.2 Analysis

The post-initial-consonant distribution of the active indicative marker can be modeled easily in terms of the following GPS constraint.

(6) ALIGN-*m* (C_1, R) 'The active indicative marker must coincide with the right edge of the first consonant'

Two additional constraints are needed. *COMPLEX, which bans consonant clusters, must be ranked below ALIGN-*m* since clusters are readily observed in this language. The constraint, MAX-MORPHEME, which penalizes the non-realization of any morpheme specified in the underlying form, must be undominated since morpheme deletion is not possible here.

(7) *COMPLEX 'No complex consonant clusters'
MAX-MORPHEME 'All morphemes in the input must be in the output'

Tableau (8) illustrates that infixation is driven by the subcategorization requirement of the morpheme itself. Neither prefixing (8)b, nor infixing the marker further into the root (8)c is allowed. Not realizing the active indicative morpheme is banned in Atayal by the dominating MAX-MORPHEME constraint (8)a.

(8)

/sbil, m/ ‘leave behind.ACT’	MAX-M	ALIGN-m	*COMPLEX
a. sbil	*!		*
b. **m**sbil		*!	**
c. sb**m**il		*!	**
d. ☞ s**m**bil			**

An advocate of DT might be quick to point out that the infixing of *-m-* could be alternatively analyzed as a case of minimizing onset sonority violations. That is, for example, the prefixing candidate (8)b might be suboptimal due to the fact that the onset sequence *-msb-* violates the Sonority Sequencing Generalization (SSG; Clement 1990, Blevins 1995). The SSG requires that the segments within an onset cluster to be rising in sonority, and an *ms-* or *mb*-initial word clearly violates this principle.

(9) Sonority Sequencing Generalization (Blevins 1995:210)

Between any member of a syllable and the syllable peak, a sonority rise or plateau must occur.

However, *m-* can in fact surface before a consonant cluster in Atayal. As noted, Egerod (1965) points out that forms infixed with the active indicative marker *-m-* are often contrastive with forms that have a prefixing *m-* marker that signifies the functions of reciprocity or reflexivity in addition to active indicative (e.g., ***s*m*bil*** ‘leave behind.ACT’ vs. ***m****sbil* ‘leave for each other’(Egerod 1965: 266); see more examples below).

(10)

kaial	‘talk’	k**m**aial	‘talk.ACT’	(Egerod 1965: 266)
		mkaial	‘talk together’	
qul	‘snatch’	q**m**ul	‘snatch.ACT’	(Egerod 1965: 266)
		mqul	‘snatch from each other’	
sbil	‘leave behind’	s**m**bil	‘leave behind.ACT’	(Egerod 1965: 266)
		msbil	‘leave for each other’	
siuk	‘give back’	s**m**iuk	‘answer’	(Egerod 1965: 266)
		mssiuk	‘tell to each other’	
spuŋ	‘meausre’	s**m**puŋ	‘measure.ACT’	(Egerod 1965: 267)
		mspuŋ	‘compete’	
suliŋ	‘burn’	s**m**uliŋ	‘burn, heat.ACT’	(Egerod 1965: 267)
		msuliŋ	‘burn self’	
hkaŋiʔ	‘search’	h**m**kaŋiʔ	‘search.ACT’	(Egerod 1965: 266)
		mhkaŋiʔ		
hutau	‘fall’	**m**hutau	fall.ACT’	(Egerod 1965: 266)
		h**m**utau	‘let fall’	

As argued in Chapter 2, the existence of homophonous morphemes that have different placement properties is problematic for DT. Particularly, it is unclear how such a system can be learned; a logical paradox arises when morpheme M_1 is influenced by some phonological constraint *P* but morpheme M_2, homophonous with M_1, does not show such influence.

Let us now turn to the cases where the active indicative non-reflexive marker replaces the initial consonant of the root. As illustrated in (5), there is an apparent ban in Atayal on a nasal preceded by a glottal stop, a labial or a liquid. This ban cannot be a general restriction on the co-occurrence of the relevant segments, however. The order between the segments in question is crucial. There is ample evidence for [mʔ], [mb], [mp] sequences in the language, both in derived and nonderived environments. Atayal only avoids the reverse order (i.e. **bm*, **pm*, * *ʔm*, **rm*).

(11)	ʔagal	**m**agal (*ʔm)	'take'	(Egerod 1965: 263)
		mʔagal	'take each other'	
	ʔaras	**m**aras (*ʔm)	'take along'	(Egerod 1965: 263)
		mʔaras	'elope together'	
	bihii	**m**ihii (*bm)	'beat'	(Egerod 1965: 263)
		mbihii	'fight'	
	biq	**m**iq (*bm)	'give'	(Egerod 1965: 264)
		mbbiq	'give to each other'	
	biruʔ	**m**iruʔ (*bm)	'write'	(Egerod 1965: 264)
		mbiruʔ	'make contrasting lines'	
	lpuu	**mp**uu	'count'	(Egerod 1965: 264)
		l**mp**uu		
		mrhuu mian	'our forefathers (not yours)	(Egerod 1965: 252)

The absence of the underlying first consonant in the output creates an apparent problem of opacity for the SNH. In traditional derivational terms, one might assume that *-m-* infixation takes place before initial-consonant-deletion (e.g., /**m**, ʔagal/ 'take' → /ʔ**m**agal/ → [**m**agal]). As noted above, the SNH predicts that all instance of the same infix should have the same pivot; the Non-violability Hypothesis does not allow the grammar to select different placements of the same infix in different contexts, according to phonological well-formedness. Therefore, Atayal represents an apparent challenge to this prediction; *-m-* surfaces as the first consonant even though it left-subcategorizes for the first consonant. While opacity can be accounted for non-derivationally, I argue that no such elaborate machinery is needed here. The initial-distribution of *-m-* falls out naturally under a fusion analysis, one of the many potential repair strategies available to satisfy the SNH.

To capture this sequential restriction, the following constraint is posited:

(12) $*_{\sigma}$[{r, ʔ, p, b}> [m] 'The segments {r, ʔ, b, p} cannot appear before [m].'[5]

Since the sequential restriction constraint is never violated, it must be undominated, and the infixed candidate (13)b can be ruled out. Moving the marker further rightward (see (13)c) or prefixing it (13)d would incur extra violations of the subcategorization requirement. The only viable repair strategy is to merge the marker with the initial consonant. However, an immediate question arises as to why (13)a does not violate the

[5] This segmental sequencing constraint is admittedly *ad hoc*. However, it is unclear what general mechanism can derive this distributional restriction.

undominated ALIGN-*m* constraint. Recall that ALIGN-*m* requires opposite-edge alignment between the first consonant and the infix; however, the merger of the two aligning entities renders it ambiguous whether the first consonant and -m- is opposite-edge alignment or same-edge alignment. Therefore, (13)a satisfies ALIGN-*m*, albeit vacuously. Fusion cannot occur willy-nilly, however. As shown by candidate (13)e, ALIGN-*m* is violated even though *-m-* is merged with the final segment of the stem. The reason for the alignment violation here is due to the fact that the *-m-* merges with the *final* segment, rather than the *first*. It is clear that the right edge of the first consonant does not coincide with the left edge of *-m-*. To be sure, the fusion of the active indicative marker comes with a cost, however; (13)a violates MORPHDIS, which demands the exponent of a morpheme to be expressed uniquely.

(13)

/ $p_1g_2iai_3$, m_4/ 'run away, ACT'	ALIGN-*m*	*BM	*COMPLEX	MORPHDIS
☞ a. **$m_{14}g_2iai_3$**			*	*
b. p_1**m_4**g_2iai_3		*!	*	
c. $p_1q_2iai_3$**m_4**	*!****		*	
d. **m_3**$p_1g_2iai_3$	*!		*	
e. p_1q_2ia**m_{34}**	*!			*

There is a final complication of *-m-* infixation in Atayal that must be accounted for. Exactly five examples of *n*-initial verbs with active marking are found, and in all *m-* is prefixing, not infixing.

(14)

nbuu	**m**nbuu	'drink'	(Egerod 1965: 259)
nbuʔ	**m**nbuʔ	'sick'	(Egerod 1965: 259)
nagaʔ	**m**nagaʔ	'wait'	(Egerod 1965: 257; 1999: 177)
nahuʔ	**m**nahuʔ	'make a fire'	(Egerod 1999: 177)

On the surface, there seems to be a ban on *-nm-* sequences, which could explain the apparent non-infixing of the *-m-* marker. However, the resolution of this co-occurrence violation differs from the usual pattern. That is, sequential restriction violations are generally avoided either by deletion or merger, a pattern that predicts that the form of *nbuu* 'drink' should be **mbuu*, rather than *mnbuu*.

Further examination of the source material reveals that the problem presented by the data in (14) might in fact be spurious. The first example, *nbuu* 'drink' is cited in Egerod 1999 as *pnbuu* (p.183). Thus, the active form *mnbuu* is just as expected, given the ban on a [pm] sequence discussed earlier. As for the other examples, the fact that they are intransitive verbs is significant. Recall that the active of intransitive verbs in Atayal is marked by the prefix *m-* (Egerod 1999:149), similar to the active reciprocal. The fact that so many *n*-initial verbs are intransitive might not be coincidental, however. In other Austronesian languages, intransitivization is marked by (-)*Vn-* or (-)*nV-*. The *n*-initial forms in (14) might be relics of this intransitivization process. The examples in (14) do not present any problems to the present account of *-m-* infixation in Atayal.

3.1.3 Conclusion

In this case study, it is shown that an apparent surface violation of the SNH proves to be no problem at all once the formal analysis is fully fleshed out. Crucially, this account is consistent with the proposed universal constraint schema M_{ALIGN} >> P. No appeal to morpheme displacement is needed. As noted, the fusion of the infix with the pivot is one of many potential repair strategies available to satisfy the SNH. The next case study will not only demonstrate how genuine infixation is handled within the GPS model, but also another repair strategy available – fission (i.e. phonological reduplication).

3.2 Homeric infixation in English

In Chapter 2, it is shown that most instances of 'infixation' can be treated as a straightforward matter of morpho-phonological alignment. Specifically, it is the proper alignment of a morpheme with respect to some phonological constituent. This strict-alignment model provides a natural account of why infixes may sometimes surface as prefixes or suffixes. Under this conception, infixes are, indeed, similar to prefixes or suffixes (cf. McCarthy & Prince 1986, 1993). The fact that they appear 'infixed' on the surface is epiphenomenonal. These 'infixes' are referred to as 'P(honological-subcategorizing)-adfixes' in Chapter 2 in contrast with the 'genuine infixes', that is, a morpheme that MUST appear within a form, never at the periphery. It should be noted that a distinction exists between an infix that never appears as an adfix because the nature of stems in the language precludes such a possibility (e.g., Muskogean pronominal infixation, Lezgic class infixation etc.) and an infix that is otherwise expected to show up as a suffix but is nonetheless banned from doing so. Only the latter can be referred to as

'genuine infixation'. The present study revisits the case of Homeric infixation in English introduced in the last chapter, showing that genuine infixes are similar to P-affixes in their alignment to some pivot, but differ from the P-affixes by having an additional requirement of non-peripherality. An analysis of this non-periphery requirement appears in section 3.2.2. Before that, however, the basic pattern of this construction is reviewed in section 3.2.1. Section 3.2.3 deals with the issue of reduplication induced by the Homeric infix. Complications introduced by variable infixation are discussed in section 3.2.4. A brief conclusion appears in section 3.2.5.

3.2.1 The basic pattern[6]

The basic pattern is best illustrated with words with stress on odd-numbered syllables. In words which bear input stress on the 1st and 3rd syllables only, the infix, *-ma-*, invariably appears after the unstressed second syllable, whether the main stress is on the first (15)a & b or the third syllable (15)c & d.

(15)	a.	ˈσσˌσ	ˈσσ-ma-ˌσ	c.	ˌσσˈσσ	ˌσσ-ma-ˈσσ
		saxophone	saxo-ma-phone		Mississippi	Missi-ma-ssippi
		telephone	tele-ma-phone		Alabama	Ala-ma-bama
		wonderful	wonder-ma-ful		dialectic	dia-ma-lectic
	b.	ˈσσˌσσ	ˈσσ-ma-ˌσσ	d.	ˌσσˈσσσ	ˌσσ-ma-ˈσσσ
		feudalism	feuda-ma-lism		hippopotamus	hippo-ma-potamus

[6] Thanks to David Peterson, Meg Grant, Emily Horner, Rachel Goulet and Jake Szamosi for sharing their intuitions on *ma*-infixation with me.

secretary	secre-ma-tary	hypothermia	hypo-ma-thermia
territory	terri-ma-tory	Michaelangelo	Micha-ma-langelo

In odd-stressed words which are long enough to have stress on the 1st, 3rd and 5th syllables, infix placement varies; the infix can follow either the 2nd syllable or the 4th syllable *-ma-* may appear two trochaic feet away from the left edge of the word (see (16)a, & (16)c) also. Words with essentially the same syllable count and stress pattern, nonetheless, may have different infixation patterns (e.g., (16)a vs. (16)b).

(16)	a.	$(_{\iota}\sigma\sigma)(^{\iota}\sigma\sigma)(_{\iota}\sigma)$	$(_{\iota}\sigma\sigma)(^{\iota}\sigma\sigma)$-ma-$(_{\iota}\sigma)$[7]
		underestimate	underesti-ma-mate
	b.	$(_{\iota}\sigma\sigma)(^{\iota}\sigma\sigma)(_{\iota}\sigma\sigma)$	$(_{\iota}\sigma\sigma)$-ma-$(^{\iota}\sigma\sigma)(_{\iota}\sigma\sigma)$
		unsubstantiated	unsub-ma-stantiated
	c.	$(_{\iota}\sigma\sigma)(_{\iota}\sigma\sigma)(^{\iota}\sigma\sigma)$	$(_{\iota}\sigma\sigma)(_{\iota}\sigma\sigma)$-ma-$(^{\iota}\sigma\sigma)$
		onomatopoeia	onomato-ma-poeia

This distribution suggests that the infix, *-ma-*, appears to the right of a disyllabic trochaic foot.

[7] Infixing after the initial foot, i.e. *under-ma-restimate*, is also possible here (i.e. *repa-ma-pellent* vs. *repella-ma-lent*), though with concomitant reduplication (see further discussion in section 3.2.4).

(17) Homeric ma-infixation (First attempt)

ALIGN (L, *ma*, R, $FT_{\sigma\sigma}$)

'Align the left edge of *ma* to the right edge of a disyllabic trochee.'

This subcategorization predicts that, in the case of a disyllabic input, *-ma-* should surface after the second syllable, giving the appearance of a suffix. Curiously, this prediction is not borne out, as evidenced by the ungrammaticality of following examples.

(18)	oboe	*oboe-ma
	opus	*opus-ma
	party	*party-ma
	piggy	*piggy-ma
	purple	*purple-ma
	scramble	*scramble-ma
	stinky	*stinky-ma
	table	*table-ma

As noted in Chapter 2, what happens in such cases is that the stem is expanded to host the infix. Two types of expansion patterns are found. When the stressed syllable is closed, a schwa is inserted to create a disyllabic stressed foot (19). This strategy is referred to as *schwa-epenthesis*. The epenthetic schwa is underlined below.

(19)

careful	ˈkʰɛɹə̲-mə-fəl
grapefruit	ˈgɹɛjpə̲-mə-ˌfɹut
graveyard	ˈgɹɛjvə̲-mə-ˌjaɹd
hairstyle	ˈhɛɹə̲-mə-ˌstajl
lively	ˈlajvə̲-mə-lɪ
lonely	ˈloʊnə̲-mə-lɪ
Orwell	ˈɔɹə̲-mə-wəl

However, when the first syllable is open, in addition to schwa epenthesis, a consonant identical to the onset of the following syllable appears before the schwa (20). I will refer to this as *partial reduplication*.

(20)

oboe	o<u>b</u>a-ma-boe	washing	wa<u>sh</u>a-ma-shing
opus	o<u>p</u>a-ma-pus	water	wa<u>t</u>a-ma-ter
party	par<u>t</u>a-ma-ty	wonder	won<u>d</u>a-ma-der
piggy	pi<u>g</u>a-ma-gy	aura	au<u>r</u>a-ma-ra
purple	pur<u>p</u>a-ma-ple	music	mu<u>s</u>a-ma-sic
scramble	scram<u>b</u>a-ma-ble	Kieran	Kie<u>r</u>a-ma-ran
stinky	stin<u>k</u>a-ma-ky	joking	jo<u>k</u>a-ma-king
table	ta<u>b</u>a-ma-ble	listen	li<u>s</u>a-ma-sten
tuba	tu<u>b</u>a-ma-ba		

The distribution of *-ma-* stands in stark contrast with the P-affixes seen in Chapter 2, whose subcategorization requirement is always unidirectional; a P-affix requires a certain type of pivot to appear at one of its edges, but makes no requirements on the opposite edge (?). The fact that *-ma-* can never be realized as a suffix suggests that the proper placement of the Homeric infix is contingent on its appearance as a genuine infix in the output, that is, it must appear before something *and* after something. The question here is what instantiates the two '*something*'s. The next section defends the idea that the proper realization of *-ma-* requires the simultaneous satisfaction of two requirements: the alignment of *-ma-* to a disyllabic trochaic foot and the need for *-ma-* to be at least one syllable away from the right edge of the word.

3.2.2 Non-peripherality of Homeric infixation

Two constraints are needed to capture the non-peripheral distribution of *-ma-*. The first constraint was already introduced earlier; it requires the infix to appear to the right of a disyllabic foot. The second constraint demands that the infix appear before a syllable. These constraints exert quite different, though not necessarily incompatible, demands on the Homeric word construction.

(21) ALIGN (L, *ma*, R, $FT_{\sigma\sigma}$) a.k.a. L-ALIGN

'Align the left edge of *-ma-* to the right edge of a disyllabic foot.'

ALIGN (R, *ma*, L, σ) a.k.a. R-ALIGN

'Align the right edge of *-ma-* to the left edge of a syllable.'

Couched within Optimality Theory, these alignment constraints must be undominated but unranked with respect to each other. Their combined effect rules out any candidate with the improper placement of the *-ma-* infix (see (22)b & (22)c). The tableau below shows the evaluation of the Homeric word *tele-ma-phone*.

(22) Evaluation of /telephone, ma/

(ˈtɛlə)(ˌfoʊn), mə	L- ALIGN	R- ALIGN
a. ☞(ˈtɛlə)-mə-(ˌfoʊn)		
b. (ˈtɛ.-mə-)lə(ˌfoʊn)	*!	
c. (ˈtɛlə)(ˌfoʊn)-mə		*!

Candidate (22)b loses since it violates L-ALIGN due to the fact the material to the left of *-ma-* does not constitute a foot. Candidate (22)c fatally violates R-ALIGN since no syllable follows the 'infix'.

Let us now consider a disyllabic input. *Ma-* can never appear finally because it would fatally violate the R- ALIGN constraint.

(23) Evaluation of /listen, ma/

(ˈlɪsn̩), mə	L-ALIGN	R-ALIGN
a. ☞ (ˈlɪsə)-mə-sn̩		
b. (ˈlɪsn̩)-mə		*!

On the other hand, *-ma-* cannot appear after a bimoraic foot in English (see (24)b) because it left-subcategories for a disyllabic foot. The correct selection of *liva-ma-ly* is given below:

(24) Evaluation of /lively, ma/

(ˈlajv)lɪ, mə	L-ALIGN	R-ALIGN
a. ☞(ˈlajv̩)-mə-lɪ		
b. (ˈlajv)-mə-lɪ	*!	

Curiously, the analysis arrived at thus far makes an interesting, though erroneous, prediction regarding the following forms:

(25)	σ̀σ̆σ́σ̆	σ̀σ̆-ma-σ́σ̆	*σ̀σ̆-ma-σ̆σ́σ̆
	multiplication	multipli-ma-cation	*multi-ma-plication
	Mediterranean	Mediter-ma-ranean	*Medi-ma-terranean
	delicacy	delica-ma-cy	*deli-ma-cacy

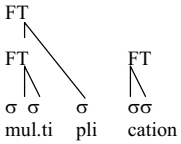
Here, the input contains a ternary pretonic string. Secondary stress is on the initial syllable. Since most theories of English stress do not admit ternary feet, a word like *multiplication* is often parsed as (*mul.ti*)*pli*(*ca.tion*) (e.g., Pater 2002). The problem with this foot-parse is that the current analysis would predict the infix to appear after the second syllable, rather than the third (e.g., *(*mul.ti*)-*ma-pli*.(*ca.tion*)).

(26) Evaluation of /multiplication, ma/

(*mul.ti*)*pli*(*ca.tion*), ma	L-ALIGN	R-ALIGN
a. ☞(*mul.ti*)*pli-ma*-(*ca.tion*)	*!	
b. 💣(*mul.ti*)-*ma-pli*.(*ca.tion*)		
c. (*mul.ti.pli*)-*ma*-(*ca.tion*)	*!	

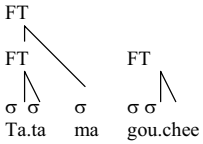
This problem cannot be resolved by simply assuming that the initial ternary string forms a ternary foot (see (26)c) since such a candidate would violate the left-pivot requirement. Following Hayes 1982, McCarthy 1982, Ito & Mester 1992, and Jensen 1993 & 2000, the third syllable is assumed to be adjoined to the initial foot, giving the following structure:

(27)



This analysis is analogous to McCarthy 1982's assumption for words such as *Tatamagouchee*.

(28)



The advantage of assuming this foot representation is that the binary character of the pivot can be maintained, which in turns allows the formulation of an alignment constraint that holds across the board without exception.

(29) Revised L- ALIGN

ALIGN (L, *ma*, R, FT_{max})

'Align the left edge of *-ma-* to the right edge of a maximal binary-branching syllabic foot.'

The notion of a *maximal foot* refers to a foot that is not dominated by another foot, which means that it must be directly dominated by a Prosodic Word. A *minimal foot*, on the other hand, refers to a foot that does not dominate another foot. By appealing to the notion of the maximal foot, the alignment constraint not only captures the infixation pattern in words like *multiplication*, but also excludes unattested patterns such as ***multi-ma-plication*.**[8]

The above Optimality Theoretic analysis of the Homeric word construction is couched within the theory of Sign-Based Morphology. Sign-Based Morphology (henceforth SBM), developed by Orgun (1996, 1998, 1999, 2002) is a declarative, non-derivational theory of the morphology-phonology interface which utilizes the basic tools one finds in any constituent structure-based unificational approach to linguistics (e.g., Construction Grammar, Fillmore & Kay 1994, and HPSG Pollard & Sag 1994). It

[8] The main problem of this understanding of the prosodic organization of words like those in (27) is that it violates the Strict Layer Hypothesis (Selkirk 1984:26, Nespor & Vogel 1986:7). However, violations of the Strict Layer Hypothesis seem to be independently motivated regardless of the case discussed here (see Hayes 1982, Jensen 1993, Jensen 2000).

assumes that both terminal and non-terminal nodes bear features and that non-terminal nodes also include the phonological information along with the usual syntactic and semantic information (i.e. co-phonology: Orgun 1996, Inkelas, et. al 1997, Inkelas 1998, Yu 2000, Orgun & Inkelas 2001, Inkelas & Zoll 2002; similar co-phonological approaches: Antilla 2001, Kiparsky 200x). In the case of the Homeric infix, the following construction is assumed.

(30) English Homeric infixation

$$\begin{bmatrix} \textit{Homeric word} & \\ \text{PHON} & \varphi_1(\#\text{l, ma}) \end{bmatrix}$$
$$\Big|$$
$$\begin{bmatrix} \textit{stem} & \\ \text{PHON} & \#\text{l} \end{bmatrix}$$

This construction states that lexical type *Homeric word* takes the type *stem* as input. The phonological output of the type *stem* is subjected to the co-phonology of the *Homeric word*, abbreviated as φ_1. This construction-specific analysis of the Homeric word reflects the fact that the non-peripheral property of the infix cannot be derived from general properties of English phonology and morphology. Non-peripherality is an idiosyncratic and intrinsic property of the Homeric infix.

For example, non-peripherality cannot be attributed to general properties of infixation in English; Expletive formation in English allows both infixing and 'prefixing' variants.

(31)

fantastic	bloody fantastic	fan-bloody-tastic
Minnesota	bloody Minnesota	Minne-bloody-sota
Alabama	bloody Alabama	Ala-bloody-bama

Neither can non-peripherality be attributed to general rhythmic considerations of English. The rhythmic pattern of the degenerate output **opus-ma* [ˈoʊpʰəsmə] (–∪∪), for example, is identical to that of *cinema* [ˈsɪnəmə] or *venomous* [ˈvɛnəməs].

Some might argue that non-peripherality might be derivable from extrametricality in English. The final syllable of nouns and suffixed adjectives is said to be extrametrical, thus exempted from foot-parsing, hence stress assignment (Hayes 1982). Thus, a word such as *cinema* is parsed as (ˈ*cine*)<*ma*>. Disyllabic words receive similar treatment. For example, *lively* is given the following foot parse: (ˈ*live*)<*ly*>. Since the input to Homeric infixation is assumed to contain metrical information (see below), the fact that *-ma-* cannot appear as a suffix falls out naturally from this assumption of foot assignment. Consider the following evaluation:

(32) Evaluation of /lively, ma/

(ˈlajv)lɪ, mə	L-ALIGN
a. ☞(ˈlajvə̲)-mə-lɪ	
b. (ˈlajv)lɪ-mə	*!

Here, candidate (32)b fails because *-ma-* is to the left of an unparsed syllable. This violates the dominating L-ALIGN constraint, which demands *-ma-* to appear after a maximal disyllabic foot. While this analysis is appealing since only an independently-needed mechanism of English metrical phonology is invoked, it is unfortunately flawed. The above analysis relies on the fact that the final syllable is extrametrical, thus not footed in the input. Consider the following scenario:

(33) Evaluation of /listen, ma/

(ˈlɪsn̩), mə	ALIGN
a. ☞ (ˈlɪsə)-mə-sn̩	
b. ☹ (ˈlɪsn̩)-mə	

The final syllable of underived verbs in English is generally not extrametrical. The word *listen* is parsed as a disyllabic foot. The extrametricality analysis erroneously predicts that the infix can appear both medially (33)a and finally (33)b since the final syllable is footed. Only (33)a is possible.

Another important aspect of Homeric infixation is that the phonology associated with the type *stem* must be stress-assigning. The reason is that the input to Homeric infixation must already be parsed metrically. The treatments of main and secondary stress in English and, by extension, foot assignment, have received quite a lot of attention in the generative phonological literature (Liberman & Prince 1977, Prince 1983, 1990, Hayes 1982, 1995). While the analyses proposed may vary quite dramatically, most agree that English foot is left-headed, thus trochaic. The rightmost foot is generally assumed to be

the strongest, thus the domain of the main stress. Main stress assignment is quantity-sensitive while secondary stress is quantity-insensitive and assigned from left to right (Halle & Kenstowicz 1991, McCarthy & Prince 1993a). Since the specific formal mechanism that derives main/secondary stresses in English is not relevant for the present discussion, whatever the ultimate analysis of English stress assignment is, it must be able to accommodate the infixation pattern discussed here. Consider, for example, the word ˈ*Canada*. Following the parametric approach to English stress assignment (cf. Hayes 1992), the main stress foot, which is trochaic, is built from right to left. The reason why this word has initial main stress, rather than penultimate, is due to the fact that the final syllable is extrametrical (e.g., (ˈ*Cana*)<*da*>). Now, consider the infixed version of this word ˈ*Cana-ma-da*. Primary stress remains initial. Yet, if stress placement occurs concomitant with infixation, antepenultimate stress (e.g., *Ca*(ˈ*na-ma*)-<*da*> similar to *A*ˈ*merica*) is predicted. This illustration points to the fact that *ma*-infixation must have access to pre-existing foot structures (see further discussion in section 3.2.4). That is, the reason one finds ˈ*Cana-ma-da*, not *Ca*ˈ*na-ma-da*, is because the Homeric infix takes (ˈ*Cana*)*da* as the input. The outcome of infixation is (ˈ*Cana*)-*ma-da*.

The basic analysis of Homeric infixation is laid out in this section. The remainder of this study focuses on two aspects of complications regarding this infixation pattern: phonological reduplication in section 3.2.3 and variable infixation in section 3.2.4.

3.2.3 Reduplication in Homeric infixation

As noted in (20), *ma*-infixation can induce pivot expansion when necessary to satisfy its dual subcategorization requirements. Two expansion strategies are possible: schwa-epenthesis and partial reduplication. This section is focused on the nature of partial reduplication. As will be demonstrated in due course, the present analysis of reduplication has serious implications on the interpretation of schwa epenthesis as well.

Partial reduplication has two variants. Variant A shows the copying of the syllable following the infix; Variant B shows a similar pattern, though the vowel of the reduplicant is reduced to a schwa.

(34)	Variant A	Variant B
piggy	pigy-ma-gy	pig[ə]-ma-gy
table	table-ma-ble	tab[ə]-ma-ble
listen	li[sn̩]-ma-[sn̩]	lis[ə]-ma-sten
oboe	oboe-ma-boe	ob[ə]-ma-boe
purple	purple-ma-ple	purp[ə]-ma-ple
scramble	scramble-ma-ble	scramb[ə]-ma-ble
stinky	stinky-ma-ky	stink[ə]-ma-ky
party	party-ma-ty	part[ə]-ma-ty

When the stressed syllable is closed there is no variation in the realization of the reduplicant. Only schwa-epenthesis is allowed.

(35)		
lively	ˈlajvə-mə-lɪ	*ˈlajvɪ-mə-lɪ
lonely	ˈloʊnə-mə-lɪ	*ˈloʊnɪ-mə-lɪ
grapefruit	ˈkɹejpə-mə-ˌfɹut	*ˈkɹejpu-mə-ˌfɹut
graveyard	ˈkɹejvə-mə-ˌjaɹd	*ˈkɹejvaɪ-mə-ˌjaɹd
hairstyle	ˈhɛɹə-mə-ˌstajl	*ˈhɛɹaj-mə-ˌstajl

Why is reduplication not possible without the copying of the onset consonant as well? Is the schwa that appears in the reduplicant of Variant A in (34) the "same" schwa that appear in (35)? To answer these questions, one must first answer a different question: why does the reduplicative copy always come from the syllable after the infix, rather than the one before? That is, why are there only examples such as *tuba-ma-ba*, but never *tuta-ma-ba*?

3.2.3.1 On the nature of the reduplicant

Most traditional theories of reduplication assume that a reduplicant copies from either one of the edges of the stem or that of a stressed constituent (e.g., a stressed foot). Neither is applicable here since the 'base' is not a morphological constituent or a stressed unit. Beyond the problem of base identification, there is also the problem of how identity between the reduplicant and the base is defined. Within standard Correspondence Theory of reduplication (McCarthy & Prince 1995), the direction of 'reduplicative copying' is regulated by ANCHOR constraints that demand the edges of the reduplicant and the base correspond in a particular fashion. Such an analysis is not available here since there is no

reduplicative morpheme in the usual sense.[9] Consequently, I adopt the distinction between ***morphological reduplication*** and ***phonological reduplication*** (see also Kawahara 2001; Inkelas in press; Inkelas & Zoll in progress; cf. Gafos 1998, Hendricks 1999, who assume all duplication is due to a RED morpheme). Phonological reduplication has no semantics associated with it, while morphological reduplication does. The question in this case is how to account for the anchoring relationship in phonological reduplication.

To this end, following Bat-El 2002 and Inkelas in press, I adopt the output segmental correspondence approach to phonological reduplication. The idea behind this approach is that output identical segments stand in a correspondence relationship (Rose & Walker 2001; Hansson 2002). Bat-El 2002, for example, invokes the following consonant correspondence constraint to account for reduplication in Hebrew.

(36) SURFACE CORRESPONDENCE BY IDENTITY (SCORRI) (Bat-El 2002)
'Identical consonants in a stem are in correspondence relation such that one is the copy of the other.'

However, a generic identity constraint, such as (36), does not suffice here since it crucially lacks a directionality component, as illustrated by the illegitimate winning of (37)b below. The copied segments should correspond to identical segments to their right, rather than their left. The reduplicative copy is indicated with the subscript 'C'.

[9] Notice that the Morphological Doubling Theory of Reduplication (MDT; Inkelas and Zoll to appear) is also unavailable here since the reduplicant serves no morphological purpose, thus no morpho-semantic identity between the base and reduplicant (see also Inkelas in press).

