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Publication Date
2003
The Morphology and Phonology of Infixation

by

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B.A. (University of California, Berkeley) 1998
M.A. (University of California, Berkeley) 1999

A dissertation submitted in partial satisfaction of the
requirements for the degree of

Doctor of Philosophy

in the

GRADUATE DIVISION

of the

UNIVERSITY OF CALIFORNIA, BERKELEY

Committee in charge:

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Fall 2003
The Morphology and Phonology of Infixation

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Alan Chi Lun Yu
ABSTRACT
The Morphology and Phonology of Infixation
by
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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, $M_{ALIGN} \gg P$, 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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ACKNOWLEDGEMENT

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.

That said, a few individuals truly warrant special mention. To this end, none deserves my gratitude more than Sharon Inkelas and Andrew Garrett.

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.

Andrew Garrett, without a doubt, has to be one of the most didactic and multi-talented linguists alive. He exemplifies the type of scholar I aspire to become. His presentations, whether in writing or in lecture, are always thorough, meticulous, yet never seem to lose sight of the big picture. I hope that this dissertation approximates the standard he embodies.
Most people would consider themselves lucky to have just one mentor whom they can go into a meeting and come out much energized and inspired. I considered myself luckiest to have two. Thank you, Sharon and Andrew!

John Ohala showed me how linguistics, and phonology in particular, can be a laboratory science. While this dissertation ultimately focuses on the interaction of phonology and morphology, John’s theory of sound change and his philosophy of science have guided me throughout the writing of this dissertation. Of course, no one who knows John can miss his love of humor and jokes. I have learnt much from him in this respect. English being my adopted tongue, the nuances of jokes often elude me. But after years of exposure, all thanks to John, I am happy to report that I have acquired a healthy appetite for good jokes.

Larry Hyman has also been a constant inspiration. His energy and his encyclopedic knowledge on phonology and anything African (esp. Bantu) are enormous. I have benefited much from his advice and encouragement. Of course, I must also thank him for all the splendid parties at his house and for introducing me to the enjoyment of a bottle of fine wine.

I have learned much about doing fieldwork from Johanna Nichols, both inside and outside of the classroom. I am especially thankful for her encouragement to me to continue my studies of the Caucasian languages. Juliette Blevins, whom I met relatively late during my tenure at Berkeley, has much positive influence on the ultimate shape of this dissertation. I am particular grateful for her agreeing to be on my dissertation committee even though she was residing at Cambridge, England at the time.
Finally, I must credit Charles Reiss for indirectly responsible for my moving to Montreal during the last year of my dissertation-writing. Few people knew that, had it not been for NAPhC 1 and 2, two of the most worthwhile conferences I have had the privilege of attending, I would never have considered moving across the continent, living in the land of Canadian-raising, let alone applying for a visiting position at McGill. My short-stay in Montreal has been a real time of growth. Thanks, Charles, for the many debates we had on the nature of phonological inquiry and all the parties and Ping-Pong tournaments at your house!

My years at Berkeley would be much less interesting had it not been a few very special friends: (in alphabetical order) Ashlee Bailey for tolerating me as your roommate! Belen Flores for all the help in paperwork, Jeff Good for the many interesting conversations about little things about the world that I didn’t know before, Julie Larson & Mary Paster for all the coffee hours we spent together, Mischa Park-Doob for all the lovely picnics and for brightening my days in general, Darya Kavitskaya unknowingly for being the model graduate student, Ruth Rouvier for being a good friend in general, Ron Sprouse for all the stimulating discussions on phonology, the much needed computing help and finally the excellent editing of my dissertation(!), Tess Wood for sparking my interests in semantics, and Esther Weiss for always being there to cheer me on. Also, my year at McGill would not have been the same without the company of three special individuals: Lotus Goldberg, Ingrid Leung, and Naoko Tomioka. Thanks y’all!

My thanks also go to Glyne Piggot and Jonathan Bobaljik at McGill for welcoming me into the department and the many interesting discussions on linguistics in general and Lydia White for giving me the opportunity to spend the year working at McGill.
I am fortunate, from a Chinese perspective, to have the support of my parents to pursue something as esoteric as linguistics. I thank them wholeheartedly for believing in my choice of study and profession and for their, sometimes much needed, encouragements.

Of course, my years at Berkeley would have been much less enjoyable had it not been the generous financial support from the Graduate Opportunity Program at Berkeley and the National Science Foundation Graduate Research Fellowship program. This work is also partially supported by the Valorisation Recherche Quebec Project Le traitement de langue naturelle, A.M. di Sciullo (UQAM), P.I.
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 qmul ‘snatch’
kat kmat ‘bite’
kuu kmuu ‘too tired, not in the mood’
hŋu? hŋŋu? ‘soak’
skziap kmziap ‘catch’
sbil smbil ‘leave behind’
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' / *trumisti* 'becomes sad'), and an intensive reduplicant that appears after the final vowel (*mēgot* 'strong' / *mēgogot* '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*Ril*ut to*Rut*ilu ‘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 *boe-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’ → pukukpe). When the stem is vowel-initial, the reduplicant appears ‘prefixing’ (e.g., iiru-ma ‘here-EMPH’ → iiriiru-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)

\[
\begin{align*}
tog\text{\`ether} & \quad \text{to-bloody-gether} \\
adv\text{\`ance} & \quad \text{ad-bloody-vance} \\
Bh\text{\`ow\`ani} & \quad \text{Bho-bloody-wani} \\
per\text{\`haps} & \quad \text{per-bloody-haps} \\
en\text{\`ough} & \quad \text{e-bloody-nough} \\
imp\text{\`ortant} & \quad \text{im-fuckin-portant} \\
Kal\text{\`amaz\`oo} & \quad \text{Kalama-fuckin-zoo} \\
Tat\text{\`amag\`ouchee} & \quad \text{Tatama-fuckin-gouchee} \\
Winnipes\`aukee & \quad \text{Winnipe-fuckin-saukee}
\end{align*}
\]

\(^1\) 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)

sú:lu       sú:-ma-\textit{lu}       ‘dog-CNS2’
áytak       áy-\textit{mana}-tak  ‘paper-CNS2’
álá:kurį    álá:-ka-\textit{kurį} ‘Muscovy duck-CNS3’
wará:w{w}   wará:w-\textit{ka}-\textit{kana}-\textit{wa} ‘parrot sp.-CNS3’
ka:sirá:mah ka:-ki-sirá:mah ‘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)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>kupu</td>
<td>‘tea cup’</td>
</tr>
<tr>
<td>kuva</td>
<td>‘a type of bean’</td>
</tr>
<tr>
<td>daŋas</td>
<td>‘upper’s side’</td>
</tr>
<tr>
<td>kadžaj</td>
<td>‘a small basket’</td>
</tr>
<tr>
<td>kadžun</td>
<td>‘bamboo water basket’</td>
</tr>
</tbody>
</table>

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
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 infixed, 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. For example, in the Pama-Nyungan language, Uradhi, pluractionality is marked by (C)CV reduplication (9).

\[(9)\] Uradhi pluractional reduplication (Crowley 1983:364)

\[
\begin{array}{ll}
\text{wi.li} & \text{wi-li-li} \quad \text{‘run’} \\
\text{aŋa} & \text{aŋa-ŋa} \quad \text{‘dig’} \\
\text{i.piŋi} & \text{i-pi-piŋi} \quad \text{‘swim’} \\
\text{wampa} & \text{wa-mpa-mpa} \quad \text{‘float’} \\
\text{i.ŋya} & \text{i-ki-ŋya} \quad \text{‘speak’} \\
\text{u.ŋja} & \text{u-ŋja-ŋja} \quad \text{‘sleep, lie down’} \\
\text{u.ŋya} & \text{u-ŋi-ŋya} \quad \text{‘eat’}
\end{array}
\]

\[3\] 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) \text{ROOT} \rightarrow \text{PIVOT-RED-BASE}

\text{un\text{"ya}} \rightarrow \text{u-\text{"ya}} \quad \text{‘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. 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.