(37)	$(^{l}C_1V_1)C_2V_2C_3$, mə	SCORRI
	a. ☞$(^{l}C_1V_1C_{2C}V_{2C})$-mə-C_2V_2 C_3	
	c. 💣$(^{l}C_1V_1C_{1C}V_{1C})$-mə-$C_2V_2C_3$	

Following Rose & Walker 2001 and Hansson 2002, I propose that directionality be stated as a correspondence relationship.[10] The particular constraint needed is defined below:

(38) Correspondence-S_iS_j ($SCORRI_L$)
'If S_i is a segment in the output and S_j a correspondent of S_i in the output, S_j must precede S_i in the sequence of segments in the output (j > i).'

The effect of $SCORRI_L$ is to rule out structures like (39)b where the copied material comes from the syllable before, rather than the one after the infix.

(39)	$(^{l}C_1V_1)C_2V_2C_3$, mə	$SCORRI_L$
	a. ☞$(^{l}C_1V_1C_{2C}V_{2C})$-mə-$C_2V_2C_3$	
	b. $(^{l}C_1V_1C_{1C}V_{1C})$-mə-$C_2V_2C_3$	*!

Let us now return to the earlier dilemma. The fact that words like *lively* Homerize as [ˈlajvə̲-mə-lɪ], never *[ˈlajvɪ̲-mə-lɪ] suggests that partial reduplication is not possible

[10] The idea that directionality is crucial in a correspondence relationship has been pointed out previously for the input-output relationship (i.e. IDEN-IO vs. IDEN-OI; Pater 1999) and in other applications of surface segmental correspondence, for example, in consonant harmony (Rose & Walker 2001, Hansson 2002).

without the copying of the onset consonant as well. In light of the current analysis, a solution to this problem is now in sight, which I refer to as ***Surface Correspondence Percolation***.

(40) Surface Correspondence Percolation

'If syllable σ_i contains a segment S_i that is in surface correspondence with segment S_j in syllable σ_j, all segments in syllable σ_i must be in correspondence with segments in syllable σ_j.'

Phonological reduplication without the copying of an onset consonant is not possible in cases like *lively* because the syllable hosting any surface corresponding segments must also be in correspondence. That is, if syllable σ_i contains a segment S_i that is in surface correspondence with segment S_j in syllable σ_j, all segments in syllable σ_i must be in correspondence with segments in syllable σ_j. Such a correspondence relationship can be captured using the theory of Prosodic Anchoring advocated in McCarthy 2002. Two syllable-anchoring constraints are posited.

(41) L-ANCHOR$_\sigma$

'The initial position of two syllables in a surface correspondence relationship must correspond.'

R-ANCHOR$_\sigma$

'The final position of two syllables in a surface correspondence relationship must

correspond.'

The compliance of these two constraints is asymmetric; L-ANCHOR$_\sigma$ must dominate R-ANCHOR$_\sigma$. Below is an example of an infixed disyllabic input.[11] The analysis predicts the reduplicant to be a CV syllable when the pivot is expanded by reduplication. While the copying of the nucleus from the syllable after the infix would be sufficient to satisfy the disyllabic requirement of the pivot, as illustrated by (42)b, such a candidate fatally violates L-ANCHOR$_\sigma$, which demands the initial segments of the corresponding syllables to match.

(42) $[{}^{\prime}C_1V_1][C_2V_2]_j$, mə	L-ALIGN	SCORRI$_L$	L-ANCHOR$_\sigma$	R-ANCHOR$_\sigma$
☞ a. $[{}^{\prime}C_1V_1][C_2V_2]_j$-mə-$[C_2V_2]_j$				
b. $[{}^{\prime}C_1V_1][V_2]_j$-mə-$[C_2V_2]_j$			*!	

This constraint hierarchy also predicts that no reduplication is possible when the initial syllable is closed. As illustrated below, (43)a is ruled out by virtue of the fact that the onsets of the corresponding syllables do not match. The syllables before and after the infix in (43)a are in correspondence due to the fact that the reduplicative vowel is in a correspondence relationship with the final vowel. (43)b prevails even though it contains an epenthetic schwa. The syllables before and after the infix are not in correspondence in this candidate since none of the segments of the respective syllables invoke surface correspondence.

[11] The angled brackets indicate syllable boundaries.

(43) [ˈC$_1$V$_1$C$_2$][C$_3$V$_3$]$_j$, mə

	SCORRI$_L$	L-ANCHOR$_\sigma$	R-ANCHOR$_\sigma$
a. [ˈC$_1$V$_1$][C$_2$V$_{3C}$]$_j$ -mə-[C$_3$V$_3$]$_j$		*!	
b. ☞ [ˈC$_1$V$_1$][C$_2$ə]-mə-[C$_3$V$_3$]$_j$			

So far, the discussion has concentrated on understanding the mechanism of 'reduplicative copying' in phonological reduplication. However, what motivates the reduplicative copying in the first place is yet to be considered and is what will be examined next.

3.2.3.2 Why reduplication?

Traditional theories of reduplication assume that reduplication happens only when it is called for by the presence of an abstract RED morpheme in the input (e.g., McCarthy & Prince 1995; Alderete et al 1999) or a COPY constraint in the constraint ranking (e.g., Yip 1998). These analytical devices are inadequate to deal with cases where 'reduplication' is required solely in order to satisfy the size requirement of the pivot and there is no evidence for positing an underlying RED morpheme in the input. What then motivates the recruitment of a reduplicative copy over fixed consonant epenthesis? The answer lies in the nature of epenthesis itself.

Traditionally in OT, epenthesis is regulated by DEP, a constraint that requires a segment in the output to have a correspondent in the input. A generic DEP constraint penalizes a candidate with a reduplicative CV sequence (44)a the same way it penalizes a candidate with epenthesized fixed segments (44)b, so some other mechanism is needed to

differentiate such a pair. Struijke's (2000) existential notion of faithfulness offers an interesting remedy.

(44) (p^{h}ɪ)g$_i$i$_j$, mə

	DEP
a. ☞(p^{h}ɪ.g$_i$i$_j$)-mə-g$_i$i$_j$	**
b. 💣 (p^{h}ɪ.ʔə)-mə-gi	**

The idea behind existential-faithfulness is that faithfulness is calculated between the input and the entire output word, rather than the base or the base and reduplicant separately, as it is traditionally assumed. Under this conception of faithfulness, a candidate with non-corresponding epenthesis (45)a violates ∃-DEP$_{IO}$ more severely than one with reduplicative epenthesis (45)b.

(45) (p^{h}ɪ)g$_i$i$_j$, mə

	∃-DEP$_{IO}$
a. ☞(p^{h}ɪ.g$_i$i$_j$)-mə-g$_i$i$_j$	
b. (p^{h}ɪ.ʔə)-mə-g$_i$i$_j$	*!*

By adopting existential faithfulness, the question as to why the epenthetic syllable is a reduplicative copy rather than some fixed segments is answered: reduplication does not introduce segments that are not already in the input. This analysis also illuminates the difference between the schwa of the partial reduplicant and that of schwa-epenthesis. As

illustrated (46), the schwa in the reduplicant must stand in correspondence with the final vowel, otherwise, the candidate would fatally violate R-ANCHOR$_\sigma$ (see (46)b)

(46) ([ˈpʰɪ)gᵢiⱼ, mə	SCORRI$_L$	L-ANCHOR$_\sigma$	R-ANCHOR$_\sigma$	∃-DEP$_{IO}$
a. ☞([ˈpʰɪ][g̲ᵢə̲ⱼ]$_k$)-mə-[gᵢiⱼ]$_k$				
b. ([ˈpʰɪ][g̲ᵢə̲]$_k$)-mə-[gᵢiⱼ]$_k$			*!	*

On the other hand, when a schwa appears alone without an accompanying reduplicative onset, the ranking predicts that such a schwa must be genuinely epenthetic. The correspondence between the schwa and the final vowel would have required the respective syllables to stand in correspondence also. As illustrated by (47)a, such a candidate would fatally violate L-ANCHOR$_\sigma$ since the onsets of the corresponding syllables do not match.

(47) (ˈlajv)lɪ, mə	SCORRI$_L$	L-ANCHOR$_\sigma$	R-ANCHOR$_\sigma$	∃-DEP$_{IO}$
a. ([ˈlaj][və̲ⱼ]$_k$)-mə-[lᵢɪⱼ]$_k$		*!		
b. ☞ ([ˈlaj][və̲])-mə-[lᵢɪⱼ]$_k$			*	*

The remaining question is why the reduplicative vowel reduces some of the time but not others (see (34)).

3.2.3.3 Variation in the reduplicant

The variation to be dealt with in this section concerns the vowel quality of a reduplicant. Such a vowel may appear as a full vowel or a reduced vowel, namely, schwa. This variation follows straightforwardly from the phonotactics of English. Full vowels in English are generally found in syllables with some degree of stress. The epenthesized syllable under infixation always occupies the weak position of a trochaic foot, thus must be stressless. Consequently, candidates such as (48)b can be ruled out by a dominating constraint against unstressed full vowel in English, called 'REDUCE'.

(48) (pʰɪ)gi, mə	REDUCE	∃-DEP$_{IO}$
a. (pʰɪ.g$_1$i$_2$)-mə-g$_1$i$_2$	*!	
b.☞(pʰɪ.g$_1$ə$_2$)-mə-g$_1$i$_2$		

The introduction of REDUCE alone prevents any variation in output selection, however, as shown by the losing of (48)a, an attested output. Thus, some additional force must counteract the effect of REDUCE. The key is in the evaluation of (48)b. The partial reduplicant in (48)b contains a schwa that is in correspondence with the final syllable. However, the two nuclei are not identical, thus should not have entered into a surface correspondence relationship. Following Walker 1999, Rose & Walker 2001 and Hansson 2001, I amend the earlier analysis and propose that correspondence is established in terms of similarity, rather than absolute identity. The following correspondence constraints that hold of pairs of similar vowels is posited:

(49) Similarity-based Surface Correspondence Hierarchy

CORR- $V_i \leftrightarrow V_i$ >> CORR-V↔ə

The faithfulness between these corresponding segments is regulated by featural IDEN-VV constraints. In this case, I posit a IDEN-$VV_{[reduced]}$ which demands that surface corresponding vowels must have identical [reduced] specification. This constraint is assumed to be co-ranked with respect to the constraint, REDUCE. At the time of evaluation, a particular ranking permutation of these two constraints is selected, producing a unique winning output. The permutation of two constraints produces, in this case, two possible outcomes, both of which are attested.

(50) a.

($p^hɪ$)gi, mə	REDUCE	IDEN-$VV_{[reduced]}$	∃-DEP_{IO}
a. ($p^hɪ.g_1i_2$)-mə-g_1i_2	*!		
b.☞($p^hɪ.g_1ə_2$)-mə-g_1i_2		*	

b.

($p^hɪ$)gi, mə	IDEN-$VV_{[reduced]}$	REDUCE	∃-DEP_{IO}
a. ☞ ($p^hɪ.g_1i_2$)-mə-g_1i_2		*	
b. ($p^hɪ.g_1ə_2$)-mə-g_1i_2	*!		

In this section, I argue that, while the Homeric infix induces foot-expansion to provide a suitable pivot for infix alignment, phonological reduplication is actually motivated by existential faithfulness and by surface segment correspondence. An interim summary of all the constraints needed to account for Homeric infixation in English is given in (51).

(51) Interim Summary of the Homeric Infixation Constraint Hierarchy

R-ALIGN, L-ALIGN >> $SCORRI_L$, L-$ANCHOR_σ$ >> {REDUCE <<>> IDEN-$VV_{[reduced]}$} >> R-$ANCHOR_σ$, ∃-DEP_{IO}

In the next section, one final aspect of Homeric infixation is considered: ***variable infixation***. Particularly, the issue of what happens when no preexisting suitable pivot is available for the purpose of infix alignment will be explored in detail.

3.2.4 Variable infixation

Thus far, only cases where a single output is attested are encountered. However, multiple infixed outcomes are possible with certain inputs. This section deals with how these patterns can be analyzed.

While the canonical infix site is after the second syllable in trisyllabic words if the second syllable is unstressed (see (15)), the placement of *-ma-* becomes quite variable if the second syllable is stressed. This variation is systematic, however. Consider the examples in (52). The infix may occur in two locations: before or after the stressed syllable. Similar to what happened when the input is disyllabic, *ma*-infixation induces reduplication.

(52)

σ('σ)σ	Before 'Ft	After 'Ft
repellant	repa-ma-'pellant	re'pella-ma-lant

offensive	ofa-ma-ˈfensive	ofˈfensa-ma-sive
Toronto	Tora-ma-ˈronto	Toˈronta-ma-to

The analysis developed in the last section can easily accommodate this variation, though not without some slight modification. Consider the following:

(53)

(ˌɹɪ)(ˈpʰɛ)lənt, mə	L-ALIGN	R-ALIGN	∃-DEP_{IO}
a. ☞ (ˌɹɪpə)-mə-(ˈpʰɛ)lənt			
b. ☞(ˌɹɪ)(ˈpʰɛlə)-mə-lənt			
c. (ˌɹɪ)(ˈpʰɛ)-mə-lənt	*!		
d. 💣 (ˌɹɪpʰɛ)-(ˈmʌ-)lənt			
e. 💣 (ˈɹɪpʰɛ)-mʌ-lənt			

Both the supposed winning candidates (see (53)a & b) satisfy the subcategorization constraints equally well. The most un-tempered candidate, (53)c, fails since the material preceding the infix is not a disyllabic foot. Candidates (53)d & e, however, present a particular challenge. (53)d prevails by placing primary stress on the infix itself, while the secondary stress foot has incorporated materials from the input stressed syllable. (53)e prevails by placing primary stress on the input secondary stressed syllable. These metrically altered candidates can be ruled out by Prosodic Anchoring constraints (McCarthy 2002). Two such constraints are needed.

(54) ANCHOR-POS_{IO}(Ft, Ft, Initial) a.k.a. I-$ANCHOR_{Ft}$

'The final position of a foot in the input must correspond to the final position of a foot in the output and vice versa.'

ANCHOR-POS_{IO}(Ft, Ft, Final) a.k.a. F-$ANCHOR_{Ft}$

'The final position of a foot in the input must correspond to the final position of a foot in the output and vice versa.'

These constraints together ensure the disruption to the foot structure remains minimal in the output. For example, the high ranking of L-Anchor prevents the reassignment of preexisting foot structure in the output, thus effectively ruling out (55)d and (55)e (i.e. the winning candidates in (53)d & (53)e respectively). F-$ANCHOR_{Ft}$ must be low-ranked since both winning candidates require the expansion of existing foot structures, rendering the right-edge segments of the input and output feet incongruent.

(55)

(ˌɹɪ)(ˈpʰɛ)lənt, mə	L- ALIGN	R- ALIGN	I-$ANCHOR_{Ft}$	F-$ANCHOR_{Ft}$
a. ☞ (ˌɹɪpə)-mə-(ˈpʰɛ)lənt				*
b. ☞(ˌɹɪ)(ˈpʰɛlə)-mə-lənt				*
c. ˌɹɪ (ˈpʰɛ)-mə-lənt	*!			
d. (ˌɹɪpʰɛ)-(ˈmʌ-)lənt			*!	
e. (ˈɹɪpʰɛ)-mʌ-lənt			*!	*

Variable infixation does not seem to present any major problem for the analysis so far since the winning candidates are comparable in all respects, for all intents and purposes. That is, both variants employ partial reduplication as the means of pivot expansion. However, the data in (56) reveals that sometimes the variants might differ in terms of their pivot expansion strategies.

(56)

σ(ˈσ)σ	Before ˈFt	After ˈFt
Alberta	Al<u>a</u>-ma-berta	Alberta-ma-ta
computer	com<u>a</u>-ma-puter	comput<u>a</u>-ma-ter
disgusting	dis<u>a</u>-ma-gusting	disgust<u>a</u>-ma-ting
suspension	sus<u>a</u>-ma-pension	suspens<u>a</u>-ma-sion

Both pivot expansion strategies are used in (56): schwa-epenthesis (e.g., *Al<u>a</u>-ma-berta*) and reduplication (e.g., *Alber<u>ta</u>-ma-ta*). This difference presents an interesting challenge for the analysis of variable infixation. Consider the following evaluation.

(57)

(ˌæl)(ˈbɚ)tə, mə	I-ANCHOR$_{Ft}$	F-ANCHOR$_{Ft}$	∃-DEP$_{IO}$
a. 💣 (ˌælə)-mə-(ˈbɚ)tə		*	*!
b. ☞ (ˌæl)(ˈbɚtə)-mə-tə		*	

As shown above, the analysis predicts a unique output. (57)a, an attested variant, is ruled out by virtue of the fact that it introduces a genuine epenthetic schwa. Some additional force must be at work here to balance the effect of ∃-DEP$_{IO}$. The constraint is none other

than the generic DEP$_{IO}$. However, the effect of this constraint must be couched within a model of variation in OT. In particular, the partial ranking model of variation is adopted here (e.g., Antilla 1995).

The partial-ranking-of-constraints model of variation says that, given a constraint ranking A >> {B, C} >> D where constraints {B, C} never co-occur at the same time, only a particular partial ranking is employed at a particular evaluation time. In this hypothetical case, there are two possible rankings: A >> B >> D and A >> C >> D. Following this line of analysis, I propose that the two DEP constraints are partially ranked. As shown by the following evaluation in a *tableau des tableaux* format, each of the winning variants is predicted by one of the partial rankings.

(58) i.

(ˌæl)(ˈbɚ)tə, mə	I-ANCHOR$_{Ft}$	F-ANCHOR$_{Ft}$	DEP$_{IO}$
a. ☞(ˌælə)-mə-(ˈbɚ)tə		*	*
b. (ˌæl)(ˈbɚtə)-mə-tə		*	*!*

ii.

(ˌæl)(ˈbɚ)tə, mə	I-ANCHOR$_{Ft}$	F-ANCHOR$_{Ft}$	∃-DEP$_{IO}$
a. (ˌælə)-mə-(ˈbɚ)tə		*	*!
b. ☞ (ˌæl)(ˈbɚtə)-mə-tə		*	

The variant with schwa epenthesis (58)ia is predicted by a partial ranking with the traditional DEP$_{IO}$. The reduplication variant (58)ib under this co-phonology is deemed suboptimal since there are more epenthetic segments than the schwa-epenthesis variant. Conversely, the reduplication variant (58)iib fares better under a partial ranking with the

existential ∃-DEP$_{IO}$ since the schwa-epenthesis variant contains an offending non-corresponding schwa (see (58)iia).

In this section, I show that variable infixation happens when the input does not provide a suitable pivot. The mechanism of partial ranking is needed when the optimal variants are not compatible. The final constraint hierarchy of the co-phonology associated with the Homeric infix is given below:

(59) Summary of the Homeric Infixation Constraint Hierarchy

R-ALIGN, L-ALIGN >> I-ANCHOR, SCORRI$_L$, L-ANCHOR$_\sigma$ >> {REDUCE <<>> IDEN-VV$_{[reduced]}$} >> R-ANCHOR$_\sigma$, F- ANCHOR >> { DEP$_{IO}$, ∃-DEP$_{IO}$}

3.2.5 Conclusion

The Homeric infixation case shows that genuine infixation, characterized by invariable non-peripherality, can be modeled straightforwardly with GPS constraints. Following the SNH, these GPS constraints are undominated. The variable placement of *-ma-* reflects indeterminacy in the subcategorization constraints themselves. Unlike other infixes considered so far, the Homeric infix specifies a pivot type (a disyllabic foot), not a specific pivot (e.g. initial foot or main stressed foot), thus giving rise to multiple output possibilities that nonetheless satisfy the same alignment requirement.

3.3 Washo plural reduplication

This final case study revisits the pattern of plural formation in Washo, a Hokan language. This pattern is of interest for several reasons. In Chapter 2, the fact that the placement of

the reduplicant depends partly on the realization of stress in this language is briefly discussed. However, as will be explicated below, Washo plural formation is not a straightforward case of affixation to the prosodic stem; the reduplicant, which must be within the head of a stressed foot, appears in the penult because stress is on the penult. Washo plural formation is also interesting from the standpoint of the development of infixation research. Broselow & McCarthy (1983), in their seminal paper on the typology of internal reduplication, classify this as a case of true infixing reduplication, instead of prefixing or suffixing to a prosodic constituent, which they refer to as fake infixation. According to their theory, the VCV reduplicant lodges itself after the initial consonant. In this study, I defend the view that the reduplicant is CV in shape, as it is traditionally analyzed (Kroeber 1907; see also de Haas 1988 & Urbanczyk 1993). This analysis eliminates the need to invoke a set of complicated vowel coalescence and vowel deletion rules that are characteristic of earlier analyses (Jacobsen 1964, Winter 1970, Broselow & McCarthy 1983). Finally, Washo plural formation is an instance of internal reduplication. An in-depth investigation of this pattern provides an opportunity to exemplify how internal reduplication might be handled within the GPS framework.[12]

This study begins with the presentation of some background information on Washo in §3.3.1. The basic pattern of plural formation in Washo is presented in §3.3.2. In §3.3.3, I advance a new theory of the plural formation in Washo accompanied by an in-depth analysis, couched within Optimality Theory (Prince and Smolensky 1993, McCarthy and Prince 1993, McCarthy and Prince 1995). §3.3.4 looks at previous analyses of this pattern

[12] While Homeric infixation involves 'internal reduplication' as well, the reduplicant cannot be considered an infix since it is phonologically induced.

and argue that none is sufficient to account for the full range of data. The conclusion appears in §3.3.5.

3.3.1 Washo: The basics

Washo is a severely moribund language spoken in an area around Lake Tahoe, California and Nevada. Washo is traditionally considered a member of the Hokan family, with the Chumash languages as its closest relatives. However, such genetic affiliation has been disputed. For example, Campbell and Mithun (1979) argue that Washo is actually an isolate.

Data cited in this study are accompanied by their source. The principal source of data comes from Jacobsen's 1964 University of California, Berkeley dissertation on the grammar of Washo. Examples are cited with the code 'J64:XXX', where 'XXX' indicates a page number. Earlier works on the Washo language, such as Kroeber (1907)'s grammatical sketch of Washo (cited as 'K07:XXX'), are also consulted.

The consonant inventory of Washo is shown in (60). The vowel inventory is given in (61) (Jacobsen 1964, 1996).

(60)

p	t			k	ʔ
b	d	z		g	
p'	t'	c'		k'	
	s		š		h
M[m̥]				ɴ[ŋ̊]	
m	n			ŋ	
W[w̥]	L[ɬ]		Y[j̊]		
w	l		y[j]		

(61)

i, iː	ɨ, ɨː	u, uː
e, eː		o, oː
	a, aː	

Stress is assigned generally to stems and is predominantly on the penultimate syllable (see further discussion in 3.3.3.1). Vowel length contrast is found only in stressed syllables.

3.3.2 Plural reduplication in Washo

In this section, the data on plural reduplication in Washo is presented, showing that, while the reduplicant might appear to surface before the final syllable, it is in fact attracted to the stressed position.

Partial reduplication is employed in Washo to denote plurality in both the nominal and verbal domains (62).

(62)

Singular	Plural	Gloss	
ˈdaʔa	daˈʔaʔa	'mother's brother'	(J64:323)
ˈʔelel	ʔeˈlelel	'mother's father'	(J64:325)
ˈgewe	geˈwewe	'coyote'	(J64:335)
ˈbɨkʼɨ	bɨˈkʼɨkʼɨ	'grandmother's sister'	(J64:326)
ˈsukuʔ	suˈkukuʔ	'dog'	(J64:326)
ˈgušuʔ	guˈšušuʔ	'pet'	(J64:326)

ˈguʔu	guˈʔuʔu	‘mother’s mother’s’	(J64:326)
ˈdamal	daˈmamal	‘to hear’	(J64:325)
ˈbokoŋ	boˈkokoŋ	‘to snore’	(J64:323)
ˈbiŋil	biˈŋiŋil	‘to try’	(J64:336)
ˈpʼisew	pʼiˈsesew	‘ear’	(J64:326)

Reduplication is stem internal, and thus never copies derivational or inflectional prefixes or suffixes (e.g., *tʼeːliw* ‘to be a man’ (J64:325); *tʼeliwhu* ‘man’ (K07:272); *tʼeliːliw* ‘to be a man.PL’ (J64:325); *tʼeliːliw-hu* ‘men’ (K07:272)). The size of the reduplicant is monomoraic, assuming that the coda consonant is mora-bearing (a detailed discussion appears in §3.3.3.2).

At first glance, one might be tempted to analyze the data as a case of the copying of the last syllable of the stem while the final consonant is extrametrical.[13] That is, *pʼiˈsesew* ‘ear’ might be parsed as *pʼiˈse-se-w*. However, consider the examples below.

(63)	ˈʔewšiʔ	ʔeˈšiwšiʔ	‘father’s brothers’	(J64:292)
	ˈnentʼuš	netʼuntʼuš-u	‘old women: -u=nominalizing’	(J64:289)
	ˈsaksag	saˈsaksag	‘father’s father’s bother’	(J64:330)
	ˈmokgo	moˈgokgo	‘shoe’	(J64336)

[13] A similar analysis was assumed in Kroeber 1907, who analyzed, for example, the reduplicated form of *gewe* ‘coyote’ as *gewe-we* ‘coyotes’.

If one were to follow the above morphological analysis, for example, the expected reduplicated form of *ˈʔewšiʔ* ‘father’s brother’ would be *ʔewˈšišiʔ*, which is incorrect. The actual form is *ʔeˈšiwšiʔ*, suggesting that the reduplicant is infixed much further inward than is predicted by the extrametricality analysis. The reduplicant cannot be analyzed as appearing before the final syllable: the syllable structure of a word like ˈ*mokgo* is ˈ*mok.go*; the reduplicant appears before the coda of the initial syllable of the single stem, rather than the final syllable (e.g., *mo.-ˈgo-k.go*, rather than **mok.ˈgo.go*). To be sure, the reduplicant does not appear after the first vowel of the root either, as illustrated by the plural of the following polysyllabic forms.[14, 15]

(64)	hañakmuwe	(K07:311)	hañakmuwewe	‘elks’	(K07: 272)
	malosañ	(K07:272)	malosasañ	‘stars’	(K07: 272)
	meskitset[16]	(K07:272)	meskitsetsat	‘arrows’	(K07: 272)
	baloxat	(K07:310)	baloxaxat	‘bows’	(K07: 272)
	taˈmomo[17]	(K07:308)	tamoˈmoomo	‘women’	(K07: 272)
	memˈdeːwi	(J64: 292)	memdeˈwiːwi	‘deer’	(J64: 292)

[14] To the best of my knowledge, these are monomorphemic forms. Additional commentary is provided wherever it is available.
[15] The examples here are given in Kroeber’s orthography to avoid misinterpretation since there are several inconsistencies in Kroeber’s transcription of the data. For example, ‘star’ appears as *malosañ* on p. 272, but *maʼlosañ* on p. 311; ‘bow’ as *baloxat* on p. 272, but *balohat* on p. 310; ‘arrow’ as *meskitset* on p. 272, but *meskitsEt* on p. 310. The segment *ñ* in Kroeber’s orthography correspond to [ŋ] in Jacobsen 1964.
[16] Cited as *mešgíc’et* on p. 104, Jacobsen suggests that *mešg-* might have been a prefix to the stem *íc’ed* ‘to prick, sting’ on p. 494, even though this is the only word with this ‘prefix’.
[17] *daʔmó ʔmoʔ* (J64:102).

As illustrated by the above examples, the reduplicant appears much closer to the end of the plural stem than to the beginning, suggesting that a post-initial-vowel analysis of the reduplicant placement cannot be correct.

3.3.3 Analysis

In this section, I argue that reduplicant placement and stress assignment are intimately connected: the reduplicant must appear within the stressed syllable. The properties of stress assignment in Washo must first be understood before one can understand the placement property of the reduplicative plural.

3.3.3.1 Stress assignment in Washo

While Jacobsen does not provide a clear characterization of the stress pattern in Washo, he provides sufficient data to show that stress is a property of the stem, which for the present purpose is defined as maximally a reduplicated root. Inflectional affixes do not generally receive stress. For example, as illustrated in (65), both the first personal possessive prefix /le-/ and the attributive-possessive suffix /-iʔ/[18] are not stressed. Stress remains on the stem-initial syllable.

(65)	ˈ**ʔe**lel	‘mother’s father’	(J64:476)
	le-ˈ**ʔe**lel-iʔ	‘my daughter’s child (of a man)’	(J64: 413)

[18] The derivatives of the attributive suffix are ‘the reciprocal kinship terms for the corresponding relatives of the descending generations’ (J64:475). For example, *le ˈʔeleliʔ* ‘my daughter’s child (man sp.)’ literally means ‘the one who has me as mother’s father’.

ˈ**gu**ʔu	‘mother’s mother	(J64:476)
le-ˈ**gu**ʔu-iʔ	‘my daughter’s child (of a woman)’	(J64:413)

Crucially, reduplication is within the domain of stress assignment. As illustrated in (66), primary stress is consistently penultimate, despite the fact that the segmental content of the stressed syllable in the singular form does not match that of the plural form.

(66)	Singular	Plural	Gloss	
	ˈʔelel	ʔeˈlelel	‘mother’s father’	(J64:335)
	ˈsukuʔ	suˈkukuʔ	‘dog’	(J64:336)
	ˈgušuʔ	guˈšušuʔ	‘pet’	(J64:336)
	ˈdamal	daˈmamal	‘to hear’	(J64:336)
	ˈbokoŋ	boˈkokoŋ	‘to snore’	(J64:336)
	ˈbiŋil	biˈŋiŋil	‘to try’	(J64:336)

Stress remains on the penult of the reduplicated stem, rather than on the penult of the inflected form (67).

(67)	ˈʔelel	‘mother’s father’	(J64:476)
	le-ˈʔelel-iʔ	‘my daughter’s child (man sp.)’	(J64: 413)
	le-ʔeˈlelel-iʔ	‘my daughter’s children (man sp.)’	(J64:413)

ˈbik’ɨ	‘grandmother’s sister’	(J64:476)
le-ˈbɨk’ɨ-yiʔ	‘my sister’s child (woman sp.)’	(J64:413)
le-biˈk’ɨk’ɨ-yiʔ	‘my sister’s children (woman sp.)	(J64:413)

Formally, the assignment of stress on the stem-penultimate syllable can be captured in terms of the following constraints.

(68) ALIGN$_{FT}$ ‘The right edge of a foot must coincide with the right edge of a stem.’

FTFM ‘A foot must be trochaic.’

PARSE-σ ‘Every syllable must be footed.’

FTBIN ‘A foot must be binary either at the syllable or moraic level.’

An illustration of this metrical analysis is given in (69). Here, due to the high ranking of ALIGN$_{FT}$, (69)c is ruled out since the left edge of the metrical foot is three segments away from the left edge of the stem. While (69)b shows proper alignment, it is nonetheless ruled out by the grammar, since it carries an iambic foot rather than a trochaic foot. (69)d also shows that, while the left edge of the stem coincides with the left edge of a foot, the parsing of the initial syllable produces an extra foot in the output, which incurs fatal violations of ALIGN$_{FT}$ since the left edge of this initial foot does not coincide with the left edge of the stem. The assignment of stress on the final syllable renders more syllables unfooted (see (69)e), which leaves (69)a the winning candidate.

(69) /ʔelel, RED/	FTBIN	FTFM	ALIGN$_{FT}$	PARSE-σ
☞ a. ʔe(ˈlelel)				*
b. ʔe(leˈlel)		*!		*
c. (ˈʔele)lel			**!*	*
d. (ʔe)(ˈlelel)			**!***	
e. ʔeleˈ(lel)				*!*

Now that the assignment of stress and metrical foot in Washo is better understood, let us return to the earlier discussion on the placement of the reduplicant.

3.3.3.2 Infixing reduplication by way of Prosodic Alignment

To capture the infixing nature of the reduplicant, I propose that the reduplicant must align with respect to the stress foot. However, unlike previous cases of prosodic alignment, which demands opposite edge alignment, Washo demands same edge alignment. That is, following the formalism of GPS, the left edge of the reduplicant must coincide with the left edge of a foot.

(70) ALIGN-RED

ALIGN (L, RED, L, ˈFOOT)

The left edge of the reduplicant must coincide with the left edge of the stressed foot.

ALIGN-RED, like all morpheme alignment constraints, is undominated. The reduplicative template is assumed to be a monomoraic syllable.

(71) RED=σ_{μ} 'The reduplicant must be a light syllable'

The fact that the reduplicant always copies from or near the right edge of the base can be attributed to the constraint, $\text{ANCHOR}_{\text{BR}}$-RIGHT.

(72) $\text{ANCHOR}_{\text{BR}}$-RIGHT

'The segment at the right edge of the reduplicant must correspond to the right edge of the base.'

Finally, since the reduplicant is often smaller than the base, the abovementioned constraints must dominate the MAX_{BR}-*seg* constraint, which demands the reduplicant be an exact copy of the base.

The reduplicant alignment constraint alone effectively rules out any non-penultimate placement of the reduplicant (i.e. (73)d-f) since stress must be penultimate. Proper alignment *per se* does not generate the correct output, however. The ranking favors candidate (73)b over (73)a since the reduplicant in (73)b is more faithful to the base.[19] A

[19] The notion of BASE adopted here is that of Kager (1999). If the reduplicant is prefixing, then the base is to its right, while if the reduplicant is suffixing, the base is to its left. Urbanczyk (1996, 2000) formalizes this implicit assumption by appealing to the notion of *tropism*. Tropism is a notion which is used in referring to edges. A 'tropic edge' is the edge immediately following the reduplicant if the reduplicant is a prefix, or immediately preceding the reduplicant if it is a suffix (Urbanczyk 1996: 272). To capture Marantz's (1982) observation that the unmarked association for prefixes is from left-to-right, while right-to-left for suffixes, she posits the Adjacent String Hypothesis, which says that the base is the string adjacent to the reduplicant such that it begins at the tropic edge (Urbanczyk 1996: 272).

problem that needs to be accounted for is why the coda of the first syllable prefers to be in the stressed syllable rather than respecting its original syllable role. The answer lies in the interpretation of the weight of coda consonants in Washo.

(73)

/saksag, RED/	ALIGN-R	RED=σ_{μ}	$\text{ANCHOR}_{\text{BR}}$	MAX_{BR}
☞ a. sa-('*sa*-k.sag)			*	ksag
💣 b. sak-('*sa*-sag)			*	g
c. sak-('*sag*-sag)		*!		
d. sak('sa-*sa*-g)	*!		*	g
e. sa-('k*ag*-sag)	*!	*		s
f. sak-('sag-*sag*)	*!	*		

Here, stem-internal coda consonants are assumed to bear weight, as illustrated by the failure of candidate (73)c. Since the reduplicative template calls for a monomoraic syllable, overcopying is not allowed. The question that must be addressed here is what motivates the weight-bearing analysis of coda consonants. In what follows, I will show that the weight of a coda consonant is derivative of the interactions between constraints governing the distribution of moras.

As shown above, Washo has a trochaic stress system. There is no evidence that coda consonants have any bearing on the placement of stress. For example, a word such as *dew.ɬhi.wi* 'thunder' (J64:79) would be expected to have initial stress if heavy syllables

attract stress. Interestingly, this ambivalence in the weight-bearing nature of coda consonants is crucial to the understanding of reduplicant placement.

Following Morén 2000, the weight of closed syllables in Washo is assumed to vary depending on stress assignment. This variability can be derived through constraint interactions. Crucially, four constraints are invoked, in addition to the constraints presented thus far. Weight-to-Stress Principle (Prince 1993) captures the tendency for heavy syllables to attract stress across languages. Weight-by-Position demands a coda consonant to be mora-bearing. These weight-related constraints are accompanied by two mora faithfulness constraints that ban any tempering of the mora count in the output.

(74)

Weight-to-Stress (WSP)	A heavy syllable must be stressed (Prince 1990, 1993).
Weight-by-Position (WBP)	Coda consonant must surface as moraic (Hayes 1989).
MAX_{IO}-μ	'The number of moras in the output must correspond to those in the input.'
DEP_{IO}-μ	'The number of moras in the input must correspond to those in the output.'

Let us now consider how these constraints, together with the other constraints on reduplication and stress assignment, derive the variability of coda consonant weight in Washo. Since ALIGN_{FT} and FTFORM is never violated in the output, for the sake of

clarity in presentation, they will be assumed to be undominated. Candidates that violate these constraints will not be presented in the tableau.

(75)

/sa$^{\mu}$k.sa$^{\mu}$g, RED$^{\mu}$/	RED	MAX_{μ}	WSP	WBP	PARSE	DEP_{μ}
☞ a. sa$^{\mu}$.('*sa*$^{\mu}$k$^{\mu}$.sa$^{\mu}$g)				*	*	*
b. sa$^{\mu}$k.('*sa*$^{\mu}$.sa$^{\mu}$g)				*!*	*	
c. sa$^{\mu}$k$^{\mu}$.('*sa*$^{\mu}$.sa$^{\mu}$g)			*!	*	*	*
d. sa$^{\mu}$k.('*sa*$^{\mu}$g$^{\mu}$.sa$^{\mu}$g)	*!			*	*	**
e. sa$^{\mu}$k.('*sa*$^{\mu}$*g*.sa$^{\mu}$g)				*!*	*	
f. sa$^{\mu}$.('*sa*$^{\mu}$k$^{\mu}$.sa$^{\mu}$g$^{\mu}$)			*!	*	*	*
g. sa$^{\mu}$k.sa$^{\mu}$.'(*sa*$^{\mu}$g$^{\mu}$)				*	*!*	*

All codas are assumed to be underlyingly weightless in Washo. As noted, overcopying fatally violates the high-ranking templatic constraint, $\text{RED}=\sigma_{\mu}$ (see (75)d) since the coda consonant of the reduplicant is moraic. Simply assuming that the reduplicative coda is non-weight-bearing does not ameliorate the situation, however, since it would fatally violate the Weight-by-Position constraint (see (75)e), which penalizes any weightless codas in the output. Let us now focus on the variable placement of the word-internal coda consonant. If a stem-internal coda retained its original syllable affiliation, that is, with the first syllable, it would have to be weightless, since the initial syllable is unstressed, which in turn would have fatally violated WBP. If the initial syllable were heavy, it would have violated WSP since stress is on the penult (see (75)c). The final consonant must be

weightless, otherwise, it would fatally violate WSP ((75)f). But what about (75)g? This candidate satisfies all high-ranking constraints: the reduplicant is in a stressed syllable; the final consonant is moraic and in a stressed syllable, thus satisfying WBP and WSP respectively. (75)g is as good as (75)a in all respects except one. (75)g leaves more syllables unfooted than (75)a. Notice that the winning candidate does not violate RED=σ_μ because the reduplicant *per se* remains monomoraic, even though the syllable that contains it is formally heavy.

Consider now the evaluation of a form that lacks an internal cluster. The analysis developed so far presents an interesting puzzle. Despite having more unparsed syllables, candidate (76)b fares better than (76)a since (76)b contains no weightless codas. Yet (76)a is the actual attested form; some as-yet-unknown factor must be at work here that favors (76)a over (76)b.

(76) /p'isew, RED/	ALIGN$_{FT}$	FTBIN	FTFM	WSP	WBP	PARSE
☞ a. p'i(^{l}*se*$^{\mu}$se$^{\mu}$w)					*!	*
💣 b. p'ise(^{l}*se*$^{\mu}$w$^{\mu}$)						**
c. p'i(^{l}*se*$^{\mu}$se$^{\mu}$w$^{\mu}$)				*		

The key is in the reduplicant's relationship with respect to the base. Thus far, the constraint, ANCHOR-R, plays no real role in the evaluation because of the categorical nature of the evaluation of this constraint. As long as the edge segments of the reduplicant and the base do not correspond, ANCHOR-R is violated. Yet (77)a and (77)b

are quite different in terms of the direction of 'reduplicative copying'. That is, in (77)b, the base of the reduplicant appears to the left, while in (77)a, the base appears to the right.

(77) /p'isew, RED/	*#V	RED=σ_μ	ALIGN-R	ANCHOR-R	MAX$_{IO}$	MAX$_{BR}$
☞ a. p'i(^{l}*se*$^{\mu}$se$^{\mu}$w)				*		*
💣 b. p'ise(^{l}*se*$^{\mu}$w$^{\mu}$)				*		*

To capture this difference between the two competing candidates, I propose to abandon the ANCHOR approach here and adopt the surface correspondence method of evaluating the relationship between the 'reduplicant' and the 'base', following the analysis already proposed in the last case study. The directional surface correspondence constraint is reproduced below.

(78) Correspondence-S_iS_j (SCORRI$_L$)

'If S_i is a segment in the output and S_j a correspondent of S_i in the output, S_j must precede S_i in the sequence of segments in the output (j > i).'

This constraint guarantees that the 'base' of reduplication must follow the reduplicant, rather than the other way around. As shown below, (79)b fails under SCORRI$_L$ since the 'reduplicant' follows the 'base' when the 'base' is supposed to follow the 'reduplicant'.

(79)	/p'is$_1$e$_2$w, RED/	*#V	RED=σ_μ	ALIGN-R	MAX$_{IO}$	SCORRI$_L$	MAX$_{BR}$
☞	a. p'i$^\mu$ ('$s_{1C}e^\mu{}_{2C}s_1e_2{}^\mu$w)						*
	b. p'i$^\mu$s$_1$e$^\mu{}_2$ ('$s_{1C}e^\mu{}_{2C}$w$^\mu$)					*!*	*

Finally, in order to prevent coda consonants from moving willy-nilly, the analysis of coda consonant weight requires the addition of a LINEARITY constraint. Take, for example, the evaluation in (80). The coda consonant of the initial syllable might be transposed to the stressed syllable (see (80)b) in order to satisfy both WSP and WBP had LINEARITY not been undominated.

(80)	/de$^\mu$w.hi$^\mu$.wi$^\mu$, RED$^\mu$/	LINEARITY	MAX$_\mu$	WSP	WBP	DEP$_\mu$
☞	a. de$^\mu$w.('hi$^\mu$.wi$^\mu$)				*	
	b. de$^\mu$.('hi$^\mu$w$^\mu$.wi$^\mu$)	*!				*
	c. de$^\mu$w$^\mu$.('hi$^\mu$.wi$^\mu$)			*!		*

LINEARITY is violated when the precedence relationships between segments in the output do not match those of the input. Thus, in the case of (80)b, LINEARITY is violated since the coda segment [w], which is between segments 2 and 4 in the input, appears between segments 5 and 6 in the output. However, the addition of this new constraint does not affect the selection of the correct optimal reduplicated candidate, because the linear precedence between input coda consonant and its preceding and following segment remains unchanged. Segment 2 still precedes segment 3 even though the reduplicant

intervenes. The interjection of the reduplicant does not constitute a linearity violation because the reduplicant is not in linear relationship with the stem in the input.

(81) INPUT /d$_1$e$_2$w$_3$.h$_4$i$_5$.w$_6$i$_7$/ /s$_1$a$_2$k$_3$.s$_4$a$_5$g$_6$, RED/

OUTPUT d$_1$e$_2$.h$_4$i$_5$w$_3$.w$_6$i$_7$ (80)b s$_1$a$_2$.<u>*sa*</u>k$_3$.s$_4$a$_5$g$_6$ (75)d

In this section, I have advanced an analysis of Washo internal reduplication that captures the odd placement of the reduplicant by appealing to the ambiguous moraic status of coda consonants in this language; while coda consonants do not affect the placement of stress, it is nonetheless attracted to the stressed syllable when the opportunity arises (i.e. in reduplication). In the next section, it will be shown that this analysis has serious implications for other aspects of the reduplication pattern also.

3.3.3.3 Reduplication and weight

The discussion on Washo plural reduplication thus far has largely ignored the issue of vowel length in the reduplicated form. In this section, I show that the realization of vowel length depends on the interaction between stress assignment and reduplication; a vowel-length contributing mora must appear in the stressed syllable, regardless of the melodic content of that syllable. Consider the examples below:

(82)	Singular	Plural	Gloss	
a.	'ʔelel	ʔe'lelel	'mother's father'	(J64:335)
	'sukuʔ	su'kukuʔ	'dog'	(J64:336)

	ˈgušuʔ	guˈšušuʔ	‘pet’	(J64:336)
	ˈdamal	daˈmamal	‘to hear’	(J64:336)
	ˈbokoŋ	boˈkokoŋ	‘to snore’	(J64:336)
	ˈbiŋil	biˈŋiŋil	‘to try’	(J64:336)
b.	ˈʔaːtʼu	ʔaˈtʼoːtʼo	‘older brother’	(J64:341)
	ˈmaːgu	maˈgoːgo	‘sister’s child’	(J64:341)
	ˈmoːkʼo	moˈkʼoːkʼo	‘knee’	(J64:325)
	ˈtʼeːliw	ˈtʼeliːliw	‘to be a man’	(J64:325)
	ˈmeːhu	meˈhuːhu	‘to be a boy’	(J64:325)
	ˈʔeːbu	ʔeˈbuːbu	‘mother’s father’s brother’	(J64:325)
	ˈwaːšiw	waˈšiːšiw	‘Washo’[20]	(J64:325)

The peculiarity presented by the above data is in the fact that vowel length is observed in the penultimate syllable (82)b, even though the long vowels in the singular and the plural forms do not match. For example, in the singular form of the word meaning ‘Washo’, the long vowel is /aː/, yet, in the plural, thus reduplicated, form, the long vowel is /iː/. How could this transfer of vowel length be possible? Quantitative transfer in reduplication has been documented in the literature (e.g., in Mokilese (Levin 1983, McCarthy and Prince

[20] B&M, in a footnote, cite Jacobsen as saying that this form is irregular in Washo. Upon examination of Winter 1970 and Jacobsen 1964, I have not been able to confirm that Jacobsen actually made that claim. In fact, the form cited by B&M as regular (i.e. ˈ*baliʔ* → *baˈlaliʔ* ‘to shoot’) should be considered irregular in light of their vowel coalescence rule (i.e. V → ∅ / V __).

1986, 1988)). That is, the vowel length of the base is copied in the reduplication. However, in the case of Washo, the base of reduplication does not contain a long vowel (e.g., the base of reduplication in *waˈšiːšiw* ‘Washos’ is *-šiw* which does not contain a long vowel). It seems as though vowel length is movable in Washo.

I propose that the mobile nature of vowel length is really a natural consequence of the fact that vowel length is only distinctive in stressed syllables in Washo. The movability of vowel length falls out naturally from the analysis developed in the last section.

As illustrated by the tableau in (83), if the mora that contributes to vowel length is associated to the same segment in the output as it was in the input, it would have fatally violated WSP, since stress is on the penult, not the antepenult (83)b. Assigning stress on antepenult to avoid violating WSP would have incurred fatal violations of ALIGN_{FT} (83)c. Finally, if the vowel-length-contributing mora were deleted in the output, it would violate the high ranking MAX_{IO}-μ, which penalizes mora deletion, even if it would satisfy both ALIGN_{FT} and WSP. Also, while a length-contributing mora associates to the reduplicant syllable, it does not violate the templatic $\text{RED}=\sigma_{\mu}$ constraint. As indicated by the underlines, the reduplicant of (83)a is still a monomoraic syllable, even though that the vowel is actually realized as long on the surface. This is due to the fact that the length-contributing mora is not formally part of the reduplicant *per se*.

(83)

/me:$^{\mu\mu}$hu$^{\mu}$, RED$^{\mu}$/	ALIGN$_{FT}$	FTFM	MAX$_{\mu}$	WSP	WBP	PARSE
☞ a. me$^{\mu}$('hu:$^{\mu\mu}$hu$^{\mu}$)						*
b. me:$^{\mu\mu}$('hu$^{\mu}$hu$^{\mu}$)				*!		*
c. ('me:$^{\mu\mu}$hu$^{\mu}$)hu$^{\mu}$	*!*					*
d. me$^{\mu}$('hu$^{\mu}$hu$^{\mu}$)			*!			

What is crucial here is that this analysis predicts that vowel length must surface with the stressed syllable in the output only when vowel length is present in the input. More importantly, it does not encourage gratuitous creation of vowel length on every stressed syllable due to the general effect of DEP$_{IO}$-μ, which penalizes any insertion of a mora not already present in the input (see (84)b).

(84)

/gu$^{\mu}$ʔu$^{\mu}$, RED$^{\mu}$/	MAX$_{\mu}$	DEP$_{\mu}$	WSP	WBP	PARSE
☞ a. gu$^{\mu}$('ʔu$^{\mu}$ʔu$^{\mu}$)					*
b. gu$^{\mu}$('ʔu$^{\mu\mu}$ʔu$^{\mu}$)		*!			*

To summarize, in this section, the question of how vowel length interacts with reduplication in Washo is considered. By appealing to various OT constraints, the movability of vowel length is partly attributed to the conservation of the input and output mora count, and partly attributed to the fact that length is only licensed in the stressed syllable in Washo.

3.3.3.4 Vowel alternation in reduplication

There are several systematic idiosyncrasies about Washo internal reduplication that must be addressed in the final analysis. First and foremost is the fact that there are cases, such as those in (85), where the final vowel /u/ in the singular always surfaces as /o/ in the plural.

(85)				
	'tʼanu	tʼa'nono	'person'	(J64:341)
	'ʔa:tʼu	ʔa'tʼo:tʼo	'older brother'	(J64:341)
	'ma:gu	ma'go:go	'sister's child'	(J64:341)
	'alʔmul	'ʔmolʔmol	'big and round'	(J64:341)
	'ašuŋ	'šošoŋ	'red'	(J64:341)
	'amkʼum	'kʼomkʼom	'arched'	(J64:341)

Urbanczyk 1993 proposes that the underlying forms of the examples in (85) actually contain an underlying /o/ instead of /u/. Thus, '*tʼanu* 'person' is underlyingly /tʼano/. She observes that /o/ occurs only in a stressed syllable or in the vicinity of a stressed /o/.[21] There are no affixes in Washo that contain the vowel /o/ either.

(86)	Singular	UR	Gloss
	'tʼanu	/'tʼano/	'person'
	'ʔa:tʼu	/'ʔa:tʼo/	'older brother'

[21] The only exception appears to be *golsísiʔ* 'wild potato' (J64: 180). However, Jacobsen reports, on p. 471, that one of his informants produces *gusísi.*

ˈmaːgu	/ˈmaːgo/	‘sister’s child’
ˈalʔmul	/ˈalʔmol/	‘big and round’
ˈašuŋ	/ˈašoŋ/	‘red’
ˈamk’um	/ˈamk’om/	‘arched’

John Frampton (p.c) and Andrew Garrett (p.c.) independently bring to my attention that the initial syllable of the singular forms all begin with /a/, which appears to be significant. Consequently, while concurring with Urbanczyk’s interpretation that the stems in (85) contain underlying /o/ rather /u/, nonetheless, I contend that the raising of /u/ is conditioned by a preceding stressed /a/; that is, the mid back vowel *o* raises to high vowel *u* when preceded by a low stressed vowel *a*.

Regardless of which of these analyses is adopted, the implication of this reinterpretation is clear; the puzzle in (85) is no longer a mystery because the appearance of /o/ is actually present in the input; that is, ˈ*t’anono* ‘person’ derives straightforwardly from underlying /t’ano/.

Unfortunately, even with this main obstacle eliminated, there are still several remaining issues that demand explanation. One such issue is the treatment of the plural of the vowel-initial stems.

3.3.3.5 Vowel-initial stems

Vowel-initial stems (87) behave slightly differently from the consonant-initial ones. The initial onsetless vowel never surfaces in the plural.

(87)	ˈahad	ˈhahad	‘across’	(J64:327)
	ˈaŋkaš	ˈkaŋkaš	‘hollow’	(J64:330)
	ˈemc’i	ˈc’imc’i-yi	‘they wake up: -i=imperfect’	(J64:292)

For example, the reduplicated form of ˈ*ahad* ‘across’ should be **a-ʱha-had*. Following Winter 1970’s theory that initial onsetless unstressed vowels are deleted in the output, *a-*ˈ*ha-had* becomes ˈ*hahad*, which is the expected output. This ban on initial onsetless unstressed vowels is modeled by the following constraint.

(88) *#V ‘No initial onsetless unstressed vowel.’

The*#V constraint dominates MAX_{IO} since there are no surface counter-examples (89).

(89)	/aŋ.kaš, RED/	*#V	ALIGN-R	SCORRI_{L}	MAX_{BR}
a.	a-(ˈ*ka*-ŋkaš)	*!			š
☞ b.	(ˈ*ka*-ŋ.kaš)				ŋš

Consider now the examples in (90).

(90)	ˈayam	ˈyaːm	‘to hit with an instrument’	(J64:332)
	ˈayaw	ˈyaːw	‘black’	(J64:332)
	ˈayab	ˈyaːb	‘through a narrow opening’	(J64:332)

ˈiyeb	ˈye:b	‘to copulate’	(J64:332)
ˈayuk	ˈyo:k[22]	‘parent-in-law’	(J64:333)
ˈays[23]	ˈyo:s	‘to miss’	(J64:333)

Here, the singular form is disyllabic, while the pluralized form appears to be monosyllabic. The analysis in (89) predicts, for example, the plural of ˈ*ayaw* ‘black’ to be *ˈ*ya-yaw*, with the initial onsetless unstressed vowel dropped. However, the actual output is ˈ*ya:m*, which shows that an intervocalic glide is dropped between to identical vowels (91).

(91) *V_iyV_i ‘/y/ is banned between identical vowels’

This glide deletion analysis is supported by Jacobsen (1964)’s report that some dialects of Washo still preserve the intervocalic glide (e.g., ˈ*yo:k* is sometimes ˈ*yoyok*).

The effect of glide deletion cannot be across the board in the language, however, since intervocalic glides do appear in underived forms (e.g., ˈ*ayam* ‘to hit with an instrument’, ˈ*ayaw* ‘black’; see singular forms in (90)). Washo also has a independent *y*-epenthesis process, whereby the glide [y] is inserted between a vowel-final stem and a

[22] This and the form below are examples of the *o*-raising rule discussed in the preceding section. Underlyingly, ‘parent-in-law’ is /ayok/ and ‘to miss’ is /ayos/. Thus, when reduplicated, /ayok/ → /ayoyok/ while /ayos/ → /ayoyos/, yielding [yo:k] and [yo:s] respectively as the result of initial stressless vowel deletion and intervocalic glide deletion between identical vowels.

[23] This form should be *ayus*, given the fact that its plural is *yo:s*. Jacobsen (1964:333) gives the plural a morphological analysis that includes a raised *u* (i.e. *y*^{u}*á:s*). No known phonological rule in Washo deletes *u* between *y* and *s*.

vowel-initial suffix. This process never occurs between a vowel-final prefix and a vowel-initial stem. Crucially, glide epenthesis takes place even if the flanking vowels are identical (see the last form in (92)), thus suggesting that intervocalic glide deletion is a very restrictive process.

(92) ˈʔ-a:hu-y-i ‘they are standing’ (J64:262)
3rd-stand-IMPERF
ˈp’iʔli-y-i ‘fish with hook and line’(J64:262)
3rd-fish with hook and line-IMPERF
ˈl-emc’i-y-i ‘I’m awake’ (J64:262)
1st-awken-IMPERF

I propose that the glide is banned between identical vowels when the first vowel is stressed. This ban on intervocalic glide across identical vowel is an instance of Non-Derived Environment Blocking (NDEB; Kiparsky 1993), that is, glide deletion is applicable only in a derived environment.

(93) *ˈV_iyV_i ‘/y/ is banned between identical vowels when the first vowel is stressed’

Derived environment effects are quite common and can be handled in various ways (e.g., Kiparsky 1993, Inkelas 2000, Antilla 2000, Yu 2000, Lubowicz 2002, McCarthy 2003). Here, NDEB is assumed to be a co-phonological effect, as in Yu 2000 and Inkelas

2000.[24] By assuming that the *'V_iyV_i constraint is restricted to the co-phonology of derived environments, the fact that glides between identical vowels are possible in monomorphemic forms is no longer a problem since such forms would not be subjected to the derived environment co-phonology in the first place.

(94) /ay$_1$a$_2$w$_3$, RED/	*#V	*V_iyV_i	ALIGN-R	SCORRI$_L$	MAX$_{BR}$
a. a-('<u>ya</u>-y$_1$a$_2$w$_3$)	*!	*			aw
☞ b. ('<u>ya</u>-a$_2$w$_3$)					w
c. ('<u>ya</u>.y$_1$a$_2$w$_3$)		*!			w

3.3.3.6 Reduplication of monosyllabic stems

Thus far, the discussion has focused on polysyllabic roots; there are in fact roots in Washo that are monosyllabic that participate in reduplication also. Although vowel-initial monosyllabic stems are not plentiful in Washo, the few that exist need to be accounted for. This discussion begins with what I refer to as the *e-plurals*.

3.3.3.6.1 *E*-plurals

E-plurals are reduplicated forms that contain an /e/ that is not in the singular. (95) shows examples of reduplication of this type. The singular forms of these *e*-plurals are mainly vowel-initial.

[24] One way to implement this is, again, to assume the Sign-Based Morphology approach to morphology-phonology interface. For general discussion on the use of construction-specific co-phonological approaches to reduplication, see Inkelas & Zoll 2002.

(95)

	Singular	Plural	Gloss	
a.	'ips	'peps	'up from a surface'	(J64:331)
	'išm	'šešm	'to sing; song'	(J64:331)
	'išl	'šešl	'to give'	(J64:331)
	'ilm	'lelm	'under, underneath'	(J64:332)
	'sesm	se'sesm	'to vomit'	(J64:332)
b.	'iʔiš	'ʔeʔš	(empty stem)	(J64:340)
	'iʔib	'ʔeʔb	'cry, weep'	(J64:340)
	'iʔiw	'ʔweʔw	'to eat'	(J64:340)

At first glance, (95)a and (95)b do not appear to have much else in common, particularly given the fact that the singular forms of (95)a are cluster-final, while the ones in (95)b are not. Here, I propose that the forms in (95)b are actually underlyingly cluster-final, similar to those in (95)a. The stems in (95)b epenthesize an echo /i/ when appearing in final and preconsonantal position.

(96)

Singular		UR
'iʔiš	(empty stem)	/'iʔš/
'iʔib	'cry, weep'	/'iʔb/
'iʔiw	'to eat'	/'iʔw/

This echo vowel analysis of the post-glottal-stop vowel is supported by two observations. First, the vowels that flank the glottal stop are always identical to each other. In addition, the second vowel is absent when such stems are followed by a suffix beginning with a vowel (Jacobsen 1999:30).

(97)	ˈiʔiw	‘to eat (something)’	k-iʔw-i	‘he’s eating it’
	ˈaʔag	‘to carry on one’s back’	k’-aʔg-i	‘he’s packing it’
	ˈiʔib	‘to cry’	ˈʔ-iʔb-i	‘she’s crying’
	ˈdaʔaw	‘lake’	ˈdaʔw-a	‘in the lake’
	daˈlaʔag	‘mountain’	daˈlaʔg-a	‘on the mountain’
	ˈdeʔeg	‘rock’	ˈdeʔg-a	‘on the rock’
	ˈmaʔag	‘wood, stick’	ˈmaʔg-a	‘on the wood’
	ˈiʔib	‘navel’	ˈt’-iʔb-a	‘at his navel’

To summarize, I argue that the stems in (95)a and (95)b are underlyingly CC-final. However, for stems that end in a *-ʔC* cluster, the cluster is broken up by an echo vowel when the stem is word-final or before a consonant-initial suffix. The new interpretation of the data in (95) is given in (98).

(98) Interim UR of e-plural roots

	UR	Plural	Gloss	
a.	/ips/	ˈpeps	‘up from a surface’	(J64:331)
	/išm/	ˈšešm	‘to sing; song’	(J64:331)
	/išl/	ˈšešl	‘to give’	(J64:331)
	/ilm/	ˈlelm	‘under, underneath’	(J64:332)
	/sesm/	seˈsesm	‘to vomit’	(J64:332)
b.	/ˈiʔš/	ˈʔeʔš	(empty stem)	(J64:340)
	/ˈiʔb/	ˈʔeʔb	‘cry, weep’	(J64:340)
	/ˈiʔw/	ˈʔweʔw	‘to eat’	(J64:340)

One ubiquitous aspect of these forms is that they are almost all *i*-initial, with the exception of *sesm* ‘to vomit’. Urbanczyk (1993) argues that Washo avoids *e* in onsetless open syllable by raising it to *i*. For example, ˈ*itiʔ* ‘down, downward’ (J64:340) is underlyingly /etiʔ/ under her analysis. However, as seen in (98), these singular roots that form *e*-plurals are all monosyllabic and closed. An alternative is available, however. While I agree with the analysis that the forms in (98) are *e*-initial underlyingly, contrary to Urbancyzk’s proposal, I argue that Washo raises onsetless *e* to *i* in monosyllabic roots only, which explains why e-initial stems are possible when the stem is disyllabic (e.g., ˈ*emlu* ‘to eat; food’(J64:328)).[25] The final reinterpretation of the forms in (95) is given in (99).

[25] The only exception to this generalization is the word *ˈetg* ‘seed’ (J99: 27).

(99) Final version of the UR of e-plural roots

	UR	Plural	Gloss	
a.	/eps/	ˈpeps	‘up from a surface’	(J64:331)
	/ešm/	ˈšešm	‘to sing; song’	(J64:331)
	/ešl/	ˈšešl	‘to give’	(J64:331)
	/elm/	ˈlelm	‘under, underneath’	(J64:332)
	/sesm/	seˈsesm	‘to vomit’	(J64:332)
b.	/ˈeʔš/	ˈʔeʔš	(empty stem)	(J64:340)
	/ˈeʔb/	ˈʔeʔb	‘cry, weep’	(J64:340)
	/ˈeʔw/	ˈʔweʔw	‘to eat’	(J64:340)

This interpretation provides an answer to the question of why the plural of the forms in (99) contains a mid vowel [e]; this vowel is underlying, which did not raise to [i] because the plural is not onsetless.

(100) /$e_1p_2s_3$, RED/	*#V	RED=σ_μ	ALIGN-R	SCORRI$_L$	MAX$_{IO}$	MAX$_{BR}$
☞ a. ˈ(*pe*-p_2s_3)					*!	s
💣 b. (ˈe_1p_2- $e_1p_2s_3$)						s
c. (*p*-$e_1p_2s_3$)		*!				es
d. *s*-($e_1p_2s_3$)		*!				ep
e. (ˈ$e_1p_2s_3$- $e_1p_2s_3$)		*!				
f. (e_1p_2- ˈ$e_1p_2s_3$)	*!					

The analysis correctly rules out the full copy candidate, (100)e, by virtue of its overcopying; a coda consonant is weight-bearing in the stressed syllable. Candidates (100)c & d fatally violate RED=σ_μ since the reduplicant is merely an onset consonant. Candidate (100)f is ruled out also since it contains an initial stressless vowel. Unfortunately, this analysis would seem to predict (100)b to be the winner, rather than (100)a, because (100)b is more faithful to the input (100)a. What could have tipped the balance toward (100)a?

The smoking gun is one word in (95). While most of the words are monosyllabic, whether in the singular or in the plural, there is one word that stands out, namely, ˈ*sesm* ‘to vomit’. Its plural form is disyllabic, i.e. *seˈsesm*. What is peculiar about the plural form of this word is that it has final, rather than penultimate stress. Why should this be? The answer lies, again, in the stress assignment. Consider the tableau in (101).

(101) /se$^{\mu}$sm, RED$^{\mu}$/	ALIGN$_{FT}$	FTBIN	FTFM	WSP	WBP	PARSE
☞ a. se.(ˈ*se*$^{\mu}$s$^{\mu}$m)					*	*
b. (ˈse$^{\mu}$.*se*$^{\mu}$s$^{\mu}$m)				*!	*	
c. (ˈse$^{\mu}$.*se*$^{\mu}$sm)					*!*	

A priori, stress should be on the penult in a disyllabic form. However, as illustrated by candidates (101)b & c, assigning stress on the penult would fatally violate either WSP, if the final syllable were heavy (101)b, or WBP, if the final syllable were light (101)c. This outcome is due to the fact that the final syllable ends in a consonant cluster. Normally, the coda of the final syllable is 'extrametrical' due to WSP (e.g., *ʔeˈlelel* 'mother's father' is parsed as *ʔe(ˈle$^{\mu}$le$^{\mu}$l)*; also see discussion regarding tableau (75)). However, when an output ends in a cluster, the penultimate consonant must be treated as moraic due to WBP. Therefore, the final syllable must be stressed since it not only satisfies WBP, but also WSP (see (101)a).

(102) /e$_1$p$_2$s$_3$, RED/	ALIGN$_{FT}$	FTBIN	FTFM	WSP	WBP	PARSE
☞ a. ˈ(*p*e$^{\mu}$-p$^{\mu}$s)					*	
b. (ˈe$^{\mu}$*p*-e$^{\mu}$ps)				*!	*	

Given this understanding of the stress property of these CC-final words, an answer to the earlier puzzle is now available: (102)b loses to (102)a because (102)b is metrically

ill-formed in Washo. This analysis also provides a natural account for a set of stems that is problematic in all previous analyses.