\footnote{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 Kamhmu? and Mlabri, both Mon-Khmer languages, the nominalizing morpheme -rn- appears after the first consonant of the stem (11a). When the stem begins with a consonant cluster, the allomorph -r- is used (11b). When the initial contains a rhotic, the allomorph -n- is used instead (11c).

(11) Mlabri nominalization (Rischel 1995: 85)

a. guuh ‘to ablaze’  grnuuh ‘flames’
   kap ‘to sing’        knnap ‘singing, song’
   peelh ‘to sweep the ground/floor’  prneelh ‘a broom’
   tek ‘to hit’         tneek ‘a hammer’

b. kwel ‘to be rolled up’  krel ‘spiral’
   gla? ‘to speak’       grla? ‘speech, words’
   pluut ‘to peel’       prluut ‘layer’
   klaap ‘to hold’       krlaap ‘forceps of split bamboo’
   gweec ‘to poke’       grweec ‘finger’

c. chreet ‘to comb’  chnreet ‘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  qmul  ‘snatch’
    kat  kmat  ‘bite’
    kuu  kmuu  ‘too tired, not in the mood’

b. hŋuʔ hŋuʔ  ‘soak’
    skziap  kmziap  ‘catch’
    sbil  smbil  ‘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  shuumanshlk  ‘get up’  (Thomas-Flinders 1981)
shtuutyk  shuutuutyk  ‘pick’  (Thomas-Flinders 1981)
chmii-m  chuumiish-k  ‘put’  (Gordon 1986: 96)
kmii-m  kuumiish-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).

   
   gurjag  gurjurjagji  ‘having a lot of lilies’
gabuji  gababuji  ‘old person’
yirag  yirirag  ‘father’
waŋgij  waŋgagij  ‘child’
jimgan  jimimagan  ‘knowledgeable one’

   
   ken  ‘cough’  kelen  ‘cough-CONT NPAST’
wornt  wornornt  ‘rustle’

c. Djingili (Fabricius 1998, Chadwick 1975:16)
   
   wanga  ‘alive, live one’  wanganga  ‘alive, live ones’
jabandja  ‘young’  jababandja  ‘the young ones’
maluga  ‘old man’  malaluغا  ‘old men’
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)

?ulu true by water’ ?ulu true ’boat riding’

s-ladǝy? ‘woman’ s-ladǝdǝy? ‘woman living along’

wǝli? ‘be visible’ wǝlǝli?-il ‘become visible’
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

<table>
<thead>
<tr>
<th>Root</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>haʔkw</td>
<td>‘for a long time’</td>
</tr>
<tr>
<td>haʔaʔkw</td>
<td>‘a little while ago’</td>
</tr>
<tr>
<td>hawl-əd</td>
<td>‘improvise’</td>
</tr>
<tr>
<td>hawawl-əd</td>
<td>‘improvise’</td>
</tr>
</tbody>
</table>

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.
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)

<table>
<thead>
<tr>
<th>stem</th>
<th>plural</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>kanayon</td>
<td>kakanayon</td>
<td>'relative'</td>
</tr>
<tr>
<td>libro</td>
<td>lilibo</td>
<td>'book'</td>
</tr>
<tr>
<td>niog</td>
<td>niniog</td>
<td>'coconut'</td>
</tr>
<tr>
<td>plato</td>
<td>paplato</td>
<td>'plate'</td>
</tr>
<tr>
<td>balbas</td>
<td>babalbas</td>
<td>'beard'</td>
</tr>
<tr>
<td>amigo</td>
<td>amimigo</td>
<td>'friend'</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th>Numeral</th>
<th>‘only’</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. sakey</td>
<td>saksakey</td>
<td>‘one’</td>
</tr>
<tr>
<td>talo</td>
<td>taltalora</td>
<td>‘three’</td>
</tr>
<tr>
<td>siam</td>
<td>siasiamira</td>
<td>‘eight’</td>
</tr>
<tr>
<td>b. apat</td>
<td>apatpatira</td>
<td>‘four’</td>
</tr>
<tr>
<td>anem</td>
<td>anemmemira</td>
<td>‘five’</td>
</tr>
</tbody>
</table>

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 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)

<table>
<thead>
<tr>
<th>verb</th>
<th>meaning</th>
<th>form</th>
</tr>
</thead>
<tbody>
<tr>
<td>kukuk</td>
<td>‘cry out’</td>
<td>kumukuk</td>
</tr>
<tr>
<td>suq</td>
<td>‘enter’</td>
<td>sumúq</td>
</tr>
<tr>
<td>lompuq</td>
<td>‘go out’</td>
<td>lumompuq</td>
</tr>
<tr>
<td>empo</td>
<td>‘sit’</td>
<td>mempo</td>
</tr>
</tbody>
</table>
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)

ipe?  ‘to cut’  inipe?  ‘thing cut’ from
epanglo  ‘hunt crabs’  umepanglo  ‘to look for crabs’
gupu  ‘to fly’  gumupu i paharu  ‘the bird flew’
tristi  ‘sad’  trumisti  ‘becomes sad’
planta  ‘set the table’  plumanta  ‘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
lary-  ‘to pass’        legary-
koʔmoy-  ‘to hear’      kegoʔmoy-
tewomef  ‘to be glad’   tegewomef
ɨkyorkʷ-  ‘to watch’    ɨkyegorkʷ-
trahk-  ‘to fetch’      tregahk-
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’ \(\text{babeik} \) ‘stupidity

katar ‘itchy’ \(\text{kakatar} \) ‘itchiness’

soi ‘rich’ \(\text{sasoi-n} \) ‘wealth, possessions’

susar ‘be in difficulty’ \(\text{sasusar} \) ‘difficulties’

krakat ‘angry, wild’ \(\text{krarakat} \) ‘anger, wildness’

ktodan ‘heavy’ \(\text{ktatodan} \) ‘weight’

kleur ‘long (time)’ \(\text{klaleur} \) ‘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’ \(\text{babeik} \) ‘stupidity

katar ‘itchy’ \(\text{kakatar} \) ‘itchiness’

soi ‘rich’ \(\text{sasoi-n} \) ‘wealth, possessions’

susar ‘be in difficulty’ \(\text{sasusar} \) ‘difficulties’

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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’  krarakat ‘anger, wildness’
ktodan ‘heavy’  ktatodan ‘weight’
kleur ‘long (time)’  klaleur ‘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’ thenena
pukpe ‘child’ pukukpe

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).
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 grumadwet ~ gumradwet ‘to graduate’
plantsa plumantsa ~ pumlantsa ‘iron’
preno prumeno ~ pumreno ‘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 C₁ and an epenthetic vowel appears immediately
following -in-.” An epenthetic vowel is capitalized in Avery and Lamontagne’s transcription.