(103)	ˈakd	ˈkakd	'slowly'	(J64:331)
	ˈawd	ˈwawd	'over the summit'	(J64:331)
	ˈaʔm	ˈʔaʔm	'to the west, from the east'	(J64:332)
	ˈa꞉m	ˈma꞉m	'to hit with body part'	(J64:332)

The behavior of these stems parallels that of the *eCC*-stems. No special treatment is needed here.

3.3.3.6.2 VC stems

Before concluding this section on monosyllabic stems, it should be mentioned that there are also VC stems in Washo that participate in reduplication (104).

(104)	ˈim	'out from'	ˈmem	(J64:339)
	ˈiw	'in a certain direction'	ˈwew	(J64:339)

Like the CC-final stems, these reduplicants also contain the vowel /e/. According to the analysis proposed above, these singular forms must also be underlyingly *e*-initial.

(105) UR Singular Plural Gloss

/em/ ˈim ˈmem 'out from' (J64:339)

/ew/ ˈiw ˈwew 'in a certain direction' (J64:339)

The constraint ranking proposed above handles the data in (104) naturally. Penultimate stress (106)c in the plural is ruled out due to the weightlessness of the final consonant. If the final consonant were moraic, WSP would have been fatally violated (106)d. Consider now the candidates that are monosyllabic: the final consonant must be moraic (106)a. As illustrated by (106)b, if the final consonant were weightless, the stressed foot would not be binary, thus fatally violating the undominated FTBIN requirement.

(106) /e$^{\mu}$m, RED$^{\mu}$/	ALIGN$_{FT}$	FTBIN	FTFM	WSP	WBP	PARSE
☞ a. ˈ(*me*$^{\mu}$-m$^{\mu}$)						
b. ˈ(*me*$^{\mu}$-m)	*	*!				
c. (ˈ*e*$^{\mu}$.*m*-e$^{\mu}$m)	*				*!	
d. (ˈ*e*$^{\mu}$.*m*-e$^{\mu}$m$^{\mu}$)				*!		

To summarize, in this section, I have considered the behavior of the monosyllabic stems when they are pluralized. The reduplicant always contains the vowel /e/ rather than /i/ found in the singular due to the fact that /e/ is actually underlying; initial onsetless /e/ is raised to /i/ in monosyllabic stems. In the next section, I examine how previous analyses

of Washo plural reduplication differ from this analysis and why the stress-philic reduplicant placement analysis should be preferred.

3.3.4 Previous analyses

In this section, I review previous analyses of Washo plural formation, demonstrating that the analysis proposed above is superior in both theoretical and empirical terms.

3.3.4.1 VCV-reduplication

Broselow and McCarthy 1983 (B&M) adopt Winter's (1970) morphological analysis of Washo plural reduplication (107).[26]

(107) $C_1V_1C_2V_2C_3$ → C_1-$V_1C_2V_2$-$V_1C_2V_2C_3$

e.g., mokgo 'shoe' → m-[oko]$_{RED}$-okgo 'shoes'

Unlike Winter, however, B & M claim that the VCV reduplicant is lodged after the first consonant (108), instead of before the stressed vowel.[27]

(108) a. +VCV+

b. $_{Root}$[(C)_ _ _ X] (Taken from B&M 1983: 50)

[26] Winter's (1970) analysis is a generalized version of Jacobsen's (1964) analysis. Jacobsen proposes that the morphological analysis, for example, of *t'anono* 'persons' should be *t'-an^{u}-anu*. The raised *u* is not quite a full vowel. Rather, it is present to allow for what Jacobsen referred to as vowel-coloring. The detail of this vowel-coloring is not crucial. It is sufficient to know that, in Jacobsen's conception, when the sequence /^{u}a/ arises, for example, it becomes /o/.

[27] For all intents and purposes, B&M and Winter/Jacobsen's analyses can be treated uniformly. However, it needs to be pointed out that Winter/Jacobsen's analysis does not run into the same problem in terms of polysyllabic stems as B&M's analysis would (see below), since the base of reduplication is defined as the stressed vowel in Jacobsen's and Winter's analyses instead of the initial consonants assumed in Broselow and McCarthy 1983.

Winter's analysis includes a set of the coalescence rules between the final vowel of the reduplicant and the stressed vowel of the root, which B&M summarize as follows:

(109) Washo Coalescence (reproduced from B&M 1983: 48)

a. $\begin{bmatrix} V \\ <+\text{round}> \\ 1 \end{bmatrix}\begin{bmatrix} V \\ +\text{low} \\ 2 \end{bmatrix} \Rightarrow \varnothing \begin{bmatrix} 2 \\ <+\text{round}> \\ <+\text{back}> \end{bmatrix}$

b. V → ∅ / V _____

In addition, a deletion rule is required to account for the absence of the otherwise expected onsetless initial vowels in the reduplicant (see section 3.3.3.5).

(110) V → ∅ / # $\begin{bmatrix} \_\_\_\_\_ \\ -\text{stress} \end{bmatrix}$

Finally, an /o/-specific vowel harmony rule (Jacobsen 1964; Winter 1970), was invoked to account for why the final vowel of the reduplicant is always /o/ (e.g., *ˈt'ano* 'person', according to Winter, ought to be **t'aˈhonu*). To summarize, the derivations using B&M's analysis of the reduplicated forms of *ˈahad* 'across' and *t'anu* 'person' are given in (111).

(111)

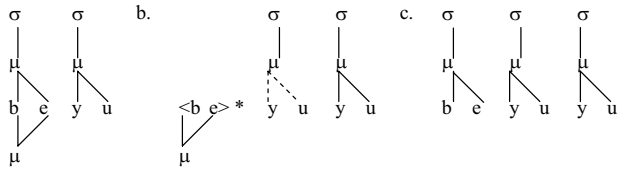
Underlying form		*ˈahad* 'across'	*t'anu* 'person'
Reduplication:	(C)+VCV+X	aha+ˈahad	t'+anu+ˈanu
V-coalescence I:	$V_{1[+\text{round}]}\ V_{2[+\text{low}]} \Rightarrow \varnothing\ 2_{[+\text{round, +back}]}$	aha'ahad	t'a'nonu
V-coalescence II:	V → ∅ / V _____	a'hahad	ta'nonu
Initial unstressed vowel deletion		'hahad	t'a'nonu
o-Vowel Harmony		'hahad	t'a'nono
Output		*ʰahad*	*t'aˈhono*

B&M's approach erroneously predicts that the VCV reduplicant should appear after the first consonant of polysyllabic words. For example, the word, *memˈdeːwi* 'deer' appears as *memdeˈwiːwi* 'deer' (J64: 292), instead of the expected **medemdeːwi*. The stress-based CV reduplication analysis should also be preferred since no vowel coalescence or vowel deletion rules are needed.

3.3.4.2 Urbanczyk 1993: Moraic circumscription

Urbaniczyk (1993) rejects the earlier VCV analysis and proposes that the reduplicant is CV (or monomoraic), and in this respect is similar to the GPS analysis. Using the theory of Prosodic Circumscription, she proposes that the initial CV sequence of the root is the kernel, thus circumscribed off temporarily. The reduplicant is prefixed to the residue. Association to the template is from left to right. A derivation under this approach is given in (112).

(112) a. b. c.



As shown in (112)a, the circumscription of a mora targets the initial CV segments. The result of this parsing function can be seen in (112)b. (112)b also shows the operation of prefixing the reduplicant to the residue with subsequent association to the template, as indicated by the dashed association lines. The reconcatenation appears in (112)c.

Two problems confront this analysis. To begin with, while Urbanczyk assumes that the coda is weight-bearing, no argument for this assumption is presented. Given that there is no evidence for quantity sensitivity in Washo stress assignment, the GPS analysis, which does not require codas to be weight-bearing underlyingly, should be preferred. Moraic circumscription also fails to account for two sets of data in Washo: the polysyllabic and VCC stems. Polysyllabic forms present a problem to moraic circumscription, which erroneously predicts second-syllable reduplication. For example, the plural of *memˈdeːwi* 'deer' is predicted to be ***me<u>de</u>mˈdeːwi**, which is false. Moraic circumscription cannot account for the plural of the VCC stems either. As admitted in Urbanczyk 1993, '[i]f the first mora is circumscribed the residue will consist solely of consonants. There will be no vowel in the residue to associate to the template' (p.352). Consequently, she has to stipulate that moraic circumscription is not applicable to these VCC forms; the reduplicant is straightforwardly prefixing.

3.3.5 Residue problems: the recalcitrant cases

In the previous sections, I argued for a novel approach to Washo plural reduplication. It is shown that the reduplicant copies the final syllable of the input and lodges itself in the stressed position. However, there appears to be some cases in Washo that defy all logical explanations.

(113)	a.	ˈemlu	ˈmumlu	'to eat; food'	(J64:328)
		ˈšawlam	šaˈwawlam	'to be a girl'[28]	(J64:328)
		ˈhelme	heˈlelme	'three'	(J64:328)
		ˈhesge	heˈsesge	'two'	(J64:328)
		ˈašdim	ˈšašdim	'to hide'	(J64:328)
	b.	ˈmayŋa	maˈyayŋa	'fawn'	(J64:328)
	c.	ˈaʔšam	ˈʔaʔšam	'to lie'	(J64:328)
		ˈmaʔšaʔ	maʔaʔšaʔ	'brother's child (of a man)'	(J64:328)

What is peculiar about these examples is the fact that the initial consonant of the reduplicant is not what is expected otherwise. Thus, for example, the reduplicated form of ˈ*emlu* 'to eat' is expected to be *ˈ*lumlu*, rather than ˈ*mumlu*. According to Jacobsen 1964, the forms in (113) exhaust the list of forms in Washo that display this type of irregularity. The pattern found in forms such as those in (114) is clearly more regular and prevalent.

[28] There is a phonetic variety of this stem ˈ*šowlam* 'to be a girl' (J64:328) which reduplicates as *šo ˈwowlam*.

Interestingly, (114)b provides near minimal pairs for the form in (113)b. (114)c provides another set of near minimal pairs for (113)c.

(114)	a.	ˈʔewšiʔ	di-ʔeˈšiwšiʔ	‘father’s brothers’	(J64:292)
		ˈnent’uš	net’unt’uš-u	‘old women: -u=nominalizing’	(J64:289)
		ˈsaksag	saˈsaksag	‘father’s father’s bother’	(J64:330)
		ˈmokgo	moˈgokgo	‘shoe’	(J64336)
	b.	ˈaynay	ˈnaynay	‘muddy, gooey’	(J64:329)
		ŋawŋaŋ	ŋaŋawŋaŋ	‘to be a child: children’	(J64:329)
	c.	ˈiʔdeb	ˈdeʔdeb	‘wrinkled’	(J64:328)
		ˈiʔsiʔ	ˈsiʔsiʔ	‘fast’	(J64:328)

Urbanczyk 1993 argues the least sonorous consonant of a cluster is picked out for reduplicative association. Thus, when C_1 is copied, the first consonant is less sonorous or equal in sonority to the second consonant; C_2 is copied when the first consonant is more sonorous than the second consonant. While this generalization is an interesting one, the evidence is not at all clear-cut. As shown in the summary of heterosyllabic consonant clusters, there are many apparent counterexamples to the sonority generalization. For example, C_2 is copied in clusters such case /ʔs, ʔd/ even though the sonority generalization predicts the copying of C_1; on the other hand, C_1 is copied in a cluster like /yŋ/ even though the sonority generalization predicts the copying of C_2. The fact that C_1

is copied in both /ml, lm/ clusters also demonstrates the problem with appealing to the sonority generalization.

(115) Heterosyllabic consonant clusters (reproduced from Urbanczyk 1993:345)

	C_2 copied	C_1 copied
obstruent	bc’	
	gs gg	
	ʔs ʔd	ʔš
	sk sp’	sd sg sm
sonorant	mh mk’ mc’	ml
	nk ny’ nt’	
	ŋk	
	lp’ lb lm’ lš	lm
	yn yp yc’	yŋ
	wk wš	wl

Thus, in sum, I propose that these irregular reduplicated forms are best treated as lexical exceptions. Their explanations could presumably be found in the history of the language.[29]

3.3.6 Conclusion

Going back to the original sources provides evidence that reduplication in Washo does not operate in the fashion proposed by previous authors. While plural formation remains a case of infixing reduplication, the reduplicant is CV, rather than VCV, and it appears only in the stressed position, instead of after the initial consonant (B&M) or preceding the stressed vowel (Jacobsen 1964, Winter 1970). This new interpretation is handily captured using the GPS formalism. In the course of the discussion, peculiar interactions

[29] Another form that is unaccounted for is the plural of *baliʔ* ‘to shoot’, which should be reduplicated as **baˈliliʔ*, the attested form is *baˈaliʔ*, however. This form escapes any logical explanation, at least in synchronic terms.

between reduplication, stress assignment and syllable weight are also discovered. The interaction between constraints on weight and foot formation provides a natural way to capture the fact that coda consonants in Washo are moraic only in stressed position but not elsewhere. Finally, the proposed GPS analysis follows the M_{ALIGN} >> P schema while still accounting for the different aspects of morpho-phonological interaction in an insight manner.

In this chapter, I advance the Subcategorization Non-violability Hypothesis which disallows morpheme movement coerced by phonological or morphological considerations. Languages differ in terms of how language-specific phonological constraints and SNH can be satisfied simultaneously. For example, Atayal reconciles an idiosyncratic sequential restriction with SNH by way of morpheme fusion; English makes use of phonological reduplication (i.e. morpheme fission) to create suitable stems in order to satisfy the infix' dual-pivot subcategorization. The final case study addresses a recalcitrant case of internal reduplication found in Washo, arguing that the placement and realization of the reduplicant depends crucially on the stress properties of this language. In the next chapter, I focus on explaining the typological placement properties of infixes, arguing that the answer lies in the diachronic developments of infixation.

Chapter 4: Explaining the typology

Chapter 1 illustrates that infixes occur in two general contexts (1)—the edges of a root/stem or around some prosodically prominent unit, such as the stressed syllable. The set of possible pivots is reproduced below:

(1) Potential pivots of infixation

Edge pivots

First consonant/onset

First vowel/nucleus

First syllable

Final syllable

Final vowel/nucleus

Prominence pivots

Stressed foot

Stressed syllable

Stressed vowel/nucleus

As foreshadowed in Chapter 2, this chapter confronts the edge-bias puzzle, arguing that the above synchronic typology is to be expected given the restricted set of possible pathways that leads to the development of an infix. This chapter begins in §4.1 by discussing possible psycholinguistic factors that favor this pivot typology. While the set of infixal pivots coincides with positions that are psycholinguistically salient, such a factor is not sufficient in explaining the typology. To this end, a theory, called the ***Exogenesis Theory of Infixation*** **(EXOTI),** is advanced in §4.2, arguing that edge-oriented infixes ultimately originate from peripheral adfixes (i.e. prefixes or suffixes). This peripheral origin gives rise to its synchronic edge-oriented profile. A diachronic typology is provided to support this theory by tracing the origins of a sample of infixes.

4.1 The role of acquisition in morphological change

The fact that the stressed syllable is psycholinguistically salient is commonly assumed. Past research has also shown that the edges of words are psycholinguistically prominent. For example, Shattuck-Hufnagel 1992 argues that the first consonant of a word based on lexical retrieval evidence. Beckman 1999 argues that initial and stressed syllables are more prominent based on the fact that they generally license a greater array of phonological contrasts than syllables in other positions. Barnes 2002 includes the final syllable among the set of positions of prominence. As the chart in (2) summarizes, the set of infixal pivots is within the set of psycholinguistically prominent positions.

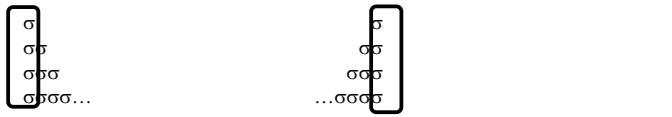
(2)

Psycholinguistic prominent positions	Infixal pivots
Initial syllable	First consonant First vowel First syllable
Final syllable	Final vowel Final syllable
Stressed syllable	Stressed vowel Stressed syllable Stressed foot

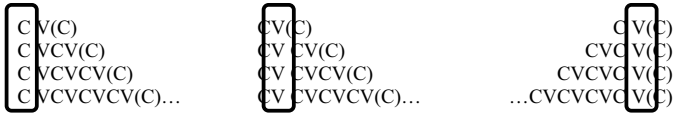
This correlation is significant. If a learner were to rely on something for infix attachment, one would expect such an entity to be prominent (i.e. easily identifiable object) somehow. The representation of morphological processes, which can be characterized as generalizations over the distinction between stems and affixes, emerges as the result of appropriate associations between formatives (e.g., Bybee 1995, 2001; see also Albright 2002). As argued in Albright 2002, the reliability of a 'rule' or, morphological generalization posited by the learner, is depended on how well the rule accounts for the data and how widely a pattern is attested. Thus, for a subcategorization frame to be considered reliable, it ought to refer to units that are widely attested as well. In this respect, the set of infixal pivots can be said to be most reliable; the set of infixal pivots attested coincides with the set of units that are likely to be established across stems. Given the fact that the chances of a root to be a syllable long is rather good in most languages, if a language were to have an infix that attaches to some syllable, or some unit

within it they should refer to either the first or the last syllable, since these pivots constitute essentially the maximal size of material that holds across most roots/stems. Prominence (e.g., stress) is predicted to be a legitimate pivot as well, since it is a feature of all content words in the language.

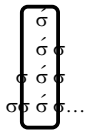
(3) a. First and last syllable pivots



b. First consonant, first vowel, and last vowel pivots



c. Prominence pivot



Similar rationale has been invoked to account for the property of demarcative stress. Hyman 1977, in his treatment of the typology of primary stress location, observed that demarcative primary stress is most often assigned to the first or the last syllable. In his

survey of 444 languages, he found 114 languages with initial stress and ninety-seven with final stress. The reason he posited for the tendency for demarcative stress to be at the word boundary is as follows:

> "One problem with assigning stress too far from a boundary is that short words may require a separate treatment. In a language with third syllable stress, a bisyllabic word should presumably get initial stress, while a monosyllabic word would receive stress on its only syllable. It is only initial and final stress which allow a general statement without complication." (Hyman 1977: fn. 16)

He also cited Kurylowicz (1958:375n) for making a similar point. The basic tenor behind Hyman's observation is clear. All else being equal, one would expect the site of linguistic operations, be it a matter of stress assignment or infixation, to be easily identifiable regardless of the shape of the word. The edges and the stressed domain of a stem are such locations. The difference between stress and infix placement is that infixes invariable shows up at those locations, while the proper placement of stress hinges on many other factors (e.g., syllable weight, foot form/structure etc.).

While the correlation between the set of infixal pivots and the set of psycholinguistically salient positions is unmistakeable, the question remains unanswered is whether this correlation is the soource of the synchronic typology or whether it is derivative of some other forces. That is, *are infixes attracted to those pivots due to their saliency or is it the fact that only infixes that cling on to those positions persisted because those positions are perceptually salient?* In what follows, I argue that the latter

interpretation of the correct one. The relation between cause and effect should not be confused. The correlation seen here is the effect of some other causes. As foreshadowed above, the shaping factor behind the synchronic typology is historical convergence; that is, infixes are predominately edge-oriented because they are historically peripheral adfixes.

4.2 Exogenesis Theory of Infixation: Toward a diachronic typology

In this section, I present a diachronic typology of infixation in support of the Exogenesis Theory of Infixation. This theory is stated in (4).

(4) **Exogenesis Theory of Infixation (EXOTI)**

Edge-oriented infixes originate from historical prefixes or suffixes

The presentation begins with an overview of past efforts in understanding the origins of infixation in §4.2.1, followed by a survey of four sources of infixes. The survey is roughly divided into two sub-sections; it begins with the origins of edge-based infixes, illustrating that there are three common ways such infixes develop: morphological entrapment in §4.2.2, phonetic metathesis in §4.2.3, and reduplication mutation in §4.2.4. The second section of this chapter, which appears in §4.2.5, demonstrates that infixes that target the prominence pivots came about mainly as the results of the prosodic stem association. Each of these sub-sections contains a general discussion on the mechanism of the change and at least one example to illustrate more precisely the mechanism in question.

4.2.1 Past efforts in understanding the origins of infixation

The study of morphological change in languages begins in earnest with the Neogrammarians, who contributed major advances in the understanding of the role analogy plays in morphological change. Particularly, much effort was focused on matters of allomorphy reduction and paradigm uniformity as a response to sound change(s). However, little attention was paid to the origins of infixation. There are notable exceptions, however. For example, Schmidt (1906) discussed the possible origin of Mon-Khmer infixes as the result of entrapment; Ferdinand de Saussure (Ultan 1967) intimated an explanation of the origin of the nasal infix in Indo-European, also in terms of entrapment (see the next section for discussion of this mechanism). Sporadic mentions of the possible origins of infixes also appear in grammatical descriptions of field languages. For example, Boas and Deloria (1941) suggested that the inflectional infixes in Dakota resulted from the fusion of the locative prefixes with the root. However, the lack of attention to the origins of infixation remains severe, partly due to the development of the field of linguistics in recent years. As Joseph and Janda (1985) observed, morphology and historical linguistics were in complementary distribution during the Generative era, for example; Morphology was in vogue while Generative historical linguistics has just gone out of fashion. However, there are signs that researchers are beginning to recognize the importance of understanding the origins of infixes; several reports on the origins of infixes in various languages have appeared in recent years (e.g., Haiman 1977, G. Anderson 1998, Garrett 2001 Harris 2002, Nichols 2003). However, the first major study of the typology of infixation, including its origins, goes back to **Ultan 1967**.

Ultan, in his pioneering work on the typology and origin of infixation, discussed two main processes that gave rise to infixes: phonological/morphological metathesis and entrapment. Both of these processes will be discussed in detail later in the chapter. But briefly, he cited the Hebrew reflexive *-t-*, Common Indonesian active and passive *-um-* and *-in-*, and Delaware third person *-wə-*, as instances of metathesis. Entrapment refers to the fusion of an outer affix with the stem, causing the intervening affix to become an infix. He gave Dakota pronominals, Northwest Caucasian pronominals, Indo-European *-n-*, Trukese *-Vkk-* durative, Miskito construct state formation, and Austro-Asiatic infixations as instances of entrapment. While I generally agree with Ultan that metathesis and entrapment are two major causes of infixation, the precise nature of these mechanisms remain largely unexplored, which is partly due to the limited data available to him when these conclusions were drawn. Much more is known now about some of the languages and language families he referred to.

Such is the current state of affair in terms of the diachronic typology of infix origins. This chapter builds on the insight this work to expand and, along the way, revise the understanding of the diachronic landscape of the creation of infixes. While this chapter provides an update and a state-of-the-art overview of the current understanding of the development of infixation, however, as in any study on diachronic typology, one is invariably restricted by the amount of studies available in the literature. Despite the recent surge of reports, the literature on the diachronic change of infixation remains far from ideal. Thus, in what follows, some of the case studies are the results of original historical investigations. I hope that this study provides the impetus needed to spark the interests of other linguists.

4.2.2 Entrapment

Entrapment refers to the scenario where a morpheme is stranded within a fossilized composite of an outer morpheme and the root. That is, in a composite *zyX* where *z* & *y* were historical adpositional affix (i.e. prefixes and suffixes), *z* merges with the root *X* forming a new root *zX*, where the relative independent existence of z or *X* is no longer recoverable synchronically. The morpheme *y* is said to be ***entrapped*** in a form like *x**y**Z*, between the historical adfix *z* and the historical root *X*. Entrapment is the most often invoked mechanism of infixation. As noted earlier, Schmidt, Saussure, Boas & Delaria all discussed possible instances of infixation developed as the result of entrapment, although the precise mechanism of this process was not explored in detail. Many other cases of entrapment have now been argued in the literature, notably the pronominal infixes in the Lezgic languages (Harris 2002; Nichols 2003). Below is an illustration of entrapment-induced infixation found in the languages of the Muskogean family.

4.2.2.1 Case study: Muskogean infixation

The functions of infixation in the Muskogean languages, spoken in the south eastern part of the United States, range from agreement marking to punctual reduplication. However, the locations of these infixes are remarkably consistent. In this section, I illustrate how the similarity between the placements of the disparate array of morphological entities can be explained as the result of the merger of a verb plus auxiliary verb complex in the history of the languages. Historical prefixes on the auxiliary verb are, therefore, 'trapped' between the main verb and the historically separate auxiliary. The account presented

below was first laid out in Haas 1977. Since then, many have reexamined and corroborated her analysis (Martin 1996, Martin & Munro 1993). In what follows, this discussion first focuses on the development of the agreement infixes.

4.2.2.1.1 Subject pronominal morphology in Muskogean languages

Haas (1946), in her pioneering work on the reconstruction of Proto-Muskogean (PM), summarizes the PM subject pronominal paradigms as follows:

(1)

	Class I	Class II	Class III
S1	*-li	*-li	*-kɑli
2	*iš-	*-ši(-)	*-iškɑ
P1	*il-/V	*hili(-)	*-(h)il(i)kɑ
	*ili-/C		
2	*hɑš-	*-hɑši(-)	*-(h)ɑš(i)kɑ

While the specific segmental composition of these morphemes is still a matter of debate (see, for example, Munro 1993), the general morphological reconstruction is widely accepted by Muskogean specialists.

Of the surviving Muskogean languages, only Koasati and Alabama retain traces of all three systems of PM subject markers. Other languages retain only one paradigm. For example, Choctaw retains the Class I paradigm, Creek retains Class II, while Hitchiti retains Class III.

(2)

	Choctaw	Koasati				Hitchiti	Creek
		I	IIA, B	IIC	IIIA, B		
S1	-li	-li	-li	-li	-li	-li	-ɑy-
2	iš-	is-	-ci(-)	-ci-	-(h)iskɑ	-ickɑ	-ick
P1	il-/V	il-	-hili(-)	-li-	-(h)ilkɑ	-i:kɑ	-iy-/V
	i:-/C						-i:-/C
2	hɑš-	hɑs-	-hɑci(-)	-hɑci-	-(h) ɑskɑ	-ɑ:ckɑ	-ɑ:ck-

Infixing subject pronominal markers all derived from the Class II paradigm. All the examples here are from Koasati. As the table in (2) illustrates, there are three reflexes of the historical Class II paradigm. Let us begin by considering some examples from Class IIA. The forms here are given in the aorist tense.

(3)

	CVCV stem	*-li* suffix stem	geminate *Ci* final Stem	Subject affix
	'to weave'	'to scratch'	'to split'	
S1	tałɑ**lí**	kɑlasli**lí**	pałł**ilí**	-li
2	tał**cí**	kɑlas**cí**	pał**cí**	-ci
3	tałá	kɑlaslí	pałłí	zero
P1	tał**hilí**	kɑlas**hilí**	pał**hilí**	-hili
2	tał**hací**	kɑlas**hací**	pał**hací**	-hɑci
3	hutałá	hukɑlaslí	hupałłí	zero (+distr.)

Most of the Koasati verbs that conjugate in Class IIA are those ending in the classifying suffix *-li* (a transitive suffix). This suffix, however, is generally dropped before the subject pronominal affixes except for the first person singular. The stems that end in a geminate followed by *i* historically ended in *-li* also. The geminate was the result of assimilation (e.g., *paɬɬi* 'to split' < *pɑɬ-li), *lakawwí* 'to lift' < *lakaw-li, *łummí* 'to whip' < *łum-li). Most CVCV stems actually conjugate in the Class I paradigm. Few conjugate in Class IIA. Thus far, no firm evidence for infixation with Class II affixes has been presented yet. One finds that in the behavior of stems that conjugate in Class IIB and Class IIC (4).

(4)		Stem with suffix *-li* + *-ci*	Subject affixes	CVCCV stem	Subject affixes
		'to thresh (e.g., rice)'	Class IIB	'to dig'	Class IIC
	S1	buklici**lí**	-li	huhca**lí**	**-**li-
	2	buk**ci**cí	-ci-	hu**ci**hcá	-ci-
	3	buklicí	zero	huhcá	zero
	P1	buk**hili**cí	-hili-	hu**li**hcá	-li-
	2	buk**hɑci**cí	-hɑci-	hu**haci**hcá	-hɑci-
	3	hubuklicí	zero (+distr.)	huhuhcá	zero (+distr.)

Class IIB and IIC are similar in that all except S1 are infixed. They differ in the form of the P1 affix (i.e. *-hili-* in Class IIB but *-li-* in Class IIC). The stems that conjugate in

Class IIB are stems that end in the classifying suffix *-li* plus the causative suffix *-ci*. Like Class IIA, the classifying suffix *-li* is dropped upon subject pronominal affixation except for S1. The causative suffix, however, always remains. While it might be argued that the pronominal affixes are not actually infixed in stems with suffixes *-li* plus *-ci*, the infixing nature of the IIC paradigm is undeniable. The stems that take the IIC paradigm are monomorphemic.

4.2.2.1.2 Entrapment in Proto-Muskogean

Armed with this reconstruction of the Proto-Muskogean paradigm, Haas (1977) argues convincingly that there were three conjugation patterns in pre-Proto Muskogean. Verb stems can be conjugated directly, where the pronominal subjects are prefixed on to the verb stems, schematically presented in (5). This pattern gives rise to the Class I paradigm.

(5)	1s.g.		VERB STEM	-li
	2. s.g	ši-	VERB STEM	
	3s.g.		VERB STEM	
	1 pl.	ili-	VERB STEM	
	2 pl.	haš-	VERB STEM	

Besides direct verb stem conjugation, there are two additional conjugation patterns that apply only to auxiliary verb constructions. Two types of auxiliary verbs are found: transitive and intransitive. The respective conjugation patterns are given in (6)a and (6)b.

The first person singular marker is always suffixed to the auxiliary verb while the other personal markers are prefixed.

(6) a. Transitive auxiliary verb conjugation

	VERB STEM		AUX	
1s.g.	VERB STEM		li	-li
2. s.g	VERB STEM	ši-	li	
3s.g.	VERB STEM		li	
1 pl.	VERB STEM	(hi)li-	li	
2 pl.	VERB STEM	haši-	li	

b. Intransitive auxiliary verb conjugation

	VERB STEM		AUX	
1s.g.	VERB STEM		ka	-li
2. s.g	VERB STEM	(h)iš-	ka	
3s.g.	VERB STEM		ka	
1 pl.	VERB STEM	(h)ili-	ka	
2 pl.	VERB STEM	(h)aši-	ka	

The auxiliary verbs grammaticalized into suffixes. Combined with various phonological changes, the results are three distinct classes of verbal inflection. According to Haas, Choctaw uses the direct conjugation model, while Hitchiti-Mikasuki and Creek used the

intransitive periphrastic model. Koasati and Alabama are most conservative, as they use all three models, including two infixing paradigms (IIB, IIC) resulting from entrapment.

The Proto-Muskogean plural *oho- affix developed into a pre-final syllable infix, *-ho-*, in Creek-Seminole and Hitchiti-Mikasuki through essentially the same mechanism (Martin 1994). As illustrated by the following pairs of singular and plural verbs, the plural *-ho-* appears before the final syllable. Crucially, the singular stem is monomorphemic.

(5)	Mikasuki	hi.ca ‘see’	ci-hi:**ho:**ca-la:ka	‘he will see you all’
		im.pa-	im**ho**pa-	‘eat (PL)’
	Creek	lík.w-i:	lik**ho**w-í	‘rotten (PL)’

With this historical scenario in mind, it is no longer surprising that the inflectional infixes target the final syllable; the historical auxiliary verbs, to which historically the inflectional affixes prefixed, were monosyllabic in Proto-Muskogean. The fact that certain pronominal affixes are infixed while others suffixed; this was merely a reflex of an archaic pronominal affixation pattern, where the first person singular was suffixing to the auxiliary, while the other pronominal affixes were prefixing to the auxiliary verb.

Besides this grammaticalization-induced pre-final syllable infixation pattern, the Muskogean languages also provide an illustration of another type of entrapment, namely, the result of fusion between a historical prefix and the root. In PM, the mediopassive proclitic *il- appears after the applicative *a- and the plural *oho- (Martin & Munro 1994). In the Southern Muskogean languages, however, it appears as an infix.

(7)	a.	PM	*a-p/hica ‘look at’	*a-il-p/hica ‘be looked at’
		Al.	a-hica ‘watch over’	a-**l**hica ‘be taken care of’
		Chickasaw	a-pi:sa ‘measure’	a-**l**pisa ‘be measured’
	b.	PM:	*oho-icca ‘shoot’	*oho-il-icca ‘be shot’
		Al.	hocca ‘shoot	ho**l**icca ‘be shot’
		Choctow.	hõssa ‘shoot at’	ho**l**isso ‘be speckled’

Martin & Munro 1994 attribute the synchronic distribution of this mediopassive infix to the result of the reanalysis of the prefixes *a- and *oho as part of certain neutral verbs, thus trapping the intervening affix *il. Subsequent analogical extension gives rise to a post-initial vowel distribution of the mediopassive today (8).

(8)	a.	Al.	o:ti ‘make a fire’	o:**l**ti ‘kindling’
		Cs.	o:ti ‘kindle’	o**l**ti ‘be kindled’
	b.	Al.	takco ‘rope (v.)’	ta**li**kco ‘be roped’[1]
		Cs.	takci ‘tie’	ta**l**akci ‘be tied’

This case study not only exemplifies the mechanism of entrapment, but also illustrates an important aspect of the genesis of an infix. While the historical *pronominal prefixes* gave rise to *pre-final syllable infixes* due to the monosyllabicity of the grammaticalized

[1] According to Martin & Munro 1994, an epenthetic *i* is inserted before consonant clusters in Alabama and Koasati.

auxiliary verbs, the historical mediopassive *proclitic* gave rise to a *post-initial vowel infix*. What this shows is that the edge alignment between the infix and the pivot does not always mimic the historical source. The ultimate determinant of what the pivot is rests on the constancy of the potential pivot unit. The fact that the mediopassive infix takes the initial vowel as the pivot rather than the material following it (i.e. the historical root) has to do with the size inconsistency of the historical roots, which could be monosyllabic or disyllabic, or four or five segments long. Therefore, it is not reliable to use that as the reference of anchoring for infix-alignment. On the other hand, the material preceding the infix is either *a- or *ho (< *oho), which is invariably monosyllabic.

Entrapment-induced infixation can be complicated by changes in other parts of the language as well, as illustrated by the development of the pronominal infixes in Hua.

4.2.2.2 Haiman 1977 on Hua

In Hua, a language in the Eastern Highlands of Papua New Guinea, a set of pronoun affixes appears with transitive verbs and with inalienable possessed nouns as shown below:

(9)	Singular		Dual		Plural	
	1	d-	1	raʔ-	1	r-
	2	g-	2/3	paʔ	2/3	p-
	3	Ø				

These pronominal affixes are generally prefixed as illustrated in the following paradigms:

(10)

		Nominal		Verbal	
Sg.	1	**d**-zaʔ	‘my hand’	**d**-ge	‘he sees me’
	2	**g**-zaʔ	‘your hand’	**g**-ge	‘he sees you’
	3	**Ø**-zaʔ	‘his/her hand’	**Ø**-ge	‘he sees him/her’
Du.	1	**raʔ**-zaʔ	‘our hand’	**raʔ**-ge	‘he sees us two’
	2/3	**paʔ**-zaʔ	‘your/their hand’	**paʔ**-ge	‘he sees you/them’
Pl.	1	**r**-zaʔ	‘our hand’	**r**-ge	‘he sees us’
	2/3	**p**-zaʔ	‘your/their hand’	**p**-ge	‘he sees you/him’

In a small number of extremely common nominal and verbal roots, these pronouns are sometimes infixed.

(11) Hua personal markers (Haiman 1998:561)

Person	haipai- ‘explain, tell’	hamu’ ‘namesake’
1sg.	ha-**nd**-apai-	ha-**nd**-amuʔ
2sg.	ha-**g**-apai-	ha-**g**-amuʔ
3sg.	hapai-	hamuʔ
1du.	ha-**raʔ**-apai-	ha-**raʔ**-amuʔ
2/3du.	fa’apai-	faʔamuʔ
1pl.	ha-**r**-apai-	ha-**r**-amuʔ
2/3pl.	fapai-	famuʔ

Based on comparative evidence, Haiman argues that these infixes were historical prefixes. He attributes the development of the infixing pattern to three factors. To begin with, the infixation process is restricted to stems beginning with the stressed sequence *há*. According to Haiman (1977), there are approximately two dozen such words, but it can be productively extended even to roots which do not usually occur with pronouns for semantic reasons (e.g., *háivuva* ‘root of tree’ → *ha-nd-áivuva*).

Haiman demonstrates that a homophonous, but unstressed sequence *ha* was historically a prefix, based partly on the following pair examples:

(12)

gai	‘look after’	haˈgai	‘stuff’
u	‘go’	ˈhau	‘go up’
to	‘leave’	haˈto	‘scoop’
go	‘see’	haˈgo	‘well up, gather’
kro	‘alight, perch’	haˈkro	‘pick leaves’
pai	‘harden in fire’	haˈpai	‘wring out’
tgi	‘split (wood)’	haˈtgi	‘finish’

This scenario suggests that the pronominal infix developed out of entrapment. The historical prefix *ha-* fuses with the root, trapping the pronominals in the process. However, this interpretation of the historical development predicts that a word such as

hamu' 'namesake' should be *ha-**nd**-mu'* when it is in the first singular, not *ha-**nd**-amu'* as attested. The infixed form shows an extra *-a-* that is unaccounted for.

Haiman argues that there is an independent rule of vowel coalescence that reduces a sequence of identical vowels through the deletion of the unstressed vowel (e.g., *ha#á* → *hâ*). Haiman argues that a pre-Hua speaker might have reinterpreted all words beginning in the stressed *ˈha* as underlyingly a sequence of *ha+ˈa* using abductive reasoning (Andersen 1973), which creates an ambiguity when the word is in the 3rd person singular. Take, for example, the word *ˈhamu* 'namesake'. There are two possible analyses of the homophonous sounding *ˈhamu* 'his namesake'. The 3rd person singular marker could be analyzed as prefixing (i.e. *∅+ha+ˈamu*) or between the prefix *ha* and a hypothetical stem *ˈamu* (i.e. *ha+∅+ˈamu*), in accordance to Watkins' Law. 'Watkins' Law' (Watkins 1962) refers to a situation where a 3 sg. form provides the basis for visible restructuring of its entire paradigm since it is susceptible to more than one analysis by virtue of a null 3 singular marker (see also Bybee 1985).

While the seed of possible reinterpretation was present, Haiman argues, an incentive for choosing one analysis over the other is discernable. This comes from the prohibition of Hua on *C+h* sequences. He demonstrates that when *C+h* sequences might be generated as a result of morpheme concatenation, a peripherasis construction is used instead. For example, when the transitive verb *ˈhako* 'look for' takes an oblique case, the benefactive with which no object pronoun agrees. However, instead of **dhake*, one finds *dgaisiʔhake*. A strictly semantic explanation would not be able to account for why *ˈhake* with the null 3rd person marker is possible.

Let us now return to the word *ˈhamu* 'namesake'. According to Haiman, upon the influence of the null 3 singular marker, in the case of 'my namesake', two possible analyses became available (i.e. **d+ha+ˈamu* or **ha+d+ˈamu*). The prefixing option is duly discouraged as a result of the ban on *C+h* sequences (i.e. **d+ha+ˈamu*).

What this case study illustrates is that the phonology of Hua provided a conducive environment for reinterpretation, which eventually gave rise to the restricted infixation pattern in the language today. However, the actual motivation for infixation comes from the fusion of the historical prefix with the root, independent of the requirement against *C+h* sequences.

4.2.2.3 Predictions of entrapment

This understanding of entrapment provides some interesting predictions, which will be explored here. Entrapment, for example, is the only infix-generating mechanism that creates multiple infixes simultaneously. Unlike the other mechanisms, where the source of reanalysis ultimately stems from the infix itself (i.e. affix-internal pressure), the cause of entrapment comes from changes that occur in the environment (i.e. affix-external pressure). It is the encroachment of the surrounding that resulted in the encasing of a historical adfix, which means that, any adfixes that ordinarily appear in such a location is going to be trapped regardless. The rise of the pronominal infixes in the Muskogean languages exemplifies this transparently. This scenario also provides special insights into the linguistic system post-entrapment. Consider the following scenario:

(13) Let W, Z be roots and X and Y prefixes,

A: when Y+[W]$_{\sigma \geq 1}$ remains Y+[W]$_{\sigma \geq 1}$, prefixation obtains;

B: when X+Y+[Z]$_{\sigma \geq 1}$ becomes XY[Z]$_{\sigma \geq 1}$, where XZ merges, entrapment-infixation arises.

The outcomes of these hypothetic changes, taken individually, seem harmless enough. An intriguing puzzle emerges, however, when both changes occur within a single language. The distribution of Y would be quite anomalous: it would be a prefix some of the time, while an infix in other occasions even though the shapes of the stems could potentially be identifical. In this case, the question is whether a unified analysis of Y is possible.

GPS, certainly, has no problem accounting for this if W and Z can be characterized coherently. The trouble comes when W and Z resist a uniform description (i.e. when they are too heterogeneous). Ideally, when the material on one side of an infix resists categorization, one looks at the other side for answers. Yet, the scenario laid out above gives no such recourse. The left side of Y need not be preceded by materials of the stem. Thus, no pivot can be posited here. For example, in Dakota, the pronominal affixes appear infixed in some forms, but not in others, even though phonologically speaking, such stems are nearly identical (14) (data taken from Albright 2002: 89).

(14)

	Prefixed stem *nuni* 'be lost'	Infixed stem *mani* 'walk'
1 sg.	**wa**-nuni	ma-**wa**-ni
2 sg.	**ya**-nuni	ma-**ya**-ni

The Muskogean languages, as noted, have verbs that take the infixing paradigms, while others that take the strictly suffixing paradigm. Kentakbong, an Austro-Asiatic language, presents an interesting challenge. In this language, the imperfect is marked by the prefixing of *ʔən-* to monosyllabic stems (15), while infixing *-ən-* in disyllabic stem (15) (Omar 1975).

(15)

a.	/co/ 'speaks'	**ʔən**co 'speaks.IMPRF'
	/cãs/ 'excretes'	**ʔən**cãs 'excretes.IMPRF'
b.	/citɔh/ 'cooks'	c**ən**itɔh 'cooks.IMPRF'
	/sapoh/ 'sweeps'	s**ən**apoh 'sweeps, is sweeping'

Admitedly, GPS offers no uniform understanding of this pattern. That is, GPS cannot analyze the distribution of Y with a single pivot. In the case of Kentakbong, if -ən- is taken to appear after the initial consonant, *co* 'speaks' should appear as **cənɔ* in the Imperfect, which is incorrect. To be sure, the predicted pattern is found in Katu, (16), a language related to Kentakbong, where a VC affix in infixed in monosyllabic stems. Any analysis that predicts the Katu system is inherently incapable of predicting the Kentakbong system at the same time.

(16)

kui	'to carry on back'	k**an**ui	'something carried on back'
tôl	'to put post in'	t**an**ôl	'post'
pó	'to dream'	p**an**ó	'a dream'

kuôl	'to have resources'	k**an**uôl	'resources, strength'
têêng	'to work'	t**an**êêng	'work'
pók	'to make idol'	p**an**ók	'idol'

Displacement Theory fairs no better either. DT predicts infixation of *-ɔn-* also, if the driving force behind infixation in disyllabic form is ONSET or NOCODA.

The result of changes A and B are better analyzed as two separate patterns; that is, the two Ys are distinct in their alignment properties. The fact that homophonous affixes might have different distributional patterns is commonly found in the literature (e.g., the two *-able* suffixes in English).

The entrapment scenario informs us why patterns like (15) should not be analyzed uniformly. As noted, Schmidt 1906 proposed the fusion of certain historical prefixes with the root resulted in the infixation patterns attested in most Austro-Asiatic languages today. Given this understanding, the fact that *-ɔn-* remains a prefix with the monosyllabic roots results from the fact that such roots do not generally take the historical prefix X, which suggests that the two sets of stems already have different distributions to begin with. The fusion of the prefix X only serves to set the resulting stems further apart from unprefixed stems like W. Therefore, it is not surprising that, despite their phonological homophony, the affix Y associates with each set of stems should be given different subcategorizations. This balkanizing view of the lexicon and treatment of infixes is supported by the fact that many, if not all, known or suspected cases of entrapment-induced infixation (e.g., Dakota, Lezgian, and the Muskogean languages) only apply to a subset of stems of the language. With this in mind, the Katu pattern could then be seen as

the result of consequent analogical extension of the infixing pattern to historical monomorphemic forms.

4.2.3 Metathesis

Metathesis refers to the transposition between two segments, which can be schematized as AB > BA. An example of phonological metathesis can be found in Cayuga, a Northern Iroquoian language, where, according to Foster (1982) cited in Blevins and Garrett 1998:509-10, /Vʔ/ → [ʔV] and /Vh/ → [hV] in odd-number nonfinal syllables. The relevant segments are underlined.

(17) Cayuga (Foster 1982; Blevins & Garrett 1998:510)

a. /kahwista͟ʔeks/ → [kʰ̥awísdʔa͟es] 'it strikes, chimes (a clock)'

b. /akeka͟haʔ/ → [agékha͟aʔ] 'my eye'

c. /koʔnikō͟haʔ/ → [gʔoníkh͟waʔ] 'her mind'

d. No change:
/akahwitá͟ʔek/ → [agahwisdá͟ʔek] 'it struck, chimed'

In a series of papers on the origins of metathesis, Blevins and Garrett (1998, In press), furthering the listener-oriented theory of sound change (cf. Ohala 1993), propose that there are four main types of metathesis: perceptual, compensatory, coarticulatory, and auditory metatheses. They summarize these four types of metathesis as follows:

> [Perceptual metathesis] involves features of intrinscially longer duration (e.g. phrangealization); in multisegmental strings, such features are spread out over the entire sequence, allowing them to be reinterpreted in non-historical positions. [Compensatory metathesis] is prosodically conditioned: within a foot, features in a weak syllable undergo temporal shifts into the strong syllable. [Coarticulatory metathesis][2] arises in clusters of consonants with the same manner of articulation but different places of articulation; the place cues do not necessarily have long duration, and we will suggest that metathesis results from coarticulation faciliated by shared articulatory gestures. [Auditory metathesis] results from the auditory segregation of sibilant noise from the rest of speech stream.' (Blevins & Garrett In press:4)

The formal resemblance between phonological metathesis and infixation, particularly infixes that are traceable to a historical prefix or suffix, has prompted some to suggest that infixation can be the result of morphological metathesis (cf. Ultan 1975; see also Halle 2001). By assuming morphological metathesis as a diachronic source of infixation, one is making the assumption that the morphemes in question, say morphemes A and B, were historically in one order and the linear order reflected in the daughter language is reversed.

(18) *A+B > B+A

[2] Blevins & Garrett's decision to label this type of metathesis as 'coarticulatory' is potentially confusing one since, with the exception of auditory metathesis, the other types of metathesis all involve coarticulation in one form or the other. A better label might be 'articulatory overlap metathesis'.

Morphological metathesis as such is not a useful concept. It is merely a restatement of the fact. It does not reveal the mechanisms through which infixation develops. As already seen through out this chapter, quite a variety of mechanisms can give rise to the impression of morphological metathesis. (e.g., reduplication mutation comes close to being a genuine case of morphological metathesis; see discussion in section 4.2.4). This section concentrates on phonological metathesis as a source of infixation.

4.2.3.1 Metathesis as a source of infixation

Of the four known triggers of phonological metathesis, perceptual metathesis seems to be the only form of metathesis that gives rise to infixation. A closer examination of Blevins & Garrett's survey of metathesis reveals that there is a simple explanation to this connection. To begin with, perceptual metathesis makes up the bulk of the attested metathesis cases. Thus, it should not be surprising that there are more instances of infixes that came from perceptual metathesis than other metathesis triggers. Second, compensatory and coarticulatory metatheses are best viewed as subtypes of perceptual metathesis. Both types of metathesis result from perceptual confusion induced by extreme coarticulatory effects. Compensatory metathesis differs from general perceptual metathesis in terms of its reference to prosodic conditioning (i.e. the extreme coarticulatory between a pair of stressed and unstressed vowels). The so-called coarticulatory metathesis, which involves extreme coarticulation, involves overlapping of consonant sequences. Thus, the additional restrictions on the enviroments of metathesis do not warrant separate classification of these metathesis types.

(19)

Mechanism of metathesis	**Subtypes**
Perceptual metathesis	Compensatory metathesis
	Coarticulatory metathesis
Auditory metathesis	

With this revised view of the different mechanisms of metathesis, coupled with the fact that perceptual metathesis constitutes the main source of the attested metathesis cases, it is only natural that metathesis-induced infixes should also have similar distribution.

The phonetic origin of metathesis makes the prediction that the potential set of metathesis-induced infixes should be restricted to the set of 'stretch-out' features and segments that are amenable to perceptual confusion (e.g., labial, palatal, pharyngeals, laryngeals, liquid, & rhotic). This class of phonetic objects has elongated acoustic cues. In what follows, I catalogue the range of known instances of metathesis-induced infixation.

4.2.3.2 Typology of metathesis-induced infixation

This survey begins with a case of palatal metathesis in Copainalá Zoque.

The 3rd person marker in Copainalá Zoque, a Mixe-Zoque language spoken in Southern Mexico, is realized as palalization on the initial consonant of a root if it begins with an alveolar consonant (i.e. *d, ts, s, n*) (20). Otherwise, a palatal glide is infixed after the initial consonant of the root (20) (Wonderly 1951).

(20)

a.	tsʌhk-	'to do'	tʃahku	'he did it'
	sʌk	'beans'	ʃʌk	'his beans'
	swerte	'fortune'	ʃwerte	'his fortune'
	nanah	'mother'	ɲanah	'his mother'
b.	pata	'mat'	pjata	'his mat'
	burru	'burro'	bjurru	'his burro'
	faha	'belt'	fjaha	'his belt'
	mula	'mule'	mjula	'his mule'
	wakas	'cow'	wjakas	'his cow'
	gaju	'rooster'	gjaju	'his rooster'
	ʔaci	'older brother'	ʔjaci	'his older brother'
	hajah	'husband'	hjajah	'her husband'

The 3rd person marker was historically a prefix **i-* (e.g., Sierra Popoluca *ʔikaːmaː* 'his cornfield' < Proto-Zoque *kämä(k) 'cornfield'), which lenited into a glide (e.g., South Zoque *kajkama* 'cornfield'). However, a general palatal metathesis in the language turned all *j + C sequences into *Cj* in Copainalá Zoque (CZ), North Zoque (NZ), Northeast Zoque (NeZ). The non-metathesized position *j can still be observed in Sierra Popoluca (SP), South Zoque (SZ), West Zoque (WZ) (Elson 1992).

(21) CZ, NZ: popja ‘he runs’ (SP, SZ: *pojpa* < PZoq *poj + pa)

CZ, NZ: hapja ‘he writes’ (SP, WZ: *hajpa* < PZoq *haj + pa)

CZ, NZ: hʌpja ‘he weeps’ (SP: *hʌjpa* ‘he speaks’ < PZoq *hʌj + pa)

CZ, NZ: homi ‘tomorrow’ (SP, SZ: *hojmʌ* < PZoq *hoj + mʌ)

An interesting variant of palatal infixation is found in Lepcha, a Tibeto-Burman language spoken in Sikkim, on the southern fringe of Tibet. The alternation between intransitive and transitive verbs can be marked by the infixing of *-j-* after the initial consonant (Benedict 1943, Voegelin & Voegelin 1965: 9, Ultan 1967).

(22)

pok	‘cast down’	pjok	‘cause to cast down’
thor	‘escape, get free’	thjor	‘let go, set free’
rop	‘stick, adhere’	rjop	‘affix, attach’
nak	‘to be straight’	njak	‘make straight’
nom	‘smell (intr.)’	njom	‘smell (tr.)’

Benedict (1943) found that the infix originates from the Tibeto-Burman causative prefix *s-, as illustrated by the following cognate forms in Tibetan:

(23)

Lepcha	nom	‘smell (intr.)’	Tibetan	mnam-pa
Lepcha	njom	‘smell (tr.)’	Tibetan	snam-pa

The patalal glide was originally conditioned by the initial *s*. After the loss of *s in initial consonant clusters, previous coarticulatory patalization was interpreted as morphological. This metathesis, of course, was not restricted to the intransitive/ transitive alternation. Other words with *s*-initial consonant clustesr also exhibit the epenthesis of the palatal.

(24)

Tibeto-Burman			Lepcha	
*s-na	‘nose’	>	njo	‘snot’
*s-nam	‘daughter-in-law’	>	njom	‘daughter-in-law’
*s-min		>	mjăn	‘to be ripe’

This particular case illustrates an important aspect of metathesis-induced infixation. The term ‘metathesis’ is often defined as the reordering of segments or features within the phonological string (e.g., Hume 2001, Blevins & Garrett In press), which might give the impression that the metathesized segment is ontologially one and the same as the “original” segment. The case of Lepcha highlights the problem with such an interpretation of metathesis. Strictly speaking, the infix in Lepcha did not transpose from some other location. There was never a palatal glide morpheme in Tibeto-Burman. The source of the palatality came from the coarticulatory effect of the initial alveolar sibilant. This type of ‘unfaithful’ metathesis is actually rather typical of metathesis in general and especially of metathesis-induced infixes. Thus, in the case of noun class infixation in several Benuo-Congo languages, the infix *-w-* came from the reconstructed prefix **u*.

(25) Noni class 3/4 nouns (Hyman 1981 cited in Garrett & Blevins 1998)

Singular (cl. 3)	Plural (cl. 4)	
kwen	ken	‘firewood’
gwéŋ	géŋ	‘root’
mbwesɛm	mbesɛm	‘green grasshopper’
twéŋ	téŋ	‘vine branch’
fwéw	féw	‘thorn’

The reflex of this co-articulatory stage is found in the cognate construction in Aghem, where class 3 nouns are marked by a prefix *ó-*, as well as an infix *-w-*

(26) Aghem class 3 (singular) nouns (Hyman 1972:21 cited in Garrett & Blevins 1998)

Singular (cl. 3)	Plural	
ó-kwíŋ	é-kíŋ (cl. 4)	‘mortar’
ó-kwâʔ	é-káʔà (cl. 4)	‘hill, mountain’
ó-twíi	ń-tíi (cl. 12)	‘medicine’

These ‘unfaithful’ metatheses serve as useful reminders to infix-hunters that, while many cases of the metathesis-induced infix do not involve segments that resemble their sources, one should be mindful that mechanism through which these patterns arose is one and the same.

Glottalization and laryngealization are also among the class of segments with long and stretched-out phonetic cues. While no clear comparative evidence is available to support the claim here, however, the glottal stop infix found in the Mayan languages is a strong candidate of glottal metathesis-induced infixes. As noted in Chapter 2, Tzutujil has a glottal stop mediopassive infix that appears after the root vowel.

(27) Tzutujil mediopassive (Dayley 1985:55, 113-4)

toj	‘pay’	toʔjik	‘to be paid’
k’is	‘finish’	k’iʔseem	‘to end, finish’
tij	‘eat, consume’	tiʔjik	‘to be paid’

In Yucateco, which is a Mayan language distantly related to Tzutujil, the passive of transitive root has the shape CVʔC. The glottal stop used to be a suffix /b’/ in the 16th century (i.e. *CVC-b’ > *CVC-ʔ > CVʔC) (Terry Kaufman p.c.). The suffix /b’/ is still found in Mopan, a closely related language.

Before I conclude the discussion on metathesis-induced infixes, it is worthwhile to point out that the phonetic origin of metathesis requires that only single segments can be involved in a ‘transposition’ at a given time. Infixations that involve the transposition of *groups* of segments, do not lend themselves readily to a phonetic misinterpretation account of metathesis (see also Janda 1984).

4.2.4 Reduplication mutation

Thus far, cases of infixation that developed out of previous adfixes are considered. The resulting infix by and large resembles the source morpheme. This section looks at cases of infixations that can all be traced back to some historical adfixal reduplication process. However, the resulting infix often does not bear close resemblance to its source. To understand this type of change, which is referred to as ***reduplication mutation***, let us first look at a simple illustration that does not involve the creation of an infix.

4.2.4.1 Hausa pluractionals

Hausa is a Chadic language spoken in Nigeria. Hausa pluractional reduplication, historically, involved reduplicating the two right-most syllables of the verb, with concomitant deletion of the original stem-final vowel (Newman 1971).

(28)

*yagala	yagalgàlaa	'tear to shreds'
*kucina	kucinc̆inaa	'break pieces off'
*taƙare	taƙarƙ̆àree	'strive hard'

Synchronically, however, most pluractional verbs are formed by reduplicating the initial CVC- of the stem, where C_2 assimilates to the following abutting consonant or undergoes rhotacization.

(29)

Singular	Pluractional	Gloss
tunàa	tuntùnaa	'remind'
gaskàtaa	gasgaskàtaa	'verify'
kaamàa	kankàamaa [kaŋkàamaa]	'catch'
bugàa	bubbùgaa	'beat'
raatàyaa	rarraatàyaa	'hang'
fita	fir̆fita	'go out'

The question here is why the original disyllabic suffixing reduplication pattern was replaced by a prefixing CVC-reduplication pattern. Newman (1971) attributes this shift to the reinterpretation of surface ambiguous output strings. Specifically, the stem-final vowel dropping in the environment of suffixation, a process that is still active today, created the environment for various phonological processes that target preconsonantal consonants. These phonological processes exerted a great deal of effects on the stem consonant (cf. the result of final vowel dropping) immediately preceding the reduplicant. A summary with illustrations of these processes is given in (30).

(30) Rhotacization of a coda consonant: **gadgadaa* > *gaɾ̃gadaa* 'rutted road'

Place assimilation of a coda nasal: **jàaɾ̃ùmtakàa* > *jàaɾ̃ùntakàa* 'bravery'

Complete assimilation of certain consonants: **zàafzaafaa* > *zàzzaafaa* 'very hot'

Shortening of long vowels and lowering of mid vowels in closed syllables:

**saaboon gidaan àbookiinsà* > *saaban gidan àbookinsà* 'his friend's new house'

Some examples illustrating these processes in pluractional reduplication are given below:

(31)	Singular		Historical Pluractional		Actual Pluractional	Gloss
	fita	→	*fitfita	>	fĩrfita	'go out'
	bugàa	→	*bugbuga	>	bubbùgaa	'beat'
	jèefaa	→	*jeefjeefa	>	jàjjeefàa	'throw'
	soomàa	→	*soomsooma	>	sansòomaa	'begin'

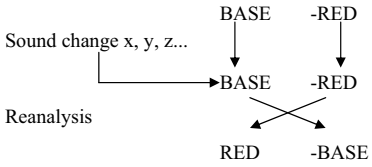
Newman argues that the reduplicant of the pluractional forms retains the full form of the underlying verb in the case of the disyllabic stems due to these phonological processes, while the original stem was deformed, in some cases, quite drastically. Thus, presumably due to the effect of paradigm uniformity between the singular and pluractional forms (e.g., *bugàa*/*bubbùgaa* 'beat'; *soomàa*/*sansòomaa* 'begin'), the pluractional form is reanalyzed morphologically in such a fashion that the position of the stem and the reduplicant were reversed, as illustrated by the examples below. The underline indicates the reduplicant.

(32)				
	*bubbùgaa	>	bubbùgaa	'beat'
	*fĩrfita	>	fĩrfita	'go out'
	*jàjjeefàa	>	jàjjeefàa	'throw'
	*sansòomaa	>	sansòomaa	'begin'

The fact that the prefixing pluractional formation pattern is synchronically productive can be seen as an extension of the reinterpreted pluractional formation rule for these disyllabic stems.

Hausa pluractional construction illustrates the general phenomenon of reanalysis induced by the ambiguity between the identities of the base and the reduplicant. The present case, it is the historical base of reduplication that is altered by sound changes, which prompted speakers to associate the historical reduplicant as the base, since it resembles closer to the non-reduplicated stem than the actual historical root.

(33)



One aspect of this type of morphological change is noteworthy. Since reduplication-mutation involves morphemes changing positional membership, say, from a suffix to a prefix, on the surface, it would seem as though the affix and the root have metathesized (e.g., *aX* > *Xa*, where X is the root, while *a* denotes an affix), which could be seen as an instance of morphological metathesis.

As illustrated below, a variety of processes can give rise to the possibility of reanalysis. This presentation makes no pretense to be a comprehensive survey of all instances of reduplication mutation. Such a comprehensive survey is untenable, in my view, since the effects of sound change in a language is invariably confounded by the

morphological system of language. The illustrations below are meant to demonstrate the intricacies involve in the development of an infix under reduplication mutation. Unlike entrapment, the shape of the resulting infix can be quite different from the 'original' affix. The first case to be considered here is from Trukese, an Austronesian language spoken in Micronesia.

4.2.4.2 Trukese durative *-ikk-*

In Trukese, pluractional is marked by CVC reduplication on consonant initial-verbs, as illustrated below (Goodenough and Sugita 1980):

(34)	fætæn	'walk'	→	fæf-fætæn 'be in the habit of walking'
	mɔːt	'sit'	→	mɔm-mɔːt 'be sitting'
	sɔtu-	'attempt'	→	sɔs-sɔt 'be attempting'

However, when the verb begins with a vowel or *w* (the only word-initial glide), the infix or prefix *-Vkk-*, where 'V' is a copy of the following vowel, is used instead. The verb 'drink' illustrates an instance of the *w*-insertion sound change (i.e. **inu > wɨn*).

(35)	wɨn	'drink'	→	w-ɨkk-ɨn	'be in the habit of drinking'
	wiik	'week'	→	w-ikk-iik	'be for a number of weeks'
	isɔni	'keep it'	→	ikk-isɔni	'be keeping it'
	ɔsɔmʷoːnu	'pay chiefly respects to'	→	ɔkk-ɔsɔmʷoːnu	'be in the habit of paying chiefly respects to'

This infix is the result of the general loss of word-initial **k* in durative verbs with original initial **k* (i.e. **kVk-k- > *Vkk-*) (Goodenough 1963, Goodenough and Sugita 1980:xxv; Garrett 2001).

(36)	Pre-Trukic	Trukese	
	*kana-	ana-	'classifer: food'
	*kakaká:su	əkkəːs	'treat as a sibling-in-law of the same sex'
	*kasamʷóːnu	ɔsɔmʷoːnu	'pay chiefly respect to'

The reason for the **kVk-k- > *Vkk-* reanalysis can be most effectively illustrated with the word *ɔsɔmʷoːnu* 'pay chiefly respect to'. Historically, it as **kasamʷóːnu*, its reduplicated form would presumably be **kak-kasamʷóːnu*. After the dropping of the initial **k*, the reduplicated form became **ak-kasamʷóːnu*, which was then reanalyzed as **akk-asamʷóːnu* since **kasamʷóːnu* would have become **asamʷóːnu*. This apparent *-Vkk-* infix was then generalized to originally vowel-initial verbs.

A prevocalic *w*-insertion process later affected certain vowel-initial words.

(37)	*kóta	woːt	'coconut husking stick'
	*ínu	wɨn	'drink'
	*kuku	wɨːk	'fingernail'
	*kúru	wur	'play'

W-insertion created synchronic base → durative alternations of the pattern *wV-* → *wVkkV-*. For example, the historical reduplicated form of the word *woːt* 'coconut husking stick' would have been **kok-kota*. After initial-*k* dropping, it became **ok-kotta*. The w-addition process took place, yielding **wokkotta*. Presumably, based on fact that the affix -*Vkk*- was posited independently of forms like this, **wokkotta* would be analyzed as **w-okk-otta*.

Ultan (1975) refers to this a case of entrapment. But as the above diachronic explanation illustrated, -*Vkk*- was not a morpheme in Pre-Trukese, thus the notion of entrapment does not really apply here. -*Vkk*- was the result of a series of isolated developments in the phonology of Trukese that obscured the reduplicative morphology of Trukese durative formation. This development of the -*Vkk*- infix in Trukese is particularly noteworthy because it resulted in a non-historical affix in Trukese.

4.2.4.3 Yurok intensive *-eg-*

Another elaborate case of an accidental infix is found in Yurok, an Algic language spoken in northwestern California. The intensive infix, *-eg-*, appears after the onset, including consonant clusters of the stem. The orthographic 'g' represents a phonetic a voiced velar fricative [ɣ]. There are no vowel initial roots in this language. Intensive is an event-external repetition marker that produces a variety of meanings (e.g., frequentative with activity verbs or intensity with verbs of experienced state; for more discussion, see Wood & Garrett 2003).

(38) Yurok intensive (Garrett 2001:269)

Base		Intensive
laːy-	'to pass'	l**eg**aːy-
koʔmoy-	'to hear'	k**eg**oʔmoy-
tewomeł	'to be glad'	t**eg**ewomeł
łkyorkʷ-	'to watch'	łky**eg**orkʷ-
trahk-	'to fetch'	tr**eg**ahk-

Garrett 2001 argues that the *-eg-* infix arose from the reinterpretation of historical monosyllabic *Ce*-reduplication. He reconstructs the Yurok *C(C)e-* intensive reduplication as the reflex of Algic *C(C)eː-* reduplication (39).