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

<table>
<thead>
<tr>
<th>Word</th>
<th>Infixation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>plahiyó</td>
<td>p-in-Alahiyó</td>
<td>‘plagiarized’</td>
</tr>
<tr>
<td>premyuhan</td>
<td>p-in-Iremyuhan</td>
<td>‘rewarded’</td>
</tr>
<tr>
<td>plántsa</td>
<td>p-in-Alántsa</td>
<td>‘ironed’</td>
</tr>
<tr>
<td>drówing</td>
<td>d-in-U-rówing</td>
<td>‘drew’</td>
</tr>
<tr>
<td>prító</td>
<td>i-p-in-I-ritó</td>
<td>‘fried’</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th>Word</th>
<th>Infixation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>prenúhan</td>
<td>pr-in-enúhan</td>
<td>‘braked’</td>
</tr>
<tr>
<td>gradúhan</td>
<td>g-in-radúhan</td>
<td>‘graded’</td>
</tr>
<tr>
<td>klipán</td>
<td>k-in-lipán/kl-in-ipán</td>
<td>‘cremated’</td>
</tr>
<tr>
<td>promót</td>
<td>p-in-romót/pr-in-omót</td>
<td>‘promoted’</td>
</tr>
<tr>
<td>b.</td>
<td>trabáho</td>
<td></td>
</tr>
<tr>
<td>t-in-arbáho</td>
<td></td>
<td>‘worked’</td>
</tr>
</tbody>
</table>

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)

\begin{itemize}
\item tak.co ‘rope (v.)’ tali\_\_co ‘be roped’\(^9\)
\item hoc.ca ‘shoot’ holicca ‘be shot’
\item o\_\_ti ‘make a fire’ o\:\\_\_ti ‘kindling’
\item a\_\_hica ‘watch over’ a\_\_lhica ‘be taken care of’
\end{itemize}

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

<table>
<thead>
<tr>
<th>Singular</th>
<th>Plural</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>qa:wat⁸</td>
<td>qa:qe:wat⁸</td>
<td>‘potato’</td>
</tr>
<tr>
<td>t’ada:dax</td>
<td>t’at’e:dax</td>
<td>‘tail (of a bird)’</td>
</tr>
<tr>
<td>haha:</td>
<td>hahiha?</td>
<td>‘tree’</td>
</tr>
<tr>
<td>wesa?t’o:pat</td>
<td>wewisa?t’o:pat</td>
<td>‘woman’</td>
</tr>
</tbody>
</table>

| b. k’at’la | k’ak’et’la | ‘stones’ |
| deq’deq’   | dedeq’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.

Miskito 2⁰ conjugation 1 person -i- (Rouvier 2002)

<table>
<thead>
<tr>
<th>Singular</th>
<th>Plural</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>bya.ra</td>
<td>byaira</td>
<td>‘abdomen’</td>
</tr>
<tr>
<td>na.pa</td>
<td>naipa</td>
<td>‘tooth’</td>
</tr>
<tr>
<td>kar.ma</td>
<td>kairma</td>
<td>‘throat’</td>
</tr>
<tr>
<td>kak.ma</td>
<td>kaikma</td>
<td>‘nose’</td>
</tr>
<tr>
<td>klah.kla</td>
<td>klaihkla</td>
<td>‘arm’</td>
</tr>
</tbody>
</table>

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 wan-, -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)

<table>
<thead>
<tr>
<th>Yuma</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>an'uv</td>
<td>'to fight'</td>
</tr>
<tr>
<td>x-al'y.qíc</td>
<td>'to grasp'</td>
</tr>
<tr>
<td>u:-kaðóm</td>
<td>'to point to something'</td>
</tr>
<tr>
<td>a:-t-axwmy</td>
<td>'to kindle'</td>
</tr>
<tr>
<td>ș-al.wáx</td>
<td>'to punch a hole with'</td>
</tr>
</tbody>
</table>

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)

ngóřůu ngògířůu ‘tied’

’yórůu yògířůu ‘stopped’

ngádf ngàgíďůu ‘eat (meat)’

kàráa kàgíráa ‘slaughter’

‘àwáa ‘àgiwáa ‘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 čoršu ‘to stab (downwards)’

saq’a sarq̄ar ‘to die’

čuqul čulq̄u ‘to rinse’

saʔa sarʔar ‘to become dry’

ʕaq̌al ʕalq̌al ‘to fall’

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

qa:le?  ‘he failed’  qa:le?  frequentative
\textit{t’iko}  ‘he put it on’  \textit{t’it’ko}  frequentative
k\textit{w}e:t’a?  ‘he is hungry’  k\textit{w}e:k\textit{w}t’a?  ‘several are hungry’
tuko:yo?  ‘snow’  tutko:yo?  ‘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)

\[
\begin{align*}
\text{ća.pà} & \quad \text{‘stab’} & \text{ća.wa.pca} & \quad \text{‘I stab’} \\
\text{?i.kto.mi} & \quad \text{‘Iktomi’} & \text{?i.ma.ktomi} & \quad \text{‘I am Iktomi’} \\
\text{ma.nù} & \quad \text{‘steal’} & \text{ma.wa.nù} & \quad \text{‘I steal’} \\
\text{na.pca} & \quad \text{‘swallow’} & \text{na.wa.pca} & \quad \text{‘I swallow it’} \\
\text{la.k'ota} & \quad \text{‘Lakota’} & \text{la.ma.k'ota} & \quad \text{‘I am a Lakota’} \\
\text{na.wizi} & \quad \text{‘jealous’} & \text{na.wa.wizi} & \quad \text{‘I am jealous’}
\end{align*}
\]

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)

\[
\begin{align*}
\text{puk} & \quad \text{‘to divide among’} & \text{puhk} & \quad \text{‘to spread the word’} \\
\text{kuč} & \quad \text{‘to carry’} & \text{kuhč} & \quad \text{‘to endure’} \\
\text{k'ep} & \quad \text{‘to clear away’} & \text{k'ehp} & \quad \text{‘to be clear’}
\end{align*}
\]

Similarly, in Tzutujil, another Mayan language, the simple passive, \(-j\)- (42)a, and the mediopassive, \(-\acute{j}\)- (42)b, must surface after the root vowel.
(42) Tzutujil simple passive/mediopassive (Dayley 1985:55, 113-4)

a. loq’ ‘buy’  lojq’ik ‘to be bought’
   ch’ey ‘hit’  xch’eji ‘it was hit’

b. toj ‘pay’  to?jik ‘to be paid’
   k’is ‘finish’  k’i?seem ‘to end, finish’
   tij ‘eat, consume’  ti?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)

<table>
<thead>
<tr>
<th>Aorist stem</th>
<th>Present stem</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>e-dak-</td>
<td>dank-an-</td>
<td>‘bite’</td>
</tr>
<tr>
<td>e-lab-</td>
<td>lamb-an-</td>
<td>‘take’</td>
</tr>
<tr>
<td>e-latʰ-</td>
<td>lantʰ-an-</td>
<td>‘escape notice’</td>
</tr>
<tr>
<td>e-lip-</td>
<td>limp-an-</td>
<td>‘leave’</td>
</tr>
<tr>
<td>e-patʰ-</td>
<td>pantʰ-an-</td>
<td>‘suffer’</td>
</tr>
<tr>
<td>e-putʰ-</td>
<td>puntʰ-an-</td>
<td>‘inquire’</td>
</tr>
<tr>
<td>e-pʰug-</td>
<td>pʰuŋg-an-</td>
<td>‘flee’</td>
</tr>
<tr>
<td>e-tʰig-</td>
<td>tʰiŋg-an-</td>
<td>‘touch’</td>
</tr>
</tbody>
</table>

- 31 -
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 Inkelas 1986)

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

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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)

<table>
<thead>
<tr>
<th>Singular</th>
<th>Plural</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>aká:son</td>
<td>aká:snon</td>
<td>‘to be hungry’</td>
</tr>
<tr>
<td>akopí:slin</td>
<td>akopí:slin</td>
<td>‘to knock something away’</td>
</tr>
<tr>
<td>imanó:kan</td>
<td>imanós:kan</td>
<td>‘to be winded’</td>
</tr>
<tr>
<td>maká:lin</td>
<td>makás:lin</td>
<td>‘to open the eyes’</td>
</tr>
<tr>
<td>stipí:lan</td>
<td>stipí:lan</td>
<td>‘to be sexually attractive.’</td>
</tr>
</tbody>
</table>

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)

alótìkan aloító:kan ‘to be full’

cosóknan cofoke:ñan ‘to be angled’

copóksin copokeösín ‘to be a hill’

lapátkin lapatlo:kin ‘to be narrow’

polóhkin polohpó:kin ‘to be circular’

taháspin tahastó:pin ‘to be light in weight’

talásban talastó: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. tašušun ‘to be fragrant’) or after the final vowel (i.e. tašušun ‘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’
oxyovon  ‘to be crazy’
yuxwowon  ‘to be high, tall’
muc’uc’u?  ‘kind of very small bead’ (muc’u? ‘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  tekipapanoa/ tekipapanoa  ‘to work’
naamuke  naamumuke/ naamumuke  ‘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)

<table>
<thead>
<tr>
<th>Lh</th>
<th>Meaning</th>
<th>Lh</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>luma?</td>
<td>'house'</td>
<td>lumaluma?</td>
<td>'houses'</td>
</tr>
<tr>
<td>kaput</td>
<td>'group'</td>
<td>kapukaput</td>
<td>'groups'</td>
</tr>
<tr>
<td>wiłan</td>
<td>'friend'</td>
<td>wiławiłan</td>
<td>'friends'</td>
</tr>
<tr>
<td>lanja</td>
<td>'sesame'</td>
<td>lanjalanja</td>
<td>'pile of sesame'</td>
</tr>
<tr>
<td>lamlu</td>
<td>'dice'</td>
<td>lamplamlu</td>
<td>'dices'</td>
</tr>
<tr>
<td>pawti</td>
<td>'bag'</td>
<td>pawtipawti</td>
<td>'bags'</td>
</tr>
<tr>
<td>?untu</td>
<td>'rock'</td>
<td>?untuuntu</td>
<td>'pile of rocks'</td>
</tr>
<tr>
<td>tanju</td>
<td>'winter melon'</td>
<td>tanjutanju</td>
<td>'winter melons'</td>
</tr>
<tr>
<td>tamlaw</td>
<td>'person'</td>
<td>tamplamlaw</td>
<td>'people'</td>
</tr>
<tr>
<td>sama</td>
<td>'card'</td>
<td>samaalamna</td>
<td>'cards'</td>
</tr>
<tr>
<td>niaru</td>
<td>'village home'</td>
<td>niaruniaru</td>
<td>'village homes'</td>
</tr>
</tbody>
</table>

b. Thao (Chang 1998)

<table>
<thead>
<tr>
<th>Lh</th>
<th>Meaning</th>
<th>Lh</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>agqtu</td>
<td>'to contemplate'</td>
<td>agqtuagqtu</td>
<td>'think about'</td>
</tr>
<tr>
<td>m-arfaz</td>
<td>'to fly, be flying'</td>
<td>m-arfarfaz</td>
<td>'to keep flying around'</td>
</tr>
<tr>
<td>m-armuz</td>
<td>'to dive'</td>
<td>m-armurmuz</td>
<td>'to dive repeatedly'</td>
</tr>
<tr>
<td>patihau</td>
<td>'a spell, a curse'</td>
<td>patihau</td>
<td>'to cast a spell on s.o.'</td>
</tr>
<tr>
<td>quiliu</td>
<td>'long'</td>
<td>mia-quiliulji</td>
<td>'to straighten, stretch out'</td>
</tr>
<tr>
<td>kikai</td>
<td>'to ask'</td>
<td>ma-kikai</td>
<td>'to ask around'</td>
</tr>
</tbody>
</table>

11 Vowel clusters are treated as vowel-sequences in Amis. The syllabification of niaru 'village home' is ni.ar.u, for example.
12 Examples are presented in IPA transcription rather than in the orthographic convention assumed in the source. Particularly, IPA [i] is represented as 'lh', while [ʃ] as 'sh' in the source.
buqnur ‘anger, hatred’   mia-bugnuqnur ‘to be irritable’
ma-kutnir ‘compact’   mia-kutnitrir ‘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)

<table>
<thead>
<tr>
<th>Nominal</th>
<th>Reduplication</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>omotumuj</td>
<td>omotumutumuj</td>
<td>‘He shook it repeatedly’</td>
</tr>
<tr>
<td>omokon</td>
<td>omokomokon</td>
<td>‘He swallowed it frequently’</td>
</tr>
<tr>
<td>ohuka</td>
<td>ohukahuka</td>
<td>‘He kept on laughing’</td>
</tr>
<tr>
<td>ojeʔapahʷat</td>
<td>ojeʔapahʷapahʷat</td>
<td>‘He rolls himself up repeatedly’</td>
</tr>
<tr>
<td>jeumirik</td>
<td>jeumirimirik</td>
<td>‘I tie up repeatedly’</td>
</tr>
<tr>
<td>oetun</td>
<td>oetuetun</td>
<td>‘He keeps on smelling’</td>
</tr>
<tr>
<td>apot</td>
<td>apoapot</td>
<td>‘I jump repeatedly’</td>
</tr>
<tr>
<td>oekij</td>
<td>oekiekij</td>
<td>‘He pulls repeatedly’</td>
</tr>
</tbody>
</table>

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.


<table>
<thead>
<tr>
<th>Nominal</th>
<th>Reduplication</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>culuk</td>
<td>cululuk</td>
<td>‘dribbling’</td>
</tr>
<tr>
<td>allok</td>
<td>allolok</td>
<td>‘mottled’</td>
</tr>
</tbody>
</table>
thak     t'atak    'with a slap'\textsuperscript{13}
t'anj    t'atanj\textsuperscript{14}    'bang'
wacak    wacacak    '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)

<table>
<thead>
<tr>
<th>Levantine Arabic</th>
<th>Inflected Arabic</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>barad</td>
<td>barbad</td>
<td>'shaved unevenly'</td>
</tr>
<tr>
<td>šarah</td>
<td>šaršah</td>
<td>'criticized severely'</td>
</tr>
<tr>
<td>halat</td>
<td>halhat</td>
<td>'sheared unevenly'</td>
</tr>
<tr>
<td>dahal</td>
<td>dahdal</td>
<td>'rolled gradually'</td>
</tr>
</tbody>
</table>

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

\textsuperscript{13} Note that the aspirated and fortis onsets are lost in the reduplicant.
\textsuperscript{14} [\textsuperscript{\textdagger}] refers to the tenseness, rather than ejection.