(39) Algic *C(C)eː-* > Ritwan **C(C)a-* > Yurok **C(C)e-* (Garrett 2001:293)

To demonstrate the relationship between Yurok **C(C)e-* intensive reduplication with the intensive infix, Garrett first demonstrates that only the **h* in *h*-initial stems, but no other initial consonant (40), was absorbed when combined with pronominal prefixes (40), creating surface forms such as those schematized in (40)c.

(40) a. **h**elomey- ‘to dance’ **ʔn**elomeyek’ ‘I dance’

hunkeks ‘to open’ **ʔn**unkeksok’ ‘I open’

ho:loh ‘basket’ **k’**o:loh ‘your basket’

haʔa:g ‘rock’ **ʔw**aʔa:g ‘her, his, etc. rock’

b. tmo:l- ‘to shoot’ **ʔne**-tmo:lok’ ‘I shoot’

skewip’- ‘to put in order’ **k’e**-skewip’ak’ ‘you (sg.) put in order’

tepo: ‘tree’ **ʔwe**-tepo: ‘her, his, etc. tree’

c. Original h-initial stems:

verb **hVC*- → intensive **he-hVC*-

Pronominal prefixes:

**ʔn-VC* (etc.) → intensive **ʔn-e-hVC*- (etc.)

A subsequent intervocalic **h* > *g* change, as partially demonstrated by the data in (41), yielded intensive forms that seem to be formed by *-eg-* infixation (41).

(41) a. /ʔo **he**ʔm/ → ʔo **ge**ʔm ‘there s/he said’ (Robins 1958:157)

/ʔo **h**o:k’^{w}c’/ → ʔo **g**o:k’^{w}c’ ‘there s/he gambled’ (Robins 1958:155)

b. Original h-initial stems:

verb **hVC*- → intensive **hegVC*-

**ʔnVC*- (etc.) → intensive **ʔnegVC*- (etc.)

Garrett argues that it is based on these apparent infixation patterns that the *-eg-* infix was extended to other consonant initial-stems. Some present *h*-initial forms still preserve the original pattern without any morphological change (42)a, while some other isolated examples preserve relics of the *Ce-* intensive reduplication pattern (42)b.

(42) Base verb Intensive

a. *heʔwoni*ɬ- ‘to wake up’ (intr.) **he-heʔwoni*ɬ- > **hegeʔwoni*ɬ- > *huːʔwoni*ɬ-

hohkum- ‘to make’ **he-hohkum* > *hegohkum-*

hoʔomah ‘to make fire together’ **he-hoʔomah* > *hegoʔomah*

hoːk^{w}c- ‘to gamble’ **he-hoːk^{w}c-* > *hegoːk^{w}c-*

b. *ckɨkɨːʔ* ‘to pierce’ ***ckɨ***ckɨkɨːʔ ‘to pierce repeatedly’

kelomen- ‘to turn’ (trans.) ***ke***kelomen- ‘to turn several things’

keʔy-* ***ke*keʔy(e*ɬ*-) ‘to shine’

lek-* ‘to fall down’ ***le**ɬ*ken- ‘to throw, to scatter’

ʔekol- ‘to hover’ ***ʔe***ʔekol- ‘to hover repeatedly’

The origins of the *-Vkk-* duratinve infix in Trukese and the *-eg-* infix in Yurok illustrate two important points. Infixes resulted from reduplicant-mutation relies crucially on the obscuring of the boundary between the reduplicant and the base. While the source of

ambiguity stems from quite different motivations – initial-*k* deletion and subsequence *w*-insertion in Trukese while intervocalic **h* > *g* in Yurok – their end effect is identical: the precise juncture between the reduplicant and the base is blurred. As the original morphological analysis is no longer readily recoverable from the data, the learner, through abductive reasoning, develops his/her own theory of morphological composition, including a plausible infixing analysis.

Thus far, I have illustrated how phonological and morphological 'erosion' can obscure the relationship between the root and the reduplicative affix, which ultimately forces a reanalysis of the morphological structure of the root+reduplicant complex. Notice that the morphology of the resulting infix is not a straightforward duplication of its source. The resulting infix appears to have sprung out of nowhere. This observation highlights another interesting aspect of reduplication mutation as a mechanism of infix creation. Reduplication mutation gives rise to fixed infixation, while fixed infixation does not seem to ever give rise to internal reduplication. This asymmetry is to be expected. A fixed infix emerges out of reduplication due to the dissociation between the reduplicant and the base, which results from the loss of identity between the reduplicant and base caused by independent sound changes. On the other hand, a fixed infix is unlikely to establish an identity relationship with the stem since the phonological composition of the stem needs not coincide with the adfix.

(43)

	→ Reduplicative infix	→ Fixed infix
Adfixal Reduplication	Base-reduplicant relationship reversal	Loss of reduplicative identity with the base
Fixed affixation	Impossible	Entrapment, metathesis

In this next case study, I consider the development of Northern Interior Salish diminutive internal reduplication, showing that reduplication mutation is conditioned by prosodic factors. This case study will serve as a bridge between the discussions on edge-oriented infixation and the prominence-driven infixes.

4.2.4.4 Northern Interior Salish diminutives

Interior Salish languages, divided into the Northern and Southern branches, consist of the following languages:

(44)

Northern	**Southern**
Lillooet	Coeur d'Alene
Thompson River Salish	Kalispel-Spokane-Flathead
Shuswap	Colville-Okanagan
	Columbian

In the Northern Interior Salish languages, diminutives are generally formed by infixing after the stressed vowel a copy of the pre-tonic consonant. In some instances, a copy of the stressed vowel appears in the reduplicant as well.

(45) a. Thompson (Thompson & Thompson 1996)

Base		Diminutive	
c^{ʔ}y^{ʔ}é	‘basket’	c^{ʔ}y^{ʔ}e**y**^{ʔ}	‘favorite (or cute) basket’
s+xén^{ʔ}x	‘rock’	sxéx**n**ʔx	‘small rockey hill’
s+mɣéw^{ʔ}	‘lynx’	smɣé**ɣ**uʔ	‘lynx cub’
k^{ʔw}áx^{w}e	‘box’	k^{ʔw}á**k^{ʔw}**x^{w}e	‘small box’
twít	‘he grows’	twí**w**^{ʔ}t	‘young man 18-30 years old’
xéʔ	‘up high’	xé**x**eʔ	‘a little higher’

b. Shuswap (Kuipers 1974)

síc^{ʔ}m	‘blanket’	sí**s**c^{ʔ}m	‘small blanket’
kykéyt	‘chichenhawk’	kykél**k**yt	‘small chickenhawk’
cwéx	‘creek’	cwé**w**x	‘small creek, brook’
twít	‘he grows up’	twí**w**t	‘young boy’
cítx^{w}	‘house’	cí**c**tx^{w}	‘little house’
tsún=k^{w}-m	‘island’	tsú**s**nk^{w}m	‘small island’

c. Lilloet (van Eijk 1997:60)

ʔáma	‘good’	ʔá**ʔ**ma	‘pretty, cute, funny’
p’aʔx^{w}	‘more’	p’ó**p’**ʔax^{w}	‘a little bit more’
ʔaw^{ʔ}t	‘late, behind’	ʔá**ʔ**w^{ʔ}t	‘a little bit later’
səmɣáw	‘lynx’	səmɣó**ɣ**əw^{ʔ}	‘little lynx’
s-yáqcaʔ	‘woman’	s-yó**y**^{ʔ}qcaʔ	‘girl’
twit	‘good hunder’	twi**w**^{ʔ}t	‘boy, young man’

The examples below illustrate that the infixal pattern does not only target the root consonant before the stressed vowel, but any consonant immediately preceding the stressed vowel, regardless whether it is part of the root nor not.

(46) a. Thompson (Thompson & Thompson 1996)

łaʔχ=áns	‘(grown person) eats’	łaʔχá**χ**n^{ʔ}s	‘(baby or animal) eats’
q^{w}əłq^{w}łi-n=éłmx	‘birch-bark basket’	q^{w}əłq^{w}łiné**n**łmx	‘small birch-bark baskets’

b. Shuswap (Kuipers 1974)

x^{w}əx^{w}y=éwt	‘absent, delayed’	x^{w}əx^{w}yé**y**wt	‘a loan, credit’
x+k^{ʔ}m=íkn^{ʔ}	‘back side’	xk^{ʔ}mí**m**kn^{ʔ}	‘upper back’
t^{ʔ}q^{w}=éws	‘both, together’	t^{ʔ}q^{w}é**q^{w}**ws	‘companion, comrade’
pésəł=k^{w}e	‘lake’	pé**p**səłk^{w}e	‘small lake’

c. Lillooet (van Eijk 1997:60)

palʔ-á**ʔ**qaʔ ‘one-year-old-buck’

(pála ‘one’, aqaʔ ‘barrel, cylindrical object’

wˀəwˀp-l-í**l**cʼaʔ ‘caterpillar’ (√wəp ‘hair’, -l- connective, -icʼaʔ ‘skin’)

χəcp-qí**qə**nˀ-kst ‘hundred’

(*χəcp element used in numerical units, -qinˀ-kst ‘finger[tip]’)

Anderson 1996 argues that the diminutive was historically a CV prefix. He demonstrates that languages within the Interior Salish family, outside of the immediate North sub-branch, only have the prefixing C(V) diminutive reduplication construction.

(47)

Colville	**kə**-kwápaʔ	‘dog’
	s-**tə**-taɬm	‘little dog’
Kalispel	sɬ-**kʷ**-kʷɬʼus	‘little face’
	ɬ-**pu**-ps	‘kitten’
Spokane	χ-χɬʼəcin	‘dog’
	l’úlʼəkʷ	‘small stick of wood’
Coeur d’Alene	hin-**qʔu**-qˀušəmˀíčnˀšənˀ	‘dog’
	šə-šə**lʔú**lˀumˀxʷnˀ	‘hoe’

In addition, as illustrated in Lushootseed, which belongs to the Central Salish family, also displays prefixing CV diminutive reduplication.

(48) Lushootseed diminutive (Bates et al. 1994)

Singular		Plural	
s-qʷəbáyʔ	‘dog’	s-**qʷí**qʷəbayʔ	‘puppy’
s-tiqíw	‘horse’	s-**tí**tiqiw	‘pony’
tʃáləs	‘hand’	**tʃá**tʃaləs	‘little hand’
s-túbʃ	‘man’	s-**tú**tubʃ	‘boy’
χáhəb	‘cry’	**χá**χahəb	‘an infant crying’

Anderson hypothesizes that the infixing reduplicative pattern in the North Interior Salish languages is the result of the copying of a historical stressed reduplicative prefix that got reinterpreted as a stress-targeting reduplication pattern, although he does not specify what prompted the reinterpretation.

Here, I argue that the reinterpretation toward the infixal analysis was the result of post-tonic vowel reduction/deletion in the North Interior Salish languages. This reduction can still be observed in some of the completely lexicalized forms (i.e. the ones where diminutive meaning is no longer transparent) in these languages. Some examples from Lillooet are given in (49) (see also discussion below on Spokane).

(49) Lillooet (van Eijk 1997:60)

pú**pə**n	'to find by accident'	(*pun* 'to find')
cí**cə**l	'new'	(*cil-kst* 'five' with *-kst* 'hand')
lú**lə**m	'jealous in matters of love'	(*lúm-ən* 'to accuse, suspect smb., tr.')
qí**qə**lʔ	'weak'	(no simplex, but cf. *qlil* 'angry'[3])

The puzzle as to why stress was placed on the diminutive reduplicant remains, however. While stress is morphologically-governed, prefixes in the Northern Interior Salish languages, and in Interior Salish languages in general, do not normally attract stress. In what follows, I argue that the diminutive prefix was stressed, at least prior to the development of the infixal pattern, based on evidence from the cognate diminutive reduplication pattern in Spokane, a Southern Interior Salish language.

Spokane diminutive reduplication

Diminutives in Spokane are marked by prefixing reduplication of the first CV of the root and the glottaliziation of the resonants in the resulting word. The data below show strong and weak CVC roots under the diminiutive construction.

(50) a. Strong roots (Bates & Carlson 1998:118)

k'^{w}úk'^{w}l'	'something small is created, made'
l'úl'k'^{w}	'it's a little stick of wood'

[3] This is likely to be a form derived from the Out-of-Control -VC reduplication, although van Eijk did not explicitly clarify this.

n'ín'č'-m'n'	'knife, jacknife'
s-**x^{w}ú**x^{w}y'-eʔ	'an ant'

b. Weak roots

x̌šíl'	'a small thing is chopped'
c'c'úr'	'a little thing is sour/salty'
qqép	'soft, diminutive'
ppín'	'a little bent'

Two important aspects of these examples must be highlighted: stress assignment and vowel deletion. The fact that the diminutive prefix is stressed in the presence of a strong root but not in the weak roots is important; it is in accordance to the stress system of Spokane. Stress is generally morphologically determined in Interior Salish languages. They distinguish roots which are stressed in the presence of suffixes ("strong" root), from those which are unstressed in the presence of suffixes ("weak" roots). In Spokane, strong roots are stressed when no strong suffixes are present (51)a. Variable suffixes are stressed when they occur with weak roots or suffixes (51)b, but are unstressed with both strong roots and suffixes (51)a. Weak suffixes contain no vowels and are never stressed. Weak roots are stressed when they occur without suffixes or with weak suffixes (51)c.

(51) Examples of Spokane stress assignment (Carlson 1989: 205)

a.	/√k'ul'-nt-ex^{w}/[4]	[k'úl'ntx^{w}]
	S -W-V	'You made it'
	make, do-TRANS-2S	
b.	/√šil-nt-ex^{w}/	[šlntéx^{w}]
	W-W-V	'You chopped it'
	chop-TRANS-2S	
c.	/hec-√šil/	[hecšíl]
	-W	'It's chopped'
	PROG-chop	

Bates and Carlson 1998 analyze Spokane stress as follows: in strong roots, stress is on the left of their domain, while weak roots are "post-stressing", building a foot starting immediately to their right. However, when a weak root lacks a vowel to its right, as in the reduplicated forms above, the default final stress obtains. As argued in Bates and Carlson, the diminutive reduplicant is within the domain of stress assignment, which yields the stress pattern observed above. The second issue concerns the phenomenon of vowel deletion. As illustrated in the diminutive forms of the strong roots (50)a, there is a productive process of unstressed vowel deletion in Spokane, which also applies to nonreduplicative forms (e.g., *k'^{w}úl'ntex^{w}* → *k'^{w}úl'ntx^{w}* 'make, 2 person'; Bates & Carlson 1998:103).

[4] The root is indicated by the √ sign.

Here, I argue that the seed for infixing reduplication can be found in the reduplicated strong roots in Spokane. Specifically, it is the reduction of unstressed vowels that is the smoking gun. The historical CV-prefixing diminutive reduplication (i.e. ˈ$\underline{C_iV}$-√C_iVC)[5] was reinterpretated as infixing -C- reduplication due to the absence of the root vowel (i.e. ˈ$\underline{C_iV}$-√C_i(ə)C > ˈ√C_iV-$\underline{C_i}$-C). What appears to have happened is that the reduplication pattern of the weak roots has leveled toward the pattern of the strong roots in the Northern Interior languages. The question here is why the leveling favored the reduplication pattern of the strong roots, rather than that of the weak. Again, the answer lies in the interaction of stress and vowel deletion. As noted, stress is on the diminutiave prefix when a strong root is reduplicated, while stress is on the weak roots when diminutivized. What is important is that, unlike a strong root, which retains stress on the reduplicant when suffixed (52)a, a weak root is stressless when a variable suffix is present (52)b. Crucially, the vowel of the the weak root is absent.

(52) Diminitivized out-of-control forms in Spokane (Carlson 1989:210)

a.	m'é-m'ɬ'-ɬ'	'A little thing got mixed by accident'
	DIM-mix-OC	
b.	š-šl'-íl'	'Small things got all cut up.'
	DIM-chop-OC	

(52) illustrates what happened what a root undergoes double reduplication (i.e. CV-prefixing diminutive and VC-suffixing out-of-control reduplication). As shown in (52)a,

[5] The root is indicated by the √ sign; the reduplicant is underlined.

stress is on diminutive reduplicant with the strong root /meɬ'/ 'mix' (i.e. ***m'ém'ɬ'ɬ'***), while stress is on the out-of-control suffix with the weak root /šil/ 'chop' (52)b (i.e. *šš**íl'***). What is of particular interests here is that, as illustrated by (52)b, the vowel of the weak root is no longer present, which gives rise to potential ambiguity in the morphological analysis of the diminutive and the root. It is this ambiguity that prompted the reanalysis toward infixing diminutive reduplication. To understand this scenario, a schematic representation of the development of Northern Interior Salsih infixing diminutive reduplication is given in below.

(53) The proposed origin of North Interior Salish infixing diminutive reduplication[6]

	Strong roots	Weak roots	
Stage 1	ˈ$\underline{C_iV}$-√C_iVC-VC	$\underline{C_iV}$-√C_iVC-ˈVC	Pre-Northern Interior Salish
Stage 2	ˈ$\underline{C_iV}$-√C_i(ə)C-(ə)C	$\underline{C_i(ə)}$-ˈ√C_i(ə)C-ˈVC	Vowel reduction/deletion
Stage 3	ˈC_iV$\underline{C_i}$C-C or ˈ$\underline{C_iV}C_i$C-C	$C_i\underline{C_i}$C-ˈVC or $\underline{C_i}C_i$C-ˈVC	Ambiguity between infixing vs. prefixing reduplication
Stage 4	ˈ√C_iV$\underline{C_i}$C-C	ˈ√$C_i\underline{C_i}$C-ˈVC	Leveling toward infixation

Diminutive reduplication in pre-Northern Interior Salish was originally prefixing. The diminutive reduplicant was stressed in the strong roots (Stage 1), causing the root vowel to be reduced or deleted (Stage 2), thus creating an opaque situation where the historical prefixing nature of the diminutive reduplicant is no longer recoverable. This opaque

[6] The reduplicant is underlined here.

situation gave rise to the possibility of an infixing analysis of diminutive reduplication (Stage 3) due to the absence of the root vowel. Crucially, the diminutive form of the weak root is consistent with the infixing analysis. Finally, the infixal pattern won out over the prefixal pattern presumably due to paradigm uniformity effect (e.g., *meɬ'* 'mix' vs. *m'é$\underline{m}$'ɬ'* 'DIM-mix'), similar to what happened in Hausa pluractional reduplication discussed above.

Thus, in this case study, I demonstrate that infixal diminutive reduplication found in the Northern Interior Salish languages are the result of stress-related deletion of the root-vowel. This case study also illustrates that the pathways discussed in this work are not mutually exclusive; the original non-stress-related prefixing reduplication gave rise to infixing reduplication that surface after the stressed vowel. In the next section, other instances of prominence-driven infixation are discussed.

4.2.5 Prosodic stem association

In Chapter 2, I show that some infixes appear adjacent to some prosodically prominent unit, oftentimes a stressed syllable or a stressed foot. One way this type of infix develops is through the mechanism of prosodic stem association. The idea behind prosodic stem association is that such a reanalysis may take place under two scenarios. One possibility is when the placement of a morpheme can be determined by both morphological and prosodic means simultaneously. This analytical ambiguity often results in the selection of either one or both modes of affixation. Examples of simultaneous subcategorizations at the morphological and phonological levels are common in the literature. The German perfective participle, *ge-*, for example, only attaches to stems that begin with a stressed

syllable; Lappish illative plural has two allomorphs: *-ide*, which appears after a stem with an even number of syllables, and *-ida*, which appears after a stem with odd number of syllables (Hargus 1993, Bergsland 1976). P-affixes and infixes, under this view, are really just affixes without any subcategorization requirement stated at the morphological level. A typology of subcategorization types and examples of each type are given in (54).

(54)

Subcategorization	Examples
Morphological (Adfix)	English nominalizing *-ness*
Morphological/Prosodic	English comparative *-er*, Expletive infixation
Prosodic (P-affix & infix)	English *ma*-infixation, Ulwa *ka*-infixation

Here, the following discussion will concentrate on a curious case of prosodic-stem association, namely the case of *ma*-infixation in English. *Ma*-infixation is unique for two reaons. As noted in Chapter 2, this infix differs from the P-affixes in terms of its non-peripherality requirement; *-ma-* can never occur at the edges on the surface. What have been considered thus far were instances of a historical prefix or suffix that got reinterpreted as an infix, a sort of affixal musical chair. While the resemblance between the infix and its historical antecedent might not always be transparent, the historical source is nonetheless a morpheme. The language has no net gain of morphemes as a consequence of the change. As will be demonstrated below, the infix *-ma-* shares no resemblance to any known historical prefix or suffix in English.

4.2.5.1 Homeric infixation in English

As discussed in the previous chapter, *ma*-infixation is a new construction recently introduced into Vernacular American English. A search on the World-Wide-Web resulted in the tokens shown in (55)a. The examples in (55)b were encountered from daily conversations. The meaning of this construction indicates roughly attitudes of sarcasm and distastefulness, although, it can also used as a form of language play.

(55) a. edu-ma-cate
sophisti-ma-cated
syndi-ma-cated
compli-ma-cated
lesser-edge-a-ma-cated
gradu-ma-cated
sitcha-ma-cation

b. Urs(a)-ma-la
vio-ma-lin
edu-ma-cate
saxa-ma-phone

People who are familiar with this construction invariably credit the TV animation series, *The Simpsons*®, particularly the speech of the main character Homer Simpson, for popularizing this construction. Below are some quotes from the animation series:[7]

(56) Homer: Well, honey, what do you like? Tuba-ma-ba? Oba-ma-bo? That one? Saxa-ma-phone?

Homer: A hundred bucks? For a comic book?? Who drew it, Micha-ma-langelo??

(From Johnsy 2003, June 26)

The next section traces the origin of this pattern, in hope that, by so doing, it will help us understand where its non-peripherality comes from.

4.2.5.2 The emergence of *-ma-*

As *ma*-infixation appears to be a colloquialism, it is difficult, if not impossible, to identify the earliest attestation of this construction in the history of English. Here, I propose that *-ma-* emerges out of the accidental convergence among the different filler-word constructions.

In English, when one has a hard time recalling a precise word, name, or phrase, a set of vague, nonsense, filler words are used to fill the gap. A list of such words is given below:

[7] While the introduction of new lexical items or phrases into a language through the media has been observed frequently enough, the Homerian infix is unique as it introduces a morphological construction. The only other instance of new affix introduced by the media is the *-gate* suffix, as in *Water-gate*, *Enron-gate*, Iraq-gate…etc. However, the affix pales in comparison to the introduction of an infix.

(57) Fillers for moments of haste or forgetfulness: Put the *thingummy* on the *whatsit*.

Phrase words based on a question: *whadyamecallit*, *what's-his-name/face*, *whatsit*, *whoosis*

Variants of thing: BrE *thingie*, *thingummy*, BrE *thingummybob* AmE *thingamabob*, BrE *thingummyjig* AmE *thingamajig*, AmE *thinkumthankum*, *chingus*, *dingbat*, *dinglefoozie*, *dingus*, *ringamajiggen*, *ringamajizzer*, *majig*, *majigger*),

extensions of do: *doings*, *doodah*/*doodad*, *doflickety*, *dofunnies*, *doowillie*, *doowhistle*

(From The Oxford Companion to the English Language 1992)

The theory proposed here is that *ma*-infixation emerges out of the accidental resemblance between two sets of these filler words: the variants of thing and the phrase words based on a question.

(58) a. Variant of things:

*thinga**ma**bob, thing**ma**bob, thingumbob, thinga**ma**jig, ringa**ma**jiggen, ringa**ma**jizzer*

b. Phrase words based on a question:

Whatdya**me**calli, whatcha**ma**callit, whatchacallit

As illustrated above, these two sets of filler words/phrases all contain the medial sequence *-ma-*. The source of this sequence is not recoverable from the forms themselves.

The listener, when encountering these sets of words together, drew the conclusion that they are all related by an infix *-ma-* since these words share similar pragmatic meaning of casualness and imprecision. This infix *-ma-* was then extended to other domains to indicate the speaker's casual and noncommittal attitude. It is a small step to extend this usage of *-ma-* to indicate sarcasm.

Given this understanding of how *-ma-* came about, what is important to demonstrate at this point is, first, how these two sets of words are related and, second, what the sources of the sequence *-ma-* in each of these sets are. These questions will be tackled in order. To begin with, the words in (58) are noun phrases. While the forms in (58)b are formally questions, they are in fact treated as noun phrases since they are substituted for the names of either persons or things. These forms were already used interchangeably as early as the seventeenth/ eighteenth centuries (59).

(59) To speak of Mr. What-d'ye-call-him, or Mrs. Thingum, or How-d'ye-call-her, is excessively awkward and ordinary. (**1741** CHESTERFIELD *Let. to Son* 6 Aug.)

He would answer...To 'What-you-may-call-um?' or 'What-was-his-name!' But especially 'Thingum-a-jig!' (**1876** L. CARROLL *Hunting of Snark* I. ix)

The quote from Lewis Carroll's *Hunting of Snark* also illustrates the source of the *-ma-* sequence in both *whatchamacallum* and *thingamajig*. The *-ma-* in *whatchi**ma**callum* comes from the word 'may' in 'what you may call him'. In contrast with *whatchacallum*

'what you call him', *whatcha**ma**callum* would appear as if there is an inserted extra syllable *ma*.

The *ma* sequence in *thingu**ma**jig*, on the other hand, is a reanalysis of the last consonant of the word *thingum* and the excrescent vowel between *thingum* and the word *jig*. The fact that *thing* and *thingy* exist as words in English might have prompted someone to analyze *thingumajig* as *thingy-**ma**-jig*. This reanalysis is likely to be strengthened by the possible alternative pronunciation of *thingamabob* as *thingmabob* (thus possibly analyzed as *thing-ma-bob*).

What might have further facilitated the creation of the *-ma-* infix, besides that these words have similar meanings, is the fact that they also have similar stress patterns. In both *whatchamacallit* and *thingumabob*, *-ma-* appears between two metrical feet (i.e. (ˈ*whatcha*)*ma*(ˌ*callit*) and (ˈ*thingu*)*ma*(ˌ*bob*)), which again could have been perceived as non-accidental, hence the extraction of a *-ma-* morpheme. What is crucial here is the fact that the reanalysis is prompted by the inability to recover the placement of a morpheme through segmental means. In lieu of that, some prosodic units were instead identified as the pivot of affixation. In this case, a disyllabic trochee is identified as the pivot. Again, the listener's inability to identify a reliable segmental pivot is the key here. In *whatchamacallit*, roughly transcribed as [wʌ(tˀ)tʃəməcɑlitˀ], *-ma-* was flanked by four to five segments to its left and five segments to its right, while in *thingumajig* [θɪŋəmədʒɪg], *-ma-* is flanked by four segments to its left and three segments to its right. What appears to the right or the left is not constant, segmentally speaking. However, prosodically, both the left and the right can be characterized metrically.

The emergence of the Homeric infix elucidates one of the earlier puzzles. Chapter 2 advances the view that there are actually two types of 'infixes'. The majority of the so-called 'infixes' are really P-adfixes. That is, prefixes or suffixes that subcategorize for a phonological unit, rather than a morphological one. However, genuine infixes do exist, as in the case of the Homeric infix. Genuine infixes differ from P-adfixes, in their non-peripherality requirement absent in P-adfixes. The diachronic typology reveals the reason behind this apparent dichotomy. P-adfixes originate from historical morphological adfixes, while genuine infixes originate internally. At the stage of reanalysis, the P-adfixes, which are historically peripheral, naturally surface at the edges. Thus, speakers have no reason to assert non-peripherality for affix placement purposes. Genuine infixes, on the other hand, never surface at the edge. The lack of evidence of peripherality and the consistent prosodic characterization of the pivots on both sides produce the synchronic situation of genuine infixation.

4.2.6 Discussion: 'An apple never falls far from the tree'

This chapter sets out to examine the developmental pathways of infixes in hope that the sources of infixes might shed light on their synchronic distributional properties. Particualrly, I advance the theory of EXOTI, which argues that all edge-oriented infixes originate from historical prefixes or suffixes.

At first glance, the different ways that infixes come about seem as diverse as the variety of infixes themselves. There are instances of entrapment, phonetic metathesis, reduplication mutation, and prosodic stem association. However, as predicted by EXOTI, it is observed that infixes came from historical adfixes in general, that is, affixes at

peripheral positions. *An apple never falls far from the tree*; given the adfixal origin of infixes, it is not surprising that infixes have an edge-oriented profile also. For example, much research on morphologization and grammaticalization (e.g., Bybee 1985) has shown that grammatical morphemes tend to be small, mainly due to reduction in stress and prominence. An infix resulted from entrapment is unlikely to appear deep inside the stem since the prefix or suffix that fused with the root/stem are unlikely to be much larger than a syllable either; as illustrated by the infixes in the Muskogean languages, the pivots referred to by the infixes were themselves historical grammatical prefixes (e.g., the first vowel/syllable pivot < historical plural *ho- and applicative *a- prefixes) and suffixes (e.g., the final syllable pivot < historical post-verbal auxiliaries *ka, *li, *ci). Infixes resulted from reduplication mutation do not vie far from the edges either since the 'mutation' takes place within the reduplicant or around the reduplicant/base boundary. Similarly, when a prefix or a suffix metathesized to become an infix (e.g., Lepcha transitive *-j-* infixation), the resulting infix is likely to remain close to one of edges of the stem given the fact that the majority of metathesis is local. Even if metathesis were long distance, the transposing segments tend to shift into relatively prominent positions (i.e. initial or stressed) but not into less prominent ones (Blevins and Garrett to appear). For example, in South Italian dialects of Greek, prevocalic *r* or *l* in a non-initial syllable has been transposed into the initial syllable.[8]

[8] This metathesis only occurs when the liquid was positioned after an obstruent, when the initial syallble had a prevocalic non-coronal obstruent, and when the liquid was *r* and the initial syllable had a prevocalic *t*.

(60)

Classical Greek	South Italian Greek	(Rohlfs 1924: 15-16, 1933: 19; taken from Blevins & Garrett to appear)
*bót^{h}**r**akos	v**r**úθako	'frog'
gamb**r**ós	g**r**ambó	'son-in-law'
kóp**r**os	k**r**ópo	'dung'
past**r**ikós	p**r**ástiko	'clean'
kapíst**r**ion	k**r**apísti	'halter'
pédik**l**on	p**l**étiko	'fetter'

Crucially, the set of prominent positions targeted by long distance metathesis is within the set of potential infixal pivots.

4.3 Conclusion

This chapter begins with the typological observation that the set of locations where an infix might appear is surprisingly small. In the last chapter, I show that no previous theories of infixation are adequate in covering the full range of data and advance the theory of Generalized Phonological Subcategorization as an alternative. However, as noted, GPS may seem excessively powerful and unrestrictive since it provides no mechanism to restrict the range of possible infixation patterns to just those that appear close to the periphery or near some sort of a prominence. In this chapter, I argue that the range of attested pivots is bounded by the force of history. That is, infixes predominately came from historical prefixes and suffixes. As pointed out in the beginning of this chapter, the set of infixal pivots coincides with the set of psycholinguistically and

acquisitionally prominent positions. This factor might have contributed to the maintainence of infixes in these positions.

A recurring theme in theoretical discussions of phonology, and elsewhere, centers on the issue of how the formalism proposed is explanatorily adequate (Chomsky 1986). That is, besides arriving at a formalism that describes what happens, many linguists consider it imperative to also restrict the formalism to capture why the phenomenon unfolds only the way it does.