[colo] ‘to make the sound of crackling paper’

[colo]+?a ‘it makes irregular crackling sounds (?a=PRES)’

tomo ‘to strike the skin drum’

čuwapi tomo+k’+e+?a ‘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’ šoram ‘to find’

haw ‘to know’ a-haraw ‘someone knows it’

ndok ‘to fish’ a-ndorok ‘somebody fishes it’

ndig ‘to string’ a-ndirixeg ‘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 & Hovdhaugen 1992:221-222)

<table>
<thead>
<tr>
<th>English</th>
<th>Samoan</th>
</tr>
</thead>
<tbody>
<tr>
<td>'toa</td>
<td>to'toa</td>
</tr>
<tr>
<td>'ma:</td>
<td>ma'ma:</td>
</tr>
<tr>
<td>a'lofa</td>
<td>a:lo'lofa</td>
</tr>
<tr>
<td>ga'lu'e</td>
<td>ga:lu'lu'e</td>
</tr>
<tr>
<td>a:vaga</td>
<td>a:va'vaga</td>
</tr>
<tr>
<td>atama'i</td>
<td>atama'mai</td>
</tr>
<tr>
<td>ma?ali'li</td>
<td>ma?ali'li</td>
</tr>
<tr>
<td>to'ulu</td>
<td>to'u'ulu</td>
</tr>
</tbody>
</table>

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' | yayámka |
|    | píw-ka | 'red-ADJ'  | papíwka |
|    | pí:ka  | 'extinguished-ADJ' | pipí:ka |
|    | bara-ka | 'dark-ADJ' | barará:ka |
|    | bisí:-ka | 'small-ADJ' | bisísí:ka |
| b. | ihífr-ka | 'erect-ADJ' | ihihífrka |
|    | walañ-ka | 'corpulent' | walañ:ka |
|    | barás-ka | 'black-ADJ' | barás:ka |
|    | buriñ-m-ka | 'firm-ADJ' | buriñmka |
|    | saháw-ka | 'nake-ADJ' | sahaháwka |

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-CNS2’
alá:kuŋ alá:-ka-kuŋ ‘Muscovy duck-CNS3’
wará:wá wará:w-kana-wa ‘parrot sp.-CNS3’
ká:sirá:mah ká:-ki-sirá:mah ‘lizard sp.-CNS1’

b. awá, awá: awá:-ki ‘silkgrass-CNS1’
súru, surú: surú:-kina ‘log-CNS1’
(?)yápu, yapú: yapú:-kana ‘crocodile-CNS3’
(?)ábu, abú: abú:-ma ‘stingray-CNS2’

Infixed 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.

péso:kʷe ‘lake’ pépsó:kʷe ‘small lake’
cqé:tp ‘tree’ cqéqʰp ‘small tree’
Chamorro continuative CV reduplication is a possible instance of infixing after the stressed vowel.

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

<table>
<thead>
<tr>
<th>Noncontinuative</th>
<th>Continuative</th>
<th>Traditional analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>'saga'</td>
<td>'sasaga'</td>
<td>'staying' 'sasaga'</td>
</tr>
<tr>
<td>hu'gando</td>
<td>hu'gagando</td>
<td>'playing' hu'gagando</td>
</tr>
<tr>
<td>'taitai'</td>
<td>'tataitai'</td>
<td>'reading' 'tataitai'</td>
</tr>
<tr>
<td>'egga?'</td>
<td>'e?egga?'</td>
<td>'watching' 'e?egga?'</td>
</tr>
</tbody>
</table>

The traditional analysis of Chamorro reduplication assumes that the reduplicant appears before the final disyllabic foot (e.g., hu(gando) → huga(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., hu'gando 'play' vs. hu'gagando '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., nānā 'mother' vs. nanā-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)

\[
\begin{align*}
\text{\textquotesingle} \text{Popo\textquoteright}{}\text{catepetl} & \quad \text{Popo-}\textbf{fuckin-}{}\text{catepetl} & \quad \text{or} & \quad \text{Popocate-}\textbf{fuckin-}{}\text{petl} \\
\text{\textquotesingle} \text{an\textquoteright}{}\text{ticipa,}{}\text{tory} & \quad \text{anticipa-}\textbf{fuckin-}{}\text{tory} & \quad \text{or} & \quad \text{an-}\textbf{fuckin-}{}\text{ticipatory} \\
\text{\textquotesingle} \text{Tatama\textquoteright}{}\text{gouchee} & \quad \text{Tata-}\textbf{fuckin-}{}\text{magouchee} & \quad \text{or} & \quad \text{Tatama-}\textbf{fuckin-}{}\text{gouchee} \\
\text{\textquotesingle} \text{Winni\textquoteright}{}\text{pesaukee} & \quad \text{Winni-}\textbf{fuckin-}{}\text{pesaukee} & \quad \text{or} & \quad \text{Winnie-}\textbf{fuckin-}{}\text{saukee} \\
\text{\textquotesingle} \text{Kalama\textquoteright}{}\text{zoo} & \quad \text{Kala-}\textbf{fuckin-}{}\text{mazoo} & \quad \text{or} & \quad \text{Kalama-}\textbf{fuckin-}{}\text{zoo}
\end{align*}
\]

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) (*)(*)(*)(*)

\[
\text{Popo cate petl}
\]
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)

\[
\begin{align*}
\text{hemg-} & \quad \text{‘take out’} \quad \text{hememg-} & \quad \text{(freq.)} \\
\text{masg-} & \quad \text{‘put’} \quad \text{matslaasg-} & \quad \text{(freq.)} \\
\text{baxm-} & \quad \text{‘come’} \quad \text{baxaaxm-} & \quad \text{(freq.)} \\
\text{t\'uul\'uulg-} & \quad \text{‘trail’} \quad \text{t\'uul\'uulg-} & \quad \text{(usit.)} \\
\text{st\'uim-t-a} & \quad \text{‘boil it!’} \quad \text{ts\'uim\'uim\'uim-t-a} & \quad \text{‘he boils it;}
\end{align*}
\]

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., \textit{hem-em-g}). However, the VC reduplicant might also be analyzed as lodging after the initial consonant (e.g., \textit{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 \textit{aaCee}, where \textit{C} is a copy of the root-final consonant, when the root is CVC (e.g., \textit{kar} \rightarrow \textit{k\'ar\'ar\'ee} ‘corn stalk’; Leben 1980, Newman 2000) (64)a. However, when a root ends in a consonant cluster, the \textit{-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* $\rightarrow$ *kásàakée* ‘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., Rosenthal 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

<table>
<thead>
<tr>
<th>a.</th>
<th>kar</th>
<th>káréea</th>
<th>káràarée</th>
<th>‘corn stalk’</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>dam</td>
<td>dámoo</td>
<td>dámàamée</td>
<td>‘land’</td>
</tr>
<tr>
<td>b.</td>
<td>bim</td>
<td>bimii</td>
<td>bíraanée</td>
<td>‘city’</td>
</tr>
<tr>
<td></td>
<td>kulk</td>
<td>kúlkî</td>
<td>kúlàaké</td>
<td>‘cudgel’</td>
</tr>
<tr>
<td></td>
<td>kask</td>
<td>káskóo</td>
<td>kásàakée</td>
<td>‘bowl’</td>
</tr>
</tbody>
</table>

There are other reported cases of infixing before the final consonant, but all are reanalysable 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)

<table>
<thead>
<tr>
<th>tānka</th>
<th>‘sesame’</th>
<th>tānkan(_)ka</th>
<th>‘pile of sesame’</th>
</tr>
</thead>
<tbody>
<tr>
<td>lamlu</td>
<td>‘die’</td>
<td>lam(_)(_)lu</td>
<td>‘dice’</td>
</tr>
<tr>
<td>pawti</td>
<td>‘bag’</td>
<td>pawt(_)(_)ti</td>
<td>‘bags’</td>
</tr>
</tbody>
</table>
However, when the root ends with a consonant, the reduplicant appears to come before the final consonant (66).

(66)  

<table>
<thead>
<tr>
<th>Word</th>
<th>Meaning</th>
<th>Word</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>lumaʔ</td>
<td>'house'</td>
<td>lumalumaʔ</td>
<td>'houses'</td>
</tr>
<tr>
<td>kaput</td>
<td>'group'</td>
<td>kapukaput</td>
<td>'groups'</td>
</tr>
<tr>
<td>wiʔaŋ</td>
<td>'friend'</td>
<td>wiʔawiʔaŋ</td>
<td>'friends'</td>
</tr>
<tr>
<td>?uŋʔuŋj</td>
<td>'rock'</td>
<td>?uŋʔuŋʔuŋj</td>
<td>'pile of rocks'</td>
</tr>
<tr>
<td>tanʔuŋj</td>
<td>'winter melon'</td>
<td>tanʔuŋʔuŋj</td>
<td>'winter melons'</td>
</tr>
<tr>
<td>tamlaw</td>
<td>'person'</td>
<td>tamlamlaw</td>
<td>'people'</td>
</tr>
<tr>
<td>niaruʔ</td>
<td>'village home'</td>
<td>niaruaruʔ</td>
<td>'village homes'</td>
</tr>
</tbody>
</table>

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’ → *pawpawti).

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’  okhocayyan
ok.cák.kon ‘to be blue’  okhocákkon
ak.letal.lin ‘to be oversize’  akholátlin
stok.hát.kan ‘to be gray’  stokhohátkan

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 ho-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.
Cantonese (Matthews & Yip 1994:43)

lœntsœn ‘clumsy’ lœn-kwai-tsœn ‘downright clumsy’
juksyn ‘ugly’ juk-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. sađa  sa'biđa ‘Q1, hundred’

b. laulus  la'hiulus ‘Q2, in the song inessive sg.’

   seadus  se'biadus ‘Q3, law, nom. s.g.’

   kauųa  ka'hiuńa ‘Q2, for a long time, adv.’

   haige  ha'biţe ‘Q3, sick, nom. s.g.’

   maijas  ma'hiţas ‘Q2, fond of sweets, nom. s.g.’

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) sađa  sa'biđa ‘Q1, hundred’

   sađa  sa'biđa ‘Q2, send, 2sg. imper.’

   sađa  sa'biđa ‘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)

<table>
<thead>
<tr>
<th>Original Word</th>
<th>Infixed Word</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>gidā</td>
<td>gibīda</td>
<td>‘house’</td>
</tr>
<tr>
<td>maskī</td>
<td>mabāski</td>
<td>‘oily’</td>
</tr>
<tr>
<td>Màimunà</td>
<td>Maibāimubùna</td>
<td>‘Maimuna (name)’</td>
</tr>
<tr>
<td>hatsī</td>
<td>habātsi</td>
<td>‘grain’</td>
</tr>
<tr>
<td>tàbarmā</td>
<td>tabababarma</td>
<td>‘mat’</td>
</tr>
</tbody>
</table>

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 (Bagemh 1988)

<table>
<thead>
<tr>
<th>Natural Lg</th>
<th>Play Lg 1</th>
<th>Play Lg 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>s’āhifu</td>
<td>s’āgāhigifugu</td>
<td>s’āgāhigifugu</td>
</tr>
<tr>
<td>bič’a</td>
<td>bigūč’aga</td>
<td>bigūč’aga</td>
</tr>
<tr>
<td>?intay</td>
<td>?igintagay</td>
<td>?igintagay</td>
</tr>
<tr>
<td>k’arma</td>
<td>k’agarmaga</td>
<td>k’agārīgīmaga</td>
</tr>
</tbody>
</table>

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 i 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.  

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

<table>
<thead>
<tr>
<th>Original</th>
<th>Infix</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>bapak</td>
<td>-ok-</td>
<td>bokap</td>
</tr>
<tr>
<td>malu</td>
<td>-ok-</td>
<td>mokal</td>
</tr>
<tr>
<td>pembantu</td>
<td>-ok-</td>
<td>pambokat</td>
</tr>
<tr>
<td>rumah</td>
<td>-ok-</td>
<td>rokum</td>
</tr>
<tr>
<td>begitu</td>
<td>-ok-</td>
<td>begokit</td>
</tr>
</tbody>
</table>

Finally, in Tagalog, the infix -gVdV- 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)

<table>
<thead>
<tr>
<th>Original</th>
<th>Infix</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>hindi?</td>
<td>-gVdV-</td>
<td>higüindigüidí? ‘not, not’</td>
</tr>
<tr>
<td>tanjháli?</td>
<td>-gVdV-</td>
<td>tagáadanjagáadaligüidi? ‘noon’</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Pivot</th>
<th>Location</th>
<th>Examples discussed above</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>First consonant</em></td>
<td>Before</td>
<td>SiSwati &amp; Kinande pluractional, Pangasinan plural</td>
</tr>
<tr>
<td></td>
<td>After</td>
<td>Atayal actor focus -m-, Mlabri nominaling -rn-, Maricopa plural -ue-</td>
</tr>
</tbody>
</table>
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 -?-,

**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 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 continues...
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.

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

\[
\text{Align} \quad (\text{Cat}_1, \text{Edge}_1, \text{Cat}_2, \text{Edge}_2) = \text{def} \quad \\
\forall \text{Cat}_1 \exists \text{Cat}_2 \text{ such that } \text{Edge}_1 \text{ of Cat}_1 \text{ and Edge}_2 \text{ of Cat}_2 \text{ coincide.}
\]

Where \( \text{Cat}_1 \in \text{MorphCat} \{\text{morphemes, morph}\} \)

\( \text{Cat}_2 \in \text{PhonCat} \{\text{ProsCat, C, V}\} \)

\( \text{Edge}_1, \text{Edge}_2 \in \{\text{Right, Left}\} \)

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 constituent 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 subcategorization (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).