While EXOTI provides the external motivation needed to constrain the nature of morphological change, which, in turns, derive the typology of infix pivots, from the perspective of the generative notion of explanatory adequacy, these conditions, which reside outside of the formalism of GPS, cannot be said to be 'constraining' the formalism *per se*. Nothing in the formalism itself encodes EXOTI directly, for example. Thus, GPS remains explanatorily inadequate, in the sense of Chomsky 1986, since it does not derive only those infix patterns that are attested in the worlds' languages. However, instead of rejecting the theory, I propose that one should actually embrace this prediction of GPS. Pivots such as 'the 3rd vowel' are not found because the scenario one would need for someone to treat the 3rd vowel as a viable pivot is not easily obtained. However, it is not impossible to imagine a language with a 4-syllable root/stem-size requirement. In such a language, it is plausible for someone to posit a pivot that is the 3rd vowel since the 3rd vowel is always there. The formal system has no business in ruling out this possibility *a priori*.[9] Anderson (1988) appeals to similar reasoning:

[9] The apparent non-occurrence of '3rd syllable' pivot might also be due to the fact that such a pivot could be analyzed in the reverse. That is, given a language with, say, a two-disyllabic feet minimal word-size requirement, a potential '3rd syllable' pivot from the left might also be analyzed as a monosyllabic pivot on the right edge. The real question here is why languages tend to single out pivots that are shorter than a

> 'Allowing one part of the grammar to 'overgenerate' in the context of constraints imposed by its interaction with other areas [i.e. morphological change, AY] often makes it possible to bring order and coherence to each independently – order and coherence that would be impossible if the principles determining the range of possible phenomena in each part of the grammar had to be limited to statements internal to that domain alone. Such a modular conception of grammar thus seems in many cases the only path to a constrained account. (p. 325)'

Many researchers have voiced similar opinions recently (e.g., Dolbey & Hansson 1999, Hale and Reiss 1999 & 2000, Hyman 2000, Kavitskaya 2001, Barnes 2002). They contend that, while the formal system should model productive grammatical effects should provide, UG-specific explanations should be appealed to only when a phenomenon cannot be accounted for by psychological or historical means. A useful analogy is the relationship between mathematics and physics (and the other physical and biological sciences for that matter). Mathematics, which provides the formalism (e.g., arithmetic, geometry, set theory, calculus etc.), does not *a priori* rule out what the possible physical universes should look like or how these universes should operate. Such is the job of the physicist, who examines the physical world and comes up with reasons why things must be the way they are. The physicist uses mathematics to construct formal systems to represent the physical world. She (the physicist) does not ask the mathematician why the formalism does not rule out equations such as $E=Mc^4$ (i.e. what is

syllabic foot. Some researchers have, for example, asserted that the linguistic system is incapable of counting higher up than two.

allowed and 'predicted' by the formalism) and only predict $E=Mc^2$ (i.e. what is actually found). Such questions are absurd and meaningless.

In conclusion, I propose to explain the placement typology of infixes by appealing to these infixes's histories. The resulting infixal pivots are strengthened by the fact that they are psycholinguistically salient, thus more easily identified and preserved.

Chapter 5: Epilogue

This study began with a catalogue of the placement properties of infixation in Chapter 1, showing that there is a bias for infixes to target edge constituents. This edge bias was explained in Chapter 4 in terms of the Exogenesis Theory of Infixation, which advocates the view that edge infixes originate from historical prefixes and suffixes; an infix's original peripheral position is reflected in its edge profile today. A synchronic theory of infixation, Generalized Phonological Subcategorization (GPS), which allows non-prosodic units to enter into subcategorization relations, was proposed in Chapter 2 to encode the subcategorization requirement of an infix. Past theories of infixation were reviewed also in Chapter 2, with particular attention focused on the Hybrid Models which account for the prominence-driven infixes in terms of Prosodic Subcategorization while promoting Displacement Theory (DT) as a mean to explain the distribution of the edge-oriented infixes. Arguments on both theoretical and empirical grounds were summoned against DT's view that edge-infixes result from the movement of an underlying prefix or suffix acquiescing to certain phonological or morphological constraints. I advanced the Subcategorization Non-violability Hypothesis (SNH), epitomized in the universal constraint ranking schema, M_{ALIGN} >> P, in Chapter 3 to supplement GPS by restricting the way morphological subcategorization requirement interacts with phonological

constraints in the grammar; coerced affix movement (i.e. DT) is ruled out by virtue of the fact that constraints on morphological subcategorization must outrank all phonological constraints.

(1) Summary of proposals advanced in this work

Formalism	Generalized Phonological Subcategorization (GPS)
Explanation of the edge-bias	Exogenesis Theory of Infixation (EXOTI)
Provision against coerced morpheme movement (e.g., DT)	Subcategorization Non-violability Hypothesis: M_{ALIGN} >> P

There are several aspects of the SNH that could benefit from further inquiry. First, I have been assuming that the Subcategorization Non-violability Hypothesis derives from a universal constraint ranking, M_{ALIGN} >> P, which prevents subcategorization constraints from being violated for the purpose of satisfying constraints on the phonology of the language. Thus, M_{ALIGN} >> P allows the possibility of conflict between competing subcategorization requirements (i.e. M_1 >> M_2). Further investigations might reveal whether such a scenario is needed at all; if subcategorization constraints were non-violable across the board, it might be better to relegate such constraints to the CONTROL component (Orgun & Sprouse 1999).

Further research is also required to elucidate the range of repair strategies available for resolving conflicts between phonological demands and the SNH. The case studies in

Chapter 3 show that morpheme fusion (i.e. Atayal *-m-* infixation) and fission (i.e. Homeric infixation-induced phonological reduplication) are possible. It would be worthwhile to expand on this set of repair strategies, analogous to those catalogued in Pater 1999 for the *NÇ constraint.

In the remainder of this chapter, I provide some discussions on other typological properties of infixation that are revealed in the survey and offer suggestions on various aspects of infixation that warrant further examination in the future. This chapter is organized as follows: Section 5.1 addresses the issue of the phonological characteristics of both the fixed segment infixes and the internal reduplicants. Section 5.2 looks at the semantic typology of infixation. Section 5.3 considers the areal typology of infixation. Finally, section 5.4 contrasts infixation with endocliticization, suggesting possible connections between these two phenomena.

5.1 The phonology of infixation

The phonological content of an infix shows a curious bias toward consonantal sonorants, particularly nasal and liquid (see also Ultan 1975 and Moravcsik 2000). Out of eighty-seven cases of fixed segment infixation, sixty involve nasals and liquids. Even if all the cognates of the Austronesian *-um-* and *-in-* and the Austro-Asiatic *-Vn-/-Vr-* infixes are factored out, there remain thirty instances of infixation involving a consonantal sonorant (34%), contrasting with fourteen cases involving stops (16%) and only seven cases of vowel-only infixation (8%).

(2)

Infixes involving:	**Cases**	**Percentage**
Nasal	36 (19 from Austronesian; 6 from Austro-Asiatic)	41%
Liquid	24 (5 from Austronesian)	28%
Oral stop	14	16%
Fricative	9	10%
Affricate	3	3%
Vowel only	7	8%

The relatively high-frequency[1] of infixation involving liquids might be partly explained by the proclivity for liquid metathesis to occur in the world's languages (Blevins & Garrett In press). However, no such explanation is available for nasals. While nasals are among the set of segments with long phonetic features, it is unclear whether nasal metathesis is particularly common in the world's languages. Thus, the source of this bias toward infixes involving nasal is unknown at this point.

Let us now turn to the shape of the internal reduplicants. The predominant type of internal reduplicant is CV, which accounts for twenty-two out of the fifty-four cases of internal reduplication (41%). The least common type of infixation is V-reduplication; only one case is found.

[1] The frequency comparison here is based on the idea that, all else being equal, each type of manner of articulation (i.e. stop, fricative, nasal, liquid, glide, & vowel) should be equally represented in the database; each manner type should be involved in 17% of a given corpus of infixation pattern. Since there are eighty-seven cases of fixed segment infixation, one would expect only around fourteen cases of infixation involving a liquid, for example.

(3)

Reduplicant type	Cases	Percentages
C	8	15%
V	1	2%
CV	22	41%
CVC	5	9%
VC(C)	10	19%
More than a σ	8	15%
Total:	54	

The fact that CV reduplicant is common among the set of internal reduplicants is not at all surprising. Many scholars have observed that reduplication tends to involve less elaborate syllable structure than is allowed in the language (e.g., Steriade 1988, McCarthy & Prince 1993b), therefore, the prevalence of CV reduplication found here is not likely to be an infixation-specific effect. Thus, there does not appear to be any phonological generalization that can be drawn here regarding any asymmetry in terms of the shape of an internal reduplicant. The next section moves away from the discussion of the morpho-phonology of infixation and briefly addresses the issues of the semantic typology of infixation.

5.2 Semantic bias toward pluractionality

Perhaps not surprisingly the majority of the internal reduplication cases signify plural in the nominal and verbal domains, intensification, diminutive, and durative aspect; these functions are characteristics of reduplication in general. The semantic function of fixed

infixation is rather more diverse. Some of the more common functions of fixed infixation are nominalization, gender/number/person markers, passives, and possessives. Curiously, of the eighty-seven instances of fixed segment infixation, twenty-two of them (i.e. more than 25%) functions as diminutive, plural, and related pluractional effects (e.g., durative, intensive, frequentative etc.). Possible explanation for this skewing might be attributed to the fact that reduplication mutation may give rise to fixed segment infixation, as established in Chapter 4. The unidirectionality of this change is significant. Fixed segment infixation does not give rise to internal reduplication, thus, the range of the semantic function of internal reduplication remains rather homogeneous. On the other hand, since internal reduplication is typically associated with plurality and related effects, when a pattern of internal reduplication gives rise to fixed segment infixation, the resultant infix naturally reflects the original function of the internal reduplicant.

(4) Summary of semantic function of infixes

Fixed infixes

Agreement markers (person, gender, number, focus), possessives, completive, intensification, nominalizer, diminutive, distributive, durative, expletive, frequentative, perfective/imperfective, intransitivizer, passive, negation, past, verbal/nominal plural, reflexive/reciprocal, resulting state, verbalizer

Internal reduplication

Intensification/augmentative, aorist, durative, verbal/nominal plural, frequentative

Four general categories emerge from this typology: agreement markers (including possessives), aspectual markers, pluralization (both the nominal and verbal domains, and its associated effects, such as intensification, diminutivization, distributivity), and derivational morphology (nominalization, verbalization, intransivization). The lack of certain morphosyntactic categories is also important here. For example, case markers are missing in the typology. From the perspective of entrapment, this gap may be attributed to two factors. First, entrapment tends to take place in the verbal rather than the nominal domains. Thus, given that case marking is generally in the nominal domain, entrapment of a case marker due to the fusion of free roots analogous to verb plus auxiliary fusion is highly unlikely. The fusion of a nominal compound is of course possible. However, compound-internal affixation is rare (e.g., *commander**s**-in-chief*), thus also not likely to give rise to entrapment. The absence of case marking infix could also be attributed to the fact that case markers tend to be the outermost affix in a language (see Greenberg 1966b). Given the fact that the chance of a case marker sandwiched between the root and some outer affix is slim, the opportunity for entrapment of case markers is proportionally diminished as well.

Earlier typological studies of infixation (Ultan 1975, Bybee 1985, Moravcik 2000) found that infixes are largely derivational. Broadly speaking, inflectional morphology is morphology relevant to syntax (e.g., agreement, nominal plural etc.), while derivational morphology is morphology that is semantic/category changing (e.g., nominalization, passivization, pluractionality etc.). This observation is confirmed here as well. As seen below, derivational infixation is almost three times as common as inflectional infixation.

(5)

	Derivational	Inflectional
Fixed segment infixation	59	28
Internal reduplication	45	9
Total	104	37

The fact that derivational morphology participates in infixation much more often than inflectional morphology might be related to the fact that derivational morphology is generally found closer to the root than inflectional ones (Bybee 1985). Thus, when a derivational morpheme is entrapped or metathesized, it is more likely to appear within the root.

5.3 Infixation as an areal feature?

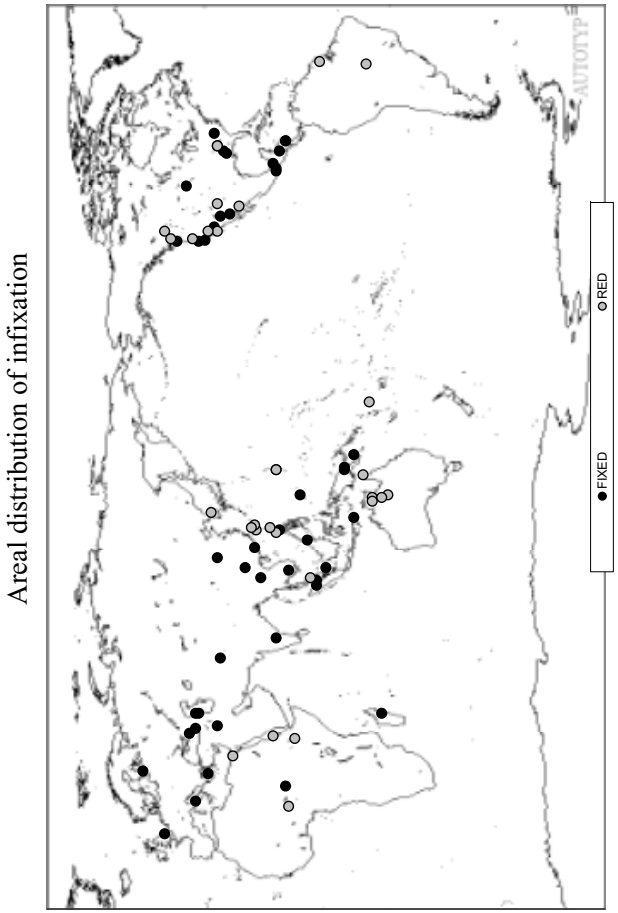
A look at the areal distribution of the attested infixation cases in the database reveals some interesting disparity. The map in (6) shows the distribution of attested infixation patterns (i.e. only positive identification is reported). No attempt is made here to summarize the distribution of languages without infixation.

The topographic representation of infix distribution shows that infixes are heavily concentrated in three main regions of the world, namely, the Pacific Rim, Central/North America and Africa. The fact that the Pacific Rim is an area with intense concentration of infixation is likely a reflection of the predominance of Austronesian and Austro-Asiatic languages in this region; however, the relative density of infixation along the Pacific Coast of Central and North Americas remains to be explained. Nichols 1992 suggests that

the Pacific Rim forms a single typological area; the relative concentration of infixes in this area is consistent with Nichols' proposal.

The scarcity of infixation in northern/central Europe, South America, and Northern/Central/South Asia is also curious. The fact that northern Europe and Northern and Central Asia region is populated predominately by the so-called Altaic languages, which are characteristically agglutinative with rather transparent morphology, might have contributed to this void of infixation. The general lack of examples of infixation from the South America region might be the result of several confounding factors. To begin with, the South American languages are generally less well-documented than the North American and Central American languages. The recent increase of linguistic interests in that part of the Americas might yield additional cases of infixation in the future. On the other hand, this state of affair could be a reflection of an areal bias against infixation in this region of the world, analogous to what is found in Northern Europe and Northern/Central Asia. Further research will hopefully elucidate this question.

(6) A map of the geographic distribution of fixed infixation, internal reduplication and endocliticization.



5.4 Formal similarity between infixes and endoclisis

Endoclisis can be defined as the insertion of a prosodically-dependent syntactic element inside a root or a stem. *A priori*, one would expect that endoclitics might give rise to infixation, given the common slogan that yesterday's syntax is today's morphology (e.g., Givón 1971). Yet, as seen in Chapter 4, none of the pathways relies on positing an intermediate endoclitic stage before the development of an infix. In this final section, I briefly discuss the possible connection between endoclitics and infixes.

Clitics can be broadly defined as a class of linguistic units that are phonologically dependent on some other prosodically independent units. Following the diagnostic conditions that were laid out in Zwicky and Pullum (1983), clitics must satisfy the majority, if not all, of the following criteria:

(7)
A. Clitics can exhibit a low degree of selection with respect to their hosts, while affixes exhibit a high degree of selection with respect to their stems.
B. Arbitrary gaps in the set of combinations are more characteristic of affixed words than of clitic groups.
C. Morphological idiosyncrasies are more characteristic of affixed words than of clitic groups.
D. Semantic idiosyncrasies are more characteristic of affixed words than of clitic groups.
E. Syntactic rules can affect affixed words, but cannot affect clitic groups.
F. Clitics can attach to material already containing clitics, but affixes cannot.

The treatment of clitics has traditionally fallen within the domain of syntax. However, Anderson (1992) explicitly argues for the view that clitics should be treated as phrasal affixes. Besides the syntactic arguments in favor of a morphological treatment of clitics, he also points out the parallelism between regular affixation and cliticization. Specifically, he observes that, not only are there prefixing and suffixing counterparts of affixation in clitics, infixation of a clitic is also possible. Let us begin with the well-known case of Serbo-Croatian to illustrate some of the infixing characteristic of clitics (data taken from Anderson 2000:308).

(8) Moja **-će** mladja sestra doći u utorak
my FUT younger sister come on Tuesday
'My younger sister will come on Tuesday'

Moja mladja sestra **-će** doći u utorak
My younger soster FUT come on Tuesday
'My younger sister will come on Tuesday'

Lav **-je** Tolstoi veliki ruski pisac
Leo is Tolstoi great Russian writer
'Leo Tolstoy is a great Russian writer'

Lav Tolstoi **-je** veliki ruski pisac
Leo Tolstoi is great Russian writer

‘Leo Tolstoy is a great Russian writer’

The clitics, shown in bold face, are instances of the so-called second position clitics, which generally appear after an initial syntactic constituent. The point of interest here is that, at least for some speakers, these clitics can appear after the initial word--irrespective of constituent unity, as it intrudes within a syntactic phrase. The infixing character of clitics, however, is best illustrated when the clitic surfaces within a root. Two examples of reported endocliticization are found in the literature: Pashto and Udi. Let us begin with an illustration from Udi, a Lezgic language of the Nakh-Daghestanian family. There are three sets of clitic pronouns (i.e. (P)ronominal (M)arker) in Udi. The most frequently used set is reproduced below (data from Harris 2000:595):

(9)

	Clitic PMs	Independent pronouns
1SG	-zu, -z	zu
2SG	-nu, -n, -ru, -lu	un
3SG	-ne, -le, -re, -n	meno, kano, šeno
1PL	-yan	yan
2PL	-nan, -ran, -lan	vạn, efạn
3PL	-q’un	met’oɣon, kat’oɣon, šet’oɣon

In most TAM categories (present, imperfect, aorist I, aorist II, perfect, particle conditional, future I, conditional I) PMs appear in a complex verb stem, occurring between the so-called incorporate category and the light verb (10).

(10) zavod-a aš-**ne**-b-sa

factory-DAT work-**3SG**-do-PRES

‘She works in a factory.’

nana-na bụɣa-**ne**-b-e p’ạ ačik’alšey

mother-ERG find-**3SG**-do-AORII two toy

The alleged intruding element is sandwiched between two morphologically distinct elements. When the verbs are monomorphemic, the PM appears immediately before the final segment of the verb stem (11). In the examples below, the root is given first, followed by the endocliticized example (Examples taken from Harris 2000:598-599).

(11) aq’- ‘take receive’

kaɣuz-ax a-**z**-q’-e

letter-DAT receive1-**1SG**-receive2-AORII

‘I received the letter’

bašq- ‘steal’

q’ačaɣ-ɣ-on bez täginax baš-**q’un**-q’-e

thief-PL-ERG my money $steal_1$-**3PL**-$steal_2$-AORII

‘Thieves stole my money’

bak ‘be, become; be possible’

ba-**ne**-k-sa sa paščʼaɣ-kʼena adamar

be$_1$-**3SG**-be$_2$-PRES one king-like person.ABSL

Let us now turn to endocliticization in Pashto, an Indo-Iranian language spoken mainly in Afghanistan, and the neighboring regions. The clitics of interest here are also second position clitics and their functions and forms are given below:

(12) Pashto Group I clitics (Tegey 1977:81)

Pronominal ergative, accusative, genitive clitics

me	1st singular
de	2nd singular
ye	3rd singular and plural
am	1st and 2nd plural
mo	1st and 2nd plural

Model Clitics

ba	will, might, must, should, may
de	should, had, better, let

Adverbial clitics

xo	indeed, really, of course
no	then

As mentioned earlier, these are second position clitics, which means they appear after an initial constituent of some sort. The clitics always appear after the verb in sentences beginning with a C-initial verb, regardless of where stress is located on the verb.

(13) Source: Tegey 1977:88

sɑtə́m	**ye**	sɑ́təm	**ye**[2]
keep	it	keep	it
‘I keep it’		‘I keep it.’	

pərebdə́	**me**	pə́rebdə	**me**
beat	I	beat	I
‘I was beating him’		‘I was beating him’	

However, when the verb is /a/-initial, the clitics can appear either in post-verbal position or infixed within the root. Infixation is allowed only when the verb has initial stress. When stress appears elsewhere, the clitics must appear after the verb.

(14) Source: Tegey 1977:89

axistə́lə	**me**	á-**me**-xistələ
buy		
‘I was buying them’		‘I was buying them’

[2] It is unclear from Tegey’s discussion what effect the change in stress has here. In other cases, the shift in stress could signify perfectivity (e.g., Tegey 1977:92).

ağustə́	**me**	á-**me**-ğustə
wear	I	
‘I was wearing it’		‘I was wearing it’

The relevance of stress in the placement of clitics is most transparent when the verbs in questions are from Class-II. The clitics must appear after a Class-II imperfective verb, which is marked by either ultimate or penultimate stress.

(15)

a.	ṭel-wɑhə́	**me**	b. pɑcedə́le	**ba**
	push	I	get up	would
	‘I was pushing it’		‘You would get up.’	
	ṭak-ɑhə́	**me**	bɑylodə́	**me**
			lose	I
	‘I was shaking it’		‘I was losing it’	
	pore-westə́	**me**	bowə́	**de**
			take	you
	‘I was carrying it across’		‘You were taking it’	

Perfective verbs are marked by its initial stress, and the clitics appears after the initial morpheme if a morpheme boundary is available (16)a; otherwise, after the initial syllable (16)b.

(16)

a.	ṭél-**me**-wɑhə	b.	pá**ba**cedə́le
	‘I pushed it’		‘You would get up.’
	ṭák-**me**-ɑhə		báy**me**lodə
	‘I shook it’		‘I was losing it’
	póre-**me**-westə		bó**de**tə
	‘I carried it across’		‘You were taking it’

A pattern seems to be emerging. Besides the placement of second position clitics, there are three other possible locations for Pashto clitics. First, Group I clitics can come after the initial word, which is a possible location for second position clitics, as in Serbo-Croatia. They can also appear after the stressed syllable, suggesting that the stressed syllable is also a pivot for endoclticization, similar to affixal infixation. More curious, however, is when clitics appear after the initial morpheme. This placement is not expected for two reasons. To begin with, it has often been observed that the internal morphological structure of a stem does not play a role in affixation, an observation formalized by Di Sciullo and Williams (1987) as the Lexical Integrity Hypothesis:

(17) Lexical Integrity Hypothesis (Di Sciullo and Williams 1987:49)

Words are 'atomic' at the level of phrasal syntax and phrasal semantics. The words have 'features', or properties, but these features have no structure, and the relation of these features to the internal composition of the word cannot be relevant in syntax – this is the thesis of the atomicity of words, or the lexical integrity hypothesis, or the strong lexicalist hypothesis.

The fact that the placement of a clitic should require morpheme boundary information clearly violates this hypothesis. More to the point, however, is that under most theories of grammar cliticization is treated as a post-lexical phenomenon. The fact that the placement of a clitic may refer to morpheme boundary is extremely puzzling, and also highlights a potential difference between endoclitics and infixes. The internal structure of a word does not play a role in determining the location of an infix. If endoclitics were indeed similar to infixes, then one might expect that the endoclitics to respect the Lexical Integrity Hypothesis too.

Despite this potential divergence, the general distribution of endoclitics is indeed not very different from infixation (cf. Anderson 1992, Anderson 2000, Legendre 2000). In the case of Udi, the pivot is identified as the root vowel, which could be characterized as initial or final. Pashto endoclitics appear to the right of the stressed syllable, when stress plays a role at all. While fixed segment infixation after a stressed syllable is rather rare as discussed in Chapter 1, nonetheless, both of endocliticization pivots are independently motivated for affixal infixation. Further research on encliticization might reveal fruitful results in the future.

Appendix I

Sampling procedures

In any large-scale typological study, the methodology of sample selection and coding is critical for the ultimate validity of any claims of universality derived from the data. Given the relative scarcity of infixation in the world's languages, the main guiding principle in compiling this database is a "the more the merrier" strategy. This methodological choice has led to certain unavoidable impasses where arbitrary decisions were made. Here, I will lay them out here as clearly as possible, in the hope that the reader will be sufficiently informed in order to avoid potential confusion.

Since infixes, more often than not, occupy a relatively small corner of most grammatical descriptions, the thoroughness of their treatment often leaves much to be desired. Thus, I have established a minimal requirement for an infixation pattern to be included in the database: the infixation construction's level of description must be sufficient to address the majority of the main coding categories in the database (i.e. language name, infix shape, infix location, and examples). Wherever information is available, basic facts regarding word order, stress assignment, and semantic import of the infix are also recorded. The sources come chiefly from reference grammars, teaching grammars, journal articles and entries in language handbooks. These materials tend to emphasize the form of the infix, but give few details regarding the meaning and productivity of the construction.

While data from secondary sources, such as short illustrations given in the theoretical literature, are included, I have made an effort to confirm the data from the original source when possible. Patterns where the original source was unavailable were included in the database only if enough data provided in the secondary source to support the description given.

The genetic affiliation information of each language recorded is based on the web edition of the Ethnologue, published by the Summer Institute of Linguistics. The Ethnologue is employed here mainly for its comprehensiveness and its easy searchable database.

No *a priori* attempt was made to form a genetically balanced database, partly because of the relative scarcity of data, but this situation is not as problematic as it might seem. While a set of infixation patterns might come from the same historical source, their synchronic manifestations, more often than not, diverge quite markedly across the daughter languages. The infix *-um-* found in the many languages of the Austronesian family is a case in point. Despite the fact that the function of this infix varies dramatically across the daughter languages, it is well established that this infix must be reconstructed

in Proto-Austronesian (Dahl 1976). This infix invariably appears toward the left edge of the stem. However, languages differ on the treatment when a root contains an initial onset cluster. Consider the following data from three Austronesian languages, Atayal, Chamorro, and Tagalog.

(1) Atayal animate actor focus (Egerod 1965:263-6)

qul	q**m**ul	'snatch'
kat	k**m**at	'bite'
kuu	k**m**uu	'too tired, not in the mood'
hŋuʔ	h**m**ŋuʔ	'soak'
skziap	k**m**ziap	'catch'
sbil	s**m**bil	'leave behind'

Chamorro verbalizer, actor focus (Topping 1973:185)

gupu 'to fly'	g**um**upu i paharu	'the bird flew'
tristi 'sad'	tr**um**isti	'becomes sad'

Tagalog focus construction (Orgun and Sprouse 1999)

gradwet	gr**um**adwet	~	g**um**radwet	'to graduate'
plantsa	pl**um**antsa	~	p**um**lantsa	'iron'
preno	pr**um**eno	~	p**um**reno	'to brake'

A quick comparison between three daughter languages of Austronesian family reveals several interesting observations. The infix surfaces variably across these languages, namely, as *-m-* in Atayal, but as *-um-* in Chamorro and Tagalog. The distributional variation of the infix is more striking, however. In Atayal, *-m-* appears invariably after the first consonant.[1] In Chamorro, *-um-* appears after the initial onset cluster. More curious is what one finds in Tagalog, where the infix can appear either after the initial consonant or after the onset cluster.

Many more intriguing variations in the appearance and distribution of historically related infixes are found within typologically and genetically distinct language families. Thus, the inclusion of these related languages does not confound the validity of this study, only enriches the database further. It should be noted that, while no conscious attempt was made to develop a genetically balanced and representative database, the ultimate corpus nevertheless contains languages from twenty-five language phyla from all major geographic areas. The summary of the genetic affiliation of languages with infixation is given below. A graphic representation of the geographic distribution of infixation appears in Chapter 5, where the areal typology of infixation is discussed.

[1] The full story of Atayal *-m-* infixation is much more complicated than can be presented at this juncture. The information not discussed here, however, mainly pertains to the realization of the infix, not its distribution (see Chapter 3 for a detailed treatment).

(2) Summary of the genetic affiliation of languages with infixation

	Phylum	No.	Languages
1.	Afro-Asiatic	9	Akkadian, Bole, Hausa, Syrian Arabic, Amharic, Harari, Levantine Arabic, Tigre, Tigrinya
2.	Algic	1	Yurok
3.	Altaic	1	Korean
4.	Australian	7	Bunuba, Djingili, Kugu Nganhcara, Mangarayi, Uradhi, Wardaman, Yir Yoront
5.	Austro-Asiatic	7	Chrau, Kamhmuʔ, Katu, Mlabri, Surin Khmer, Temiar, Kentakbong
6.	Austronesian	25	Acehnese, Amis, Atayal, Chamorro, Ferhan Tetun, Kadazan, Kiriwina/ Kilivila, Leti, Malagasy, Nakanai, Paiwan, Palauan, Pangasinan, Pazeh, Samoan, Sundanese, Tagalog, Thao, Toba Batak, Toratan, West Tarangan, Nakanai, Timugon Murut, West Tarangan, Trukese
7.	Carib	1	Tiriyo
8.	Chimakuan	1	Quileute
9.	Hokan	7	Kashaya Pomo, Kiliwa, Maricopa, Mojave, Yuma, Ineseño Chumash, Washo
10.	Huavean	1	Huave
11.	IE	3	English, Greek, Sanskrit
12.	Mayan	3	Chontal, Tzeltal, Tzutujil
13.	Misumalpan	2	Miskito, Ulwa
14.	Mixe-Zoque	1	Zoque
15.	Muskogean	6	Alabama, Choctaw, Koasati, Creek, Mikasuki, Chickasaw
16.	Nakh-Daghestanian	4	Archi, Budukh, Hunzib, Rutul
17.	Niger-Congo	5	Birom, KiChaga, IsiXhosa, Kinande, SiSwati, Noni
18.	Penutian	1	Takelma
19.	Salishan	5	Colville, Lushootseed, Shuswap, Thompson, Lilloet
20.	Sino-Tibetan	4	Cantonese, Lepcha, Peking Mandarin, Pingding Mandarin
21.	Siouan	1	Dakota
22.	Trans-New Guinea	3	Hua, Yagaria, Nabak
23.	Tupi	1	Kamaiurá,
24.	Uto-Aztecan	1	Sonora Yaqui
25.	Isolate	1	Zuni
		101	

Appendix II: Database of Fixed Segment Infixation (Arranged by language names)

LANGUAGE	INFIX	LOCATION	FUNCTION	PHYLUM	EXAMPLES	SOURCES
Akkadian	-ta-, -t-	after 1st C or first V	reflexive/ reciprocal	Afro-Asiatic: Semitic	ishriq 'he stole'/ish**t**ariq 'he stole for himself' paraesum 'to separate' iparras 'he separates. PRES' ip**ta**rras 'he separated. PERF'	Marcus 1978, Whaley 1997
Acehnese	-eum-	after 1st C (do not infix in forms more than three syllables long)	intransitive	Austronesian: Malayo-Polynesian	plah 'to split' p-**eum**-lah → s-**eum**-eulah (by eu epentheis; note also p → s dissimilation) p-**eum**-plah → s-**eum**-uplah (by eu epenthesis and reduplication; note also meu → mu assimilation and p → s dissimilation)	Durie 1985
Alabama	-h-	before final syllable	an increase in degree of the quality expressed by the verb	Muskogean: Eastern	kano 'be good'/ ka**h**no 'be better' kasatka 'be cold'/ kasa**h**ka 'be colder'	Hardy & Montler 1988:386, Moravcsik 2000
Alabama	-il-, -li-, -l-	before final syllable (but also before final CCV)	1st person plural	Muskogean: Eastern	pa 'eat' /**il**pa 'we eat' coopa 'buy'/coo**l**pa 'we buy' takco 'rope'/ta**li**kco 'we rope'	Montler & Hardy 1990
Alabama	-ic-, -c-, -ci-	before final syllable (also before final CCV)	type I second person singular	Muskogean: Eastern	pa 'eat'/**is**pa 'you eat' coopa 'buy'/coo**s**pa 'you buy' takco 'rope'/ta**ci**kco 'you rope'	Montler & Hardy 1990
Amis	-um-	after 1st C	verbalizer	Austronesian: Paiwanic	shual 'speech' sh-**um**-ual 'conversation'	Ho, Ju-Fen et al. 1986.