[čula]Ft ri       mula-[čula]Ft-ri  ‘initiated man’ vs. *[čular]-[čula]ri
[čukar]Fr pa   tukar-[čukar]Fr pan  ‘unsettled mind’ vs. *[čuka]-
[čukar]pan

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b. i. \( O(\Phi([\text{múla}]_{F1} \text{ri}) = O([\text{múla}]_{F1} \text{ri} \cdot \Phi) \star [\text{múla}]_{F1} \text{ri}/\Phi \)

ii. \( = O([\text{múla}]_{F1}) \star \text{ri} \)

iii. \( = [\text{múla}]_{F1} [\text{múla}]_{F1} \star \text{ri} \)

iv. \( = [\text{múla}]_{F1} [\text{múla}]_{F1} \text{ri} \)

Under positive prosodic circumscription, one first selects the prosodic constituent to be copied (represented by the function \( \Phi \)), in this case, a stressed foot (step i). The \( \Phi \)-delimited portion of the word is assembled with the non-\( \Phi \)-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).


a. bulud \( \textbf{bu} \)-bulud ‘hill/ridge’
limo \( \textbf{li} \)-limo ‘five/about five’
ulampoy \( \textbf{u-la} \)-lampoy no gloss
abalan \( \textbf{a-ba} \)-balan ‘bathes/often bathes’
ompodon  om-po-podon ‘flatter/always flatter’

b. Circumscriptional analysis

\[ \Phi(\text{Onsetless Syllable, Left}), O = \text{Prefix} \sigma_\mu (\text{reduplicative prefix}) \]

\[
\begin{align*}
O/\Phi(\text{ompodon}) & = O(\text{ompodon}/\Phi) * \text{ompodon}:\Phi \\
& = O(\text{podon}) * \text{om} \\
& = \text{popodon} * \text{om} \\
& = \text{ompopodon}
\end{align*}
\]

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

<table>
<thead>
<tr>
<th>Singular</th>
<th>Plural</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>niʔis</td>
<td>nariʔis</td>
<td>'to cool oneself'</td>
</tr>
<tr>
<td>naho</td>
<td>naraho</td>
<td>'to know'</td>
</tr>
</tbody>
</table>

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 *hetter* baff (*My better half*)

*Can* I *morrow* your dotes? (*Can* I *borrow* your notes?)

*The Folden Gleece* award (*The Golden Fleece* award)
b. Vocalic exchange (Shattuck-Hufnagel 1986)

Error (target)

f[i]lt the b[u]ll (foot the bill)

st[r]red the sh[i]p (steered the ship)

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

ch[i]ps ’n tw[ə]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: sweet smell of success, a dime a dozen, bigger & better, jump for joy

Wordsworth: And sings a solitary song That whistles in the wind.

Assonance:

‘fleet feet sweep by sleeping geeks.’

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’ähifu         s’agähigifugu    ‘he wrote’
bīc’a           bigić’aga       ‘yellow’
?iìntay         ?iìgìntagay     ‘what’
k’arma          k’agarmaga      ‘gnat’

b. Hausa word game (Newman 2000:297)

gidā             gibida       ‘house’
maskī            mabàski      ‘oily’
Māimunà         Mai bà imubùna ‘Maimuna (name)’
hatsī           habàtsi       ‘grain’
tàbarmā         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: dito > doti ‘here’ (Conklin 1956)
Javanese: satus > tasus ‘100’ (Sadtano 1971)

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Sequence exchanges

Hanunoo: rignuk > nugrik ‘tame’ (Conklin 1959)

Thai: khab rod > khod rab ‘to drive’ (Surintramont 1973)

Mandarin: ma > ma key> mey ka (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

<table>
<thead>
<tr>
<th></th>
<th>Fixed</th>
<th>RED</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edge-oriented</td>
<td>85</td>
<td>43</td>
<td>128</td>
</tr>
<tr>
<td>Prominence-driven</td>
<td>3</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>141</td>
</tr>
</tbody>
</table>

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 infixed 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, V₁). 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., trumisti ‘becomes sad’); when the stem is V-initial, -um- appears prefixing (e.g., umepanglo ‘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.

![Example of genuine infixation in English](image)

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 following examples:

(a) "saxophone" saxo-ma-phone
(b) "telephone" tele-ma-phone
(c) "wonderful" wonder-ma-ful
(d) "feudalism" feuda-ma-lism
(e) "hippopotamus" hippo-ma-potamus
(f) "secretary" secre-ma-tary
(g) "hypothermia" hypo-ma-thermia
(h) "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 following examples:
If -\textit{ma}- were merely an affix that left-subcategories 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.

\begin{tabular}{lll}
(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 \\
\end{tabular}

\begin{tabular}{lll}
(20) & oboe & oba-ma-boe \\
    & opus & opa-ma-pus \\
    & party & parta-ma-ty \\
    & piggy & piga-ma-gy \\
    & purple & purga-ma-ple \\
    & scramble & scramba-ma-ble \\
    & stinky & stinka-ma-ky \\
    & table & taba-ma-ble \\
    & tuba & tuba-ma-ba \\
\end{tabular}

\begin{tabular}{lll}
    & washing & washa-ma-shing \\
    & water & wata-ma-ter \\
    & wonder & wonda-ma-der \\
    & aura & aura-ma-ra \\
    & music & musa-ma-sic \\
    & Kieran & Kiera-ma-ran \\
    & joking & joka-ma-king \\
    & listen & lisa-ma-sten \\
\end{tabular}
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 ['lajvlI] yields live-ama-ly ['laj-və-mə-li] not *live-ma-ly *[lajv-mə-li]. However, the satisfaction of the leftward pivot is not enough, since *lively-ma *[lajv1-mə] is not possible even though lively ['lajvlI] 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 -ga- 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):

\[
\begin{align*}
(21) \quad /i, awi/ & \rightarrow i-awit \quad \text{‘sang’} \\
/in, bigy, an/ & \rightarrow b-igy-an \quad \text{‘gave to’} \\
/\hat{i}, in, bilih/ & \rightarrow i-b-ilil \quad \text{‘bought for’} \\
/\hat{i}, in, ka-takoh/ & \rightarrow i-k-ina-takoh \quad \text{‘caused to run for’}
\end{align*}
\]

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.

\[
\begin{align*}
(22) \quad /ni, awi/ & \rightarrow i-nawit \quad \text{‘sang’} \\
/ni, bigy, an/ & \rightarrow bi-nigy-an \quad \text{‘gave to’} \\
/\hat{i}, ni, bilih/ & \rightarrow i-bilil \quad \text{‘bought for’} \\
/\hat{i}, ni, ka-takoh/ & \rightarrow i-ki-na-takoh \quad \text{‘caused to run for’}
\end{align*}
\]
Schematically, Halle’s *Onset Metathesis* analysis of infixation can be stated as follows:

(23) Onset Metathesis

\[ \text{\begin{array}{c|c|c|c|c|c|c|c|c}
\downarrow & n & i & C & \ldots & C & i & n & \ldots \\
\hline
X & X+ & X & \rightarrow & X & X & X & \\
1 & 2 & 3 & 4 & 3 & 2 & 1 & 4
\end{array}} \]

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)

<table>
<thead>
<tr>
<th>Root</th>
<th>Gloss</th>
<th>Prohibitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>yeči</td>
<td>‘to arrive’</td>
<td>yemeči</td>
</tr>
<tr>
<td>yixor</td>
<td>‘to be’</td>
<td>yimoxor</td>
</tr>
<tr>
<td>yuc’u</td>
<td>‘to give’</td>
<td>yumoc’u</td>
</tr>
</tbody>
</table>
Here, the infix -mE- always appears after the initial vowel of the stem. Onset metathesis would predict the wrong results (e.g., *mɔ+yixɔr → *yɔmixinɔr, not yimɔxɔr). 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).
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).