LANGUAGE	INFIX	LOCATION	FUNCTION	PHYLUM	EXAMPLES	SOURCES
Amis	-in-	after 1st C	nominalizer	Austronesian:Paiwanic	paru 'insert' p-**in**-aru 'things used to insert'	Ho, Ju-Fen et al. 1986.
Archi	-w-, -r-, -b-	after 1st V or before the final syllable	number/class marker	Nakh-Daghestanian	aXa-s 'to lie down (indicative, class III) a**b**X-u 'to lie down (perfective, aorist)'	Kibrik 1998:458
Archi	-r-~r	after 1st V or before the final syllable	durative	Nakh-Daghestanian	aXa 'to lie down' a**r**Xar 'to lie down, durative'	Kibrik 1998:457
Atayal	-n-	after 1st C	perfective	Austronesian: Atayalic	spung/s**m**pung 'measure' si?/s**m**i? 'put'	Egerod 1965:268, Moravcsik 1977:83, Moravcsik 2000
Atayal	-m-	after 1st C	animate actor focus	Austronesian: Atayalic	q**m**ul 'snatch, animate actor focus' hkangi?/h**m**kangi? 'search' skziap/k**m**ziap 'catch' prau/r**m**au 'help'	Egerod 1965:263-6, 1999
Birom	-w-	after 1st C	Class 3	Niger-Congo: Atlantic-Congo	gat 'bed 4, plural'/ g**w**at 'bed 3, singular'	Bouquiaux 1970
Bole	-gi-	after 1st syllable (CV) or before the final syllable	pluractional	Afro-Asiatic: Chadic	ngoruu/ngo**gi**ruu 'tied' yoruu/yo**gi**ruu 'stopped'	Gimba 2000 Ch. 10
Budukh	-R(V)-, R=r, l, n	after first V or before the final syllable	durative	Nakh-Daghestanian	choshu 'to stab (downwards)/ cho**r**shu saq'a 'to die'/sa**r**q?a**r**	Alekseev 1989:273
Budukh	-mV-	after first V/syllable or before the final syllable	prohibitive	Nakh-Daghestanian	yech'i 'to arrive'/ ye**me**ch'i yuc'u 'to give'/yu**mo**c'u	Alekseev 1989:279

LANGUAGE	INFIX	LOCATION	FUNCTION	PHYLUM	EXAMPLES	SOURCES
Cantonese	-gwai-	after 1st syllable	adjectival emphasis	Sino-Tibetan: Chinese	leuhnjeuhn 'clumsy' leuhn-**gwai**-jeuhn 'downright clumsy' yuhksyun 'ugly' yuhk-**gwai**-syun 'downright ugly'	Matthews & Yip 1994:43
Cantonese	-metyeh-, -mieh-, -maat-	after 1st syllable	What do you mean?/What's the point?	Sino-Tibetan: Chinese	pinsam 'biased' pin-**matyeh**-sam a? 'What do you mean, biased?'	Matthews & Yip 1994:44
Chamorro	-in-	before 1st V	nominalization (?)	Austronesian: Malayo-Polynesian	tristi 'sad': tr**in**isti 'sadness' hasso 'think' i h**in**asso 'the thought'	Topping 1973, Anderson 1992: 207-208
Chamorro	-um-	before first V	verbalizer, actor focus	Austronesian: Malayo-Polynesian	gupu 'to fly' g**um**upu i paharu 'the bird flew' tristi 'sad': tr**um**isti 'becomes sad'	Topping 1973:185, Anderson 1992: 207-208
Chickasaw	-ɬ-	after 1st V	medio-passive	Muskogean	a-pi:sa 'measure'/ a-**ɬ**pisa 'be measured' o:ti 'kindle'/ o**ɬ**ti 'be kindled'	Martin & Munro 1994
Choctaw	-l-	after 1st V	passive	Muskogean: Western	aapitta 'to put into a container' --> a**l**pitta	Lombardi & McCarthy 1991
Choctaw	-h-	before final syllable	instantaneous	Muskogean: Western	waaya 'to grow (of plants)'/ wa**h**ya	Lombardi & McCarthy 1991

LANGUAGE	INFIX	LOCATION	FUNCTION	PHYLUM	EXAMPLES	SOURCES
Chontal	-olh-, -ulhy-	possibly after 1st C	plural (noun and verb)	Mayan: Cholan-Tzeltalan	akweʔ 'man'/ aky**lh**yweʔ 'men' kon'iʔ 'grandchild'/ ko**lh**n'iʔ 'grandchildren'	Waterhouse 1962:95
Chrau	-an-	after 1st C	nominalization	Austro-Asiatic: Mon-Khmer	tung 'carry'/ t**an**ung 'armload' gon 'hunt'/ g**an**on 'hunting blind'	Thomas 1971, Bauer 1988
Colville	-aʔ-	before final C	diminutive	Salishan: Interior Salish	-itkw 'water'/ -it**aʔ**kw 'little water'	Mattina 1973:91
Creek	-ho-	before final syllable	plural	Muskogean: Eastern	lík.w-i:/ lik**ho**w-í 'rotten (PL)'	Martin 1994
Dakota	-wa-, -ma-	after 1st V	1st person	Siouan: Siouan Proper	napca 'swallow'/ na**wa**pca 'I swallow it' nawizi 'jealous' / na**wa**wizi 'I am jealous'	Moravcsik 1977
English	word	before stressed syllable	expletive	IE: Germanic	fan-**bloody**-tastic	McCarthy 1982
Greek	-N-	after root V	present	IE: Greek	e-lab-/la**m**b-an- 'take' e-math-/ma**n**th-an- 'learn'	Garrett 2003
Hausa	-aa-	before final syllable	nominal plural	Afro-Asiatic: Chadic	gulbii/gul**aabee** 'stream (sg/pl)' wurii/wur**aaree** 'place (sg/pl)'	Heine & Nurse 2000:165, Newman 1990:38
Hua	-raʔ-, -ng-, -g-, -r-	before 1st vowel	person	Trans-New Guinea: Main Section	raʔ-haie vs. ha-**raʔ**-aie 'it please the two of us' hapai 'explain, tell' ha-**nd**-apai '1sg.' ha-**g**-apai '2sg.' ha-**raʔ**a-pai '1du.' ha-**r**-apai '1pl.'	Haiman 1977:314, 1998:561

LANGUAGE	INFIX	LOCATION	FUNCTION	PHYLUM	EXAMPLES	SOURCES
Hua	-ʔa-	before final syllable	negative	Trans-New Guinea: Main Section	Negzgavo zga **ʔa**vo 'not embrace' Negharupo haru **ʔa**po 'not slip'	Haiman 1980, Anderson 1992: 209
Huave	-ro-, -ra-, -ɾiːe	after root V	indefinite actor	Huavean	-ndok 'to fish', ando-**ro**-k 'there is fishing'	Stairs & Hollenbach 1969:52; Suarez 1975
Hunzib	-a-, -(y/w)A-	possibly always on stressed position	pluractioinal	Nakh-Daghestanian	uhu/u**wA**he 'die' ek/e**yA**k 'fall' aeˑ E/(m-)a.**a.**c'E 'see'	van den Berg 1995: 81-82
Kadazan	-in-	after 1st syllable	adjectival nominalizer	Austronesian: Malayo-Polynesian	avasi/v**in**asi 'goodness' opoit/p**in**oit 'bitterness' aagang/**in**agang 'redness'	Anonissen 1958: 12
Kadazan	-in-	after 1st C, after -um- infix	imperfective	Austronesian: Malayo-Polynesian	moboos 'speak'/m**in**oboos 'spoke' gumamas 'weed'/gum**in**amas 'weeded'	Anonissen 1958: 26
Kamhmuʔ	-rn- or -r-	after 1st C for -rn- and between 1st CC for -r-	instrument	Austro-Asiatic: Mon-Khmer	hiip 'eat with spoon': h**rn**iip 'spoon' cok 'to gouge': c**rn**ok 'gouging instrument' klam 'carry suspended from a pole': k**r**lam 'pole carried on the shoulders'	Merrifield et al. 1965, Anderson 1992: 207
Kashaya Pomo	-t-, -h-	after the final vowel	pluractional	Hokan: Northern	phanem 'hit with the first' phane**t**m-aw 'hit with the first (pl)'	Buckley 1994
Katu	-a-	after 1st C	nominalizer	Austro-Asiatic: Mon-Khmer	kloos 'to exchange' k**a**loos 'an exchange'	Costello 1998

LANGUAGE	INFIX	LOCATION	FUNCTION	PHYLUM	EXAMPLES	SOURCES
Katu	-an-	after 1st C	nominalizer	Austro-Asiatic: Mon-Khmer	phaar 'to feed animal' ph**an**aar 'food given to animal'	Costello 1998
Katu	-r-	after 1st V	nominalizer	Austro-Asiatic: Mon-Khmer	katas 'to name' ka**r**tas 'name'	Costello 1998
Katu	-ar-	after 1st C	nominalizer	Austro-Asiatic: Mon-Khmer	teh 'to hammer' t**arn**eh 'hammer'	Costello 1998
Kentakbong	-ən-	before 1st V (do not infix in monosyllabic forms)	imperfect	Austro-Asiatic: Mon-Khmer	/sapoh/ 'sweeps'/ s**ən**apoh 'sweeps, is sweeping' /citɔh/ 'cooks'/ c**ən**itɔh 'cooks.IMPRF'	Omar 1975
KiChaga	-n-	before final syllable	intensive	Niger-Congo: Atlantic-Congo	o.lon.ga/-olon-**n**-ga 'point' -aam.bi.a/-aambi-**n**-a 'look at'	Inkelas p. c.
Kiliwa	-n-	after 1st C (even between /s/ and a glottal stop)	diminutive	Hokan: Esselen-Yuman	sʔaaw 'give birth' s-<**n**>+ʔaaw-u 'offstring'	Mixco 1985
Kiriwina/ Kilivila	-gu-, -m-, -le- etc.	before final syllable or after the first syllable.	possessive	Austronesian: Malayo-Polynesian: Oceanic (New Guinea Cluster)	lu-**gu**-ta 'my opposite sex sibling' lu-**m**-ta 'your(sg.) opposite sex sibling' lu-**le**-ta 'his/her opposite sex sibling'	Lawton 1993; Senft 1986
Koasati	-ho-	after 1st syllable	punctual	Muskogean: Eastern	okcayyan 'to be alive[sg]', plural ok-**ho**-cayyan	Kimball 1991

LANGUAGE	INFIX	LOCATION	FUNCTION	PHYLUM	EXAMPLES	SOURCES
Koasati	-s-	before final syllable	plural (verbal)	Muskogean: Eastern	aka:non aka-**s**-non 'to be hungry' akopi:lin akopi-**s**-lin 'to knock something away'	Kimball 1991
Lepcha (Rong)	-j-	After first consonant	transitive	Sino-Tibetan: Tibeto-Burman	nom 'smell (intr.)' n**j**om 'smell (tr.)'	Benedict 1943, Voegelin & Voegelin 19765:9
Leti	-ni-, -n-, -i-	after 1st C	nominalizer	Austronesian: Malayo-Polynesian	kaati 'to carve' k-**ni**-aati 'carving' kini 'to kiss' k**n**ini 'kissing' mai 'to come' m**i**ai 'arrival'	Blevins 1999
Malagasy	-in-	after 1st C, before 1st V	passive (unproductive)	Austronesian: Malayo-Polynesian	vaky 'broken/ v**in**aky 'be broken' vidy 'bought'/ v**in**idy 'be bought' tapaka 'broken'/ t**in**apaka 'be broken'	Keenan & Polinsky 1998:590
Peking Mandarin	-li-	after 1st syllable	emphasis in adjectives	Sino-Tibetan: Chinese	hwudu-de 'muddled' hwu-**li**-hwudu-de 'good and muddled'	Chau 1968
Maricopa	-uu-	after 1st C	plural	Hokan: Esselen-Yuman	shtuutyk: sh**uu**tuutyk 'pick'	Thomas-Flinders 1981
Mikasuki	-ho-	before last syllable	plural	Muskogean: Eastern	hi.ca 'see'/ ci-hi:**ho:**ca-la:ka 'he will see you all' im.pa-/ im**ho**pa- 'eat (PL)'	Martin 1994

LANGUAGE	INFIX	LOCATION	FUNCTION	PHYLUM	EXAMPLES	SOURCES
Miskito	-m-	after 1st V	construct state	Misumalpan	na-**m**-pa 'your tooth'	Ultan 1975:170, Moravcsik 2000, Rouvier 2002
Mlabri	-r-, -rn-	after 1st C	instrumental noun	Austro-Asiatic: Mon-Khmer	klaap 'to hold k**r**laap 'forceps of split bamboo'	Rischel 1995: 85
Mojave	-uu-, -t-, -ch-	before last syllable	plural subject	Hokan: Esselen-Yuman	m-s**uù**va**ṫ**-k 'you (pl .) sing' /-ka**t**nyewk-k 'we bend it out of shape' (sg. kanyewk)	Munro 1976
Nakanai	-il-, ul, ir, ur	before first V	non-concrete nominalization	Austronesian: Malayo-Polynesian	tuga 'walk' t**ul**uga 'trip'	Johnston 1980:176-177, Broselow & McCarthy 1983:63
Noni	-w-	after 1st C	Class 3	Niger-Congo	ken/k**w**en 'firewood' mbesɛm/ mb**w**esɛm 'green grasshopper'	Hyman 1981; Garrett & Blevins 1998
Palauan	-me-, -m-, -u-, -o-	after 1st C	verb marker	Austronesian: Malayo-Polynesian Micronesian	l-**m**-uut 'return' ch-**Em**-iis 'escape' s-**u**-ebl̆ 'fly '	Josephs 1975:150
Palauan	-il-, -ir-, -l-	after 1st C	past tense	Austronesian: Malayo-Polynesian Micronesian	l-**il**-uut 'returned' r-**ir**-ebl̆ 'fell'	Josephs 1975
Palauan	-(E)l-	after 1st C	resulting state verb	Austronesian: Malayo-Polynesian Micronesian	k-**l**-imd 'cut' ch-**əl**-sbrebər 'painted'	Josephs 1975

LANGUAGE	INFIX	LOCATION	FUNCTION	PHYLUM	EXAMPLES	SOURCES
Pangasinan	-in-(-RED)	before 1st V	frequentative	Austronesian: Malayo-Polynesian	bolan 'month' /bi**in**olanbolan **ni**-labilabi 'nightly, every night'	Benton 1971: 104
Pingding Mandarin	-ɭ-	after 1st C	diminutive	Sino-Tibetan: Chinese	xuɑ/ xɭuɑ 'flower' mɤŋ/ mɭɤŋ 'door'	Xu 1981
Rutul	-r-	after first V	durative	Nakh-Daghestanian	sixi 'to put'/ si**r**xe haga 'to see' /ha**r**ga	Alekseev 1989:228
Sanskrit	-N-	after root-V	present stem	IE: Indo-Aryan	yuj 'join'/ yu**ñ**j	Whitney 1889:251
Sundanese	-ar-	after 1st	plural	Austronesian: Malayo-Polynesian	budak 'child'/ b**ar**udak 'children' sare 'sleep'/ s**ar**are 'sleep.PL' niis 'cool onself'/n**ar**iis 'cool oneself.PL'	Moravcsik 2000
Surin Khmer	-N-, rN-	after 1st C (raN is prefixed before labial, infixed after alveolar and palatal stops. All others take N.)	instrument/ locative nominalizer	Austro-Asiatic: Mon-Khmer	kvvc 'to knot' k^{h}**n**vvc 'bamboo string' (note it induces aspiration) doot 'to pierce' tr**an**oot 'to skewer for fish' (note the devoicing)	Thomas 1990
Surin Khmer	-N-, -nr-	after 1st C	Nominalizing to a Goal noun	Austro-Asiatic: Mon-Khmer	kuur 'to draw' k**n**uur 'wavy line'	Thomas 1990

LANGUAGE	INFIX	LOCATION	FUNCTION	PHYLUM	EXAMPLES	SOURCES
Syrian Arabic	-r-	before final syllable or after first vowel	augmentative & frequentative	Afro-Asiatic: Semitic	xamas 'to scratch'/ xa**r**mas 'to scratch'	Ultan 1975:165, Cowell 1964:255, Moravcsik 2000
Tagalog	-um-	after the first C or before first V	actor focus	Austronesian: Malayo-Polynesian	b**um**ilih 'X buys/ bought': bilih gr**um**adwet 'X graduates/ graduated': gradwet	French 1988:25, 32, Moravcsik 2000
Toba Batak	-um-	before 1st V	active completve, intensification, tense	Austronesian: Malayo-Polynesian	tibbo/t**um**ibbo 'tall/taller' las/l**um**as 'hot/hotter' pasak/**up**pasak 'beat/has beaten' ngali/**ung**ngali 'cold/colder'	Crowhurst 1998, 2001
Toratan (Ratahan)	-um-	before 1st V	agent voice non-past	Austronesian: Malayo-Polynesian	empo 'sit' /**m**empo kukuk 'cry out'/k**um**ukuk	Himmelman & Wolff 1999:13, 41
Toratan (Ratahan)	-im-	before 1st V	agent voice past	Austronesian: Malayo-Polynesian	tumpa 'jump down' / t**im**umpa empo 'sit' /**n**empo 'sat'	Himmelman & Wolff 1999:13, 41
Toratan (Ratahan)	-in-	before 1st V	patient voice past	Austronesian: Malayo-Polynesian	**ni**-ehom 'carried' **ni**-lutam'shot' tuwang 'fall'/t**in**uwang 'fell'	Himmelman & Wolff 1999:13, 41
Tzeltal	-h-	after root vowel	intransitivizer	Mayan: Cholan-Tzeltalan	puk 'to divide among' pu**h**k 'to spread the word'	Slocum 1948, Nida 1:68
Tzutujil	-ʔ-	after first V	mediopassive	Mayan: Quichean-Mamean	k'is 'finish' k'i**ʔ**seem 'to end, finish'	Dayley 1985:112

LANGUAGE	INFIX	LOCATION	FUNCTION	PHYLUM	EXAMPLES	SOURCES
Tzutujil	-j-	after first V	simple passive	Mayan: Quichean-Mamean	loq' 'buy' lo**j**q'ik 'to be bought'	Dayley 1985:55, 113-4
Ulwa	-ka-	after stressed syllable	construct state	Misumalpan	baskarna/bas**ka**karna 'comb' siwanak/siwa**ka**nak 'root'	McCarthy & Prince 1990:228, Hammond 1991:196, Hale & Blanco 1988
West Tarangan	-u-, -i-	after final V	agreement (1, 2, 3 singulars)	Austronesian: Malayo-Polynesian	karɔn/ karɔ**u**n-nga 'old, 1sg'	Nivens 1992:181
Yagaria	-da-, -ka-, -ʔa-, -ʔi-	after 1st syllable	possessive	Trans-New Guinea: Main Section	bo-**ʔa**-vaʔa his tutor e-**ʔa**-goʔga his older brother	Renck 1975
Yuma	-t-, -c-	after 1st V	distributive object	Hokan: Esselen-Yuman	an^{y}uv 'to fight'/ a**c**nyuv 'to be a fighter' xal^{y}.qíc 'to grasp'/ xa**c**l^{y}qíc 'to grasp with both hands' u:kaðə́n 'to point to something towards there'/ u:**c**kaðə́n 'to send in different directions'	Halpern 1946:277 Halpern 1947
Yuma	-u- ~v	before final syllable which is stressed	'to be one who does...' 'to have been doing...'	Hokan: Esselen-Yuman	wi:a:vkyáw 'to call someone paternal half-sibling' wa:a:v**u**kyáw**v** 'to have a paternal half-sibling'	Halpern 1946:273

LANGUAGE	INFIX	LOCATION	FUNCTION	PHYLUM	EXAMPLES	SOURCES
Yuma	-u-	before final syllable which is stressed	distributive plural	Hokan: Esselen-Yuman	avsə́ 'to urinate' v**u:**sə́v 'to urinate (many)' apám 'to fall down' **u:**pácm 'to fall down (many)' /wa-aš̨ ^{w}ív/ → wa-š̨ **u:**q^{w}ív 'to be noisy (distr. plu.)	Halpern 1946:278 Halpern 1947
Yurok	-eg-	after 1st C	pluractional	Algic	la:y- 'to pass' l-**eg**-a:y koʔmoy- 'to hear' k-**eg**-oʔmoy-	Robins 1958
Zoque	-j-	after 1st C	3 person possessive	Mixe-Zoque	p**j**ata 'his mat' b**j**uro 'his burro'	Wonderly 1951

Appendix III: Database of Internal reduplication (Arranged by language names)

LANGUAGE	INFIX	LOCATION	FUNCTION	PHYLUM	EXAMPLES	SOURCES
Amharic	-Ca-	after 1st V	pluractional	Afro-Asiatic: Semitic	səbbər 'break' sə**ba**bbər 'shatter in pieces'	Rose to appear b:3
Amis	-2 moras-	after final V	Nominal plural	Austronesian: Paiwanic	luma?/**luma**-luma? 'house' lamlu/la**mlu**mlu 'dices'	Ho, Ju-Fen et al. 1986.
Bole	-C-	after 1st syllable (CV)	pluractional	Afro-Asiatic: Chadic	bulaa/bu**l**laa duuro 'he dug out peanuts little by little'	Gimba 2000: chapter 10
Bunuba	-VC(C)-	after 1st C	plural, intensification	Australian: Bunaban	ngarranyi 'mother' ng**arr**angarranyi 'mothers' jalungurru 'good (one)' j**al**alungurru 'good ones' or j**alu**jalungurru 'good ones'	Rumsey 2000: 69
Chamorro	-CV-	after final V	adjectival intensification	Austronesian: Malayo-Polynesian	dankolo 'big' danko**lo**lo 'very big' metgot 'strong' met**go**got 'very strong'	Topping 1973: 183
Chamorro	-CV-	before stressed syllable	continuative	Austronesian: Malayo-Polynesian	hu'gango 'play' hu'**ga**gando 'playing'	Topping 1973: 259; Moravcsik 2000
Djingili	-VC(C)-	after 1st C	plural (nominal)	Australian: West Barkly	badaura 'good' b**ad**adaura 'very good'	Fabricius 1998, Chadwick 1975:16

LANGUAGE	INFIX	LOCATION	FUNCTION	PHYLUM	EXAMPLES	SOURCES
Harari	-Ca-	after 1st syllable	pluractional	Afro-Asiatic: Semitic	magəd-a 'burn surface' mi**ga**gəd-a 'burn a lot'	Rose to appear:2
Hausa	-CVC-, -CVG-	after 1st syllable	pluractional	Afro-Asiatic: Chadic	rikita/ri**kir**kita 'tangle, confuse someone' farauta/fa**rau**rauta 'hunt'	Newman 2000:427
Hausa	-CVC-	after 1st syllable	nominal plural	Afro-Asiatic: Chadic	cikuna/ci**kun**kuna 'bellies'	Hausa 2000: 430-431
Ineseño Chumash	-CV-	before final syllable or after the final CV	?	Hokan: Chumash	yuxwowon 'to be high, tall' oxyoyon 'to be crazy'	Applegate 1976
IsiXhosa	-2 syllables-	before 1st C	pluractional	Niger-Congo: Atlantic-Congo	ukw-alatha ukw-a-**latha**-latha 'point at' uk-ophula uk-o-**phula**-phula 'break'	Downing 1997
Kamaiurá	a foot	after final V	pluractional	Tupi: Tupi-Guarani	omokon o**moko**mokon 'He swallowed it frequently'	Everett & Seki 1986
Kinande	-foot-	before 1st C	pluractional (?)	Niger-Congo: Atlantic-Congo	ohera/o-**hera**-hera 'pick for' esera/e-**sera**-sera ''play for'	Downing 1999:64

LANGUAGE	INFIX	LOCATION	FUNCTION	PHYLUM	EXAMPLES	SOURCES
Koasati	-Co-	before final syllable	punctual	Muskogean: Eastern	alotkan 'to be full,' plural a lot-**loː**-kan	Kimball 1991
Korean	-CV-	after final V	onomatopoeic	Altaic: Isolate	culuk/cu**lulu**k 'dribbling' allok/al**lolo**k 'mottled'	Kim 1984, Jun 1994, Lee & Davis 1993
Kugu Nganhcara	-VC-	after 1st C	durative, iterative	Australian: Pama-Nyungan	thena 'stand'/ th**en**ena pukpe 'child'/ p**uk**ukpe nunpa 'run'/n**unt**unpa	Smith & Johnson 2000: 382
Levantine Arabic	-C-	before final V	Intensification, perjoration	Afro-Asiatic: Semitic	barad vs ba**r**bad 'shaved unevenly'	Cowell 1964, Broselow & McCarthy 1984
Lilloet	-C-	after stressed V	diminutive	Salishan: Interior	p'aʔx^{w} 'more'/ p'ó**p'**ʔax^{w} 'little bit more' səmɣáw 'lynx'/ səmɣó**ɣ**əw^{ʔ} 'little lynx'	van Eijk 1997:60
Lushootseed	-VC-	before first V	out of control	Salishan: Central Salish	gwədil 'sit' gw**əd**ədil 'just sitting around' stubsh 'man' st**ub**ubsh 'men'	Urbanczyk 1996, Broselow & McCarthy 1983:69
Mangarayi	-VCC-	after 1st C	intensification	Australian: Gunwingguan	gurjag 'lily'/ g**urj**urjagji 'having a lot of lilies'	Merlan 1982, Kurisu & Sanders 1999
Nabak	-CVN-	before final syllable	negative imperative	Trans-New Guinea: Main Section	kutu/ ku**tu**tuping '(don't) fold it' ande/an-**den**-de-ping '(don't) tie it'	Fabian, Fabian and Peck 1971, Kiparsky 1986:161

LANGUAGE	INFIX	LOCATION	FUNCTION	PHYLUM	EXAMPLES	SOURCES
Nakanai	CV, CVCV	before stressed foot	plural? nominalization?	Austronesian: Malayo-Polynesian	burulele/bur**ule**lele 'sliding on buttocks' bilau/bi**la**lau 'songs' tuluga 'trip'/tu**luga**luga 'sandal'	Johnston 1980:149-150, Broselow & McCarthy 1983:59
Ngizim	-Ca-	After 1st syllable or 1st V	pluractional	Afro-Asiatic: Chadic	gEnu/gE**na**nu 'get many' dEgEru/dE**ga**gEru 'pound floor'	Newman 1990 (p. 106)
Paiwan	-2 moras-	after final V	plural	Austronesian: Paiwanic	ʔulavav 'mouse' ʔu**lava**-lavav-ən 'mice'	Chen & Ma 1986
Pangasinan	-CV-	before 1st C, after first V	nominal plural	Austronesian: Malayo-Polynesian	amigo 'friend' / a**mi**migo 'friends'	Benton 1971:99, McCarthy & Prince 1986:35
Pangasinan	-CV-	Before 1st C, after 1st V	'only'	Austronesian: Malayo-Polynesian	apat/a**pat**patira 'four'	Benton 1971:151, McCarthy and Prince 1986:36
Pangasinan	-CVC-	before stressed syllable	comparative intensification	Austronesian: Malayo-Polynesian	amputi 'beautiful' am**pu**tputi 'more beautiful'	Benton 1971: 117
Pazeh	-2 moras-	after final V	pluractional	Austronesian: Paiwanic	mubuut 'to fart' u-**buu**-buut 'to fart repeatedly' ma-gizem 'strong' ma-**gize**-gizem 'very strong'	Blust 1999
Quileute	-Ce-	after 1st V	distributive/plural	Chimakuan	qa:wats/qa:**qe:**wats 'potato'	Andrade 1933:188, Broselow & McCarthy 1983:44

LANGUAGE	INFIX	LOCATION	FUNCTION	PHYLUM	EXAMPLES	SOURCES
Quileute	-C-	after 1st V	pluractional	Chimakuan	tsiko 'he put it on' ts**i**t**s**ko 'frequentative'	Andrade 1933:188, Broselow & McCarthy 1983:44
Samoan	-CV-	before a stressed syllable		Austronesian: Malayo-Polynesian	alofa vs. a**lo**lofa 'love'	Broselow & McCarthy 1984
Shuswap	-C-	after stressed V	diminuative/ first-person verbal form	Salishan: Interior Salish	sqexhe 'dog': sqe**q**xhe 'little dog'	Kuipers 1974, Anderson 1992:209, van Eijk 1990:231
SiSwati	-foot-	before 1st C	pluractional	Niger-Congo: Atlantic-Congo	enyela/ e-**nyela**-nyela 'be hurt' engetisa/ e-**ngeti**-ngetisa 'cause to increase'	Downing 1999:74
Sonora Yaqui	-CV-	before final syllable	intensive (?)	Uto-Aztecan: Southern Uto-Aztecan	tekipanoa tekipa**pa**noa 'to work' naamuke naamu**mu**ke 'to get drunk'	Dedrick & Casad 1999
Takelma	-V-	after 1st CVC	aorist	Penutian: Oregon Penutian	hemg- 'take out' h<u>e</u>meg-	Golla, Victor (ed.) 1990
Takelma	-VC-	after 1st CVC (but between CC)	frequentative	Penutian: Oregon Penutian	hemg 'take out' h<u>emem</u>g (freq)	Sapir 1922:38
Temiar	-C-	after the first C	continuative	Austro-Asiatic: Mon-Khmer	kɔɔw 'to call' /k**w**kɔɔw slɔg 'to lie down'/s**g**lɔg	Benjamin 1976, Gafos 1998:233-
Tetun (Ferhan)	-aC-	before first V	deadjectival nominalization	Austronesian: Malayo-Polynesian	di'ak 'good' d**ad**i'ak 'goodness' krakat 'angry' kr**ar**akat 'anger'	Van Klinken 1999:45-6

LANGUAGE	INFIX	LOCATION	FUNCTION	PHYLUM	EXAMPLES	SOURCES
Thao	-CCV- (probably 2 moras)	after final V, before final C	pluractional	Austronesian: Paiwanic	agqtu 'to contemplate' ag**qtu**qtu 'to think about' m-arfaz 'to fly' m-a**rfa**rfaz 'to keep flying around'	Chang 1998
Thompson Salish	-C-	after stressed V	diminutive	Salishan: Interior	sx̌én ʔx 'rock'/ sxéx**n**ʔx 'small rock hill' kʔwáxʷe 'box'/ kʔwá**kʔw**xʷe 'small box'	Thompson & Thompson 1996
Tigre	CV	after first V	intensive, frequentative	Afro-Asiatic: Semitic	ləwwət'-ə/lə**wa**wwət'-ə 'change constantly'	Rose ms. Rose Ms.
Tigre	-Ca:-	after 1st V	pluractional	Afro-Asiatic: Semitic	mərmər-aː / mə**raː**mər-aː 'examine thoroughly'	Rose to appear:3
Tigrinya	CV	after 1st syllable	frequentative	Afro-Asiatic: Semitic	səbər-ə/sə**ba**bər-e 'break in pieces'	Buckley 1990, Rose Ms.
Tiriyo	CVV, CCV	after initial vowel if root is vowel-initial	?	Carib: Northern	enapka 'to wake O up' e**mpa**mpaka (103) in-ponoo-sewa 'didn't tell O' i**mpɔ**mpɔnɔɔshEva' (103)	Meira 1999
Timugon Murut	-CV-	before stressed foot	augmentative, frequentative etc.	Austronesian: Malayo-Polynesian	abalan 'bathes' /a**ba**balan 'often bathes'	McCarthy and Princce 1993ab

LANGUAGE	INFIX	LOCATION	FUNCTION	PHYLUM	EXAMPLES	SOURCES
Trukese	-Vkk-	before initial V after *w-*	pluractional	Austronesian: Malayo-Polynesian	wiik 'week' / w-**ikk**-iik 'be for a number of weeks' isɔni 'keep it'/ **ikk**-isɔni 'be keeping it'	Goodenough and Sugita 1980, Garrett 2001
Ulwa	CV	Before the stressed syllable	adjective distributive	Misumalpan	barás-ka/ba**ra**ráska 'black-ADJ' saháw-ka/sa**ha**háwka 'nake-ADJ'	Green 1999:51
Uradhi	-CV-	after 1st V	adjective	Australian: Pama-Nyungan	wamp/wa**mpa**mpa 'float' ikya/i**ki**kya 'speak'	Fabricius 1998, Crowley 1983:364
Wardaman	-VCC-	After 1st C	nominal plural	Australian: Gunwingguan	marluga 'old man' m**arl**arluga 'old men'	Merlan 1994
Washo	-CV-	within the stressed syllable	plural	Isolate/Hokan(?)	memdeewi 'deer'/ memde**wii**wi 'deers'	Yu 2001
West Tarangan	-CVC-	before stressed syllable	?	Austronesian: Malayo-Polynesian	si**ngal**ngalta 'flying fish'	Nivens 1992:189
Yir Yoront	-Vl- or -lV-	after 1st C?	CONT NPAST	Australian: Pama-Nyungan	ken 'cough' k**el**en 'cough-cont.NPAST' wornt/wornornt 'rustle'	Fabricius 1998, Alpher 1973:266-7, Alpher 1991:45
Zuni	-C-	before final V	medio-passive repetitive	Isolate	cholo 'to make the sound of crackling paper' chol**ch**o+ʔa 'it makes irregular crackling sounds'	Newman 1965:55, Broselow & McCarthy 1983:43

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