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).
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. **inpaltóg** ‘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)

\[\text{pinaltóg} \quad \text{‘was shot’}\]
\[\text{sinúlat} \quad \text{‘was written’}\]
\[\text{binása} \quad \text{‘was read (no assumptions made about alternative)’}\]
\[\text{tináwag} \quad \text{‘was called’}\]

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)

<table>
<thead>
<tr>
<th>Root</th>
<th>Gloss</th>
<th>Actor focus</th>
<th>Reciprocal/Reflexive</th>
</tr>
</thead>
<tbody>
<tr>
<td>kaiil</td>
<td>‘talk’</td>
<td>kmaial</td>
<td>mkaial(^1)</td>
</tr>
<tr>
<td>qul</td>
<td>‘snatch’</td>
<td>qmul</td>
<td>mqu1</td>
</tr>
<tr>
<td>sbil</td>
<td>‘leave behind’</td>
<td>sbi1</td>
<td>msbi1</td>
</tr>
<tr>
<td>siuk</td>
<td>‘give back’</td>
<td>smiuk</td>
<td>msiuk</td>
</tr>
<tr>
<td>spuŋ</td>
<td>‘measure’</td>
<td>spuŋ</td>
<td>mspuŋ</td>
</tr>
<tr>
<td>sulun</td>
<td>‘burn’</td>
<td>smuliŋ</td>
<td>msuliŋ</td>
</tr>
</tbody>
</table>

\(^1\) 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.
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)

<table>
<thead>
<tr>
<th></th>
<th>Austronesian</th>
<th>Austro-Asiatic</th>
<th>Elsewhere</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>VC after onset</td>
<td>19</td>
<td>8</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>VC elsewhere</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>C</td>
<td>5</td>
<td>3</td>
<td>30</td>
<td>38</td>
</tr>
<tr>
<td>CV</td>
<td>2</td>
<td>0</td>
<td>17</td>
<td>19</td>
</tr>
</tbody>
</table>

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, $v = [\beta]$; $\dot{e} = [\epsilon]$; $\delta = \sigma$. 

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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-\textit{ni}-aati 'carving'
kasi 'to dig' k-\textit{ni}-asi 'act of digging'
kakri 'to cry' k-\textit{ni}-akri 'act of crying'
pèpna 'to fence' p-\textit{ni}-èpna 'act of fencing, fence'
polu 'to call' p-\textit{ni}-olu 'act of calling, call'
n-sai 'to climb, rise, III (3SG)' s-\textit{ni}-ai 'act of climbing, rising'
n-teti 'to chop, III (3SG)' t-\textit{ni}-eti 'chop, chopping'
n-vaka 'to ask (for), III (3SG)' v-\textit{ni}-aka 'act of asking, request'

b. kili 'to look' k-\textit{n}-ili 'act of looking'
kini 'to kiss' k-\textit{n}-ini 'act of kissing, kiss'
surta 'to write' s-\textit{n}-urta 'act of writing, memory'
tutu 'to support' t-\textit{n}-utu 'act of supporting, support'
n-virna 'to peel, II (3SG)' v-\textit{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.
Nominalizing -i- in Leti

davra 'cut' d-i-avra 'act of cutting, cut'
dèdma 'to smoke' d-i-èdma 'act of smoking'
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 -r-, is infixed between the onset and the rhyme of a syllable.
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 -$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 [] 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 Dagestani language spoken in 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)

<table>
<thead>
<tr>
<th>Root</th>
<th>Gloss</th>
<th>Prohibitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>yeči</td>
<td>'to arrive'</td>
<td>yečeméči</td>
</tr>
<tr>
<td>yixar</td>
<td>'to be'</td>
<td>yimoxor</td>
</tr>
<tr>
<td>yuc'u</td>
<td>'to give'</td>
<td>yumoc'u</td>
</tr>
</tbody>
</table>

In Hua, a Papuan language of the Eastern Highlands of New Guinea, the negative morpheme -ra- 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-externally.
(36) Hua negative formation (Haiman 1980)

zgavo  zgavo ‘not embrace’
harupo  harupo ‘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. 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. 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

<table>
<thead>
<tr>
<th>abot</th>
<th>umabot</th>
<th>‘reach for’</th>
</tr>
</thead>
<tbody>
<tr>
<td>aral</td>
<td>umaral</td>
<td>‘teach’</td>
</tr>
<tr>
<td>tawag</td>
<td>tumawag</td>
<td>‘call’</td>
</tr>
<tr>
<td>sulat</td>
<td>sumulat</td>
<td>‘write’</td>
</tr>
<tr>
<td>gradwet</td>
<td>grumadwet</td>
<td>‘graduate’</td>
</tr>
</tbody>
</table>

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., ṭaral ‘to study’ → mag-ṭaral ‘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.
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). 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 guthradwet 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)**

<table>
<thead>
<tr>
<th>Candidates</th>
<th>NOCODA</th>
<th>EDGEMOST(L, um)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [-um.grad.wet.]</td>
<td>***!</td>
<td></td>
</tr>
<tr>
<td>b. [g-um.rad.wet.]</td>
<td>***!</td>
<td>*</td>
</tr>
<tr>
<td>c. gr-u.mad.wet.</td>
<td>**</td>
<td>gr</td>
</tr>
<tr>
<td>d. [grad.w-u.met.]</td>
<td>**</td>
<td>gradw!</td>
</tr>
</tbody>
</table>

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

(41) Candidates

<table>
<thead>
<tr>
<th>Candidates</th>
<th>NOCODA</th>
<th>EDGEMOST(L, um)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [-u.ma.ral.]</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. [a.-um.ral.]</td>
<td>**!</td>
<td>a</td>
</tr>
<tr>
<td>c. [a.r-u.mal.]</td>
<td>*</td>
<td>ar!</td>
</tr>
<tr>
<td>d. [a.ra.-uml.]</td>
<td>*</td>
<td>ara!</td>
</tr>
<tr>
<td>e. [a.ra.l-um.]</td>
<td>*</td>
<td>aral!</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th>English</th>
<th>Alabama</th>
</tr>
</thead>
<tbody>
<tr>
<td>rope (v.)</td>
<td>takco</td>
</tr>
<tr>
<td>be roped</td>
<td>talikco</td>
</tr>
<tr>
<td>shoot</td>
<td>hocca</td>
</tr>
<tr>
<td>be shot</td>
<td>holicca</td>
</tr>
</tbody>
</table>

\[^8\] According to Martin & Munro 1994, an epeithetic *i* is inserted before consonant clusters in Alabama and Koasati.
oti 'make a fire'  o:lti 'kindling'

a-hica 'watch over'  a- lhica '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'  dabχdi 'to churn (AOR., III)'  (K & K 1988:33)
ak' a 'to drive'  abk'u 'to drive (AOR., III)'  (K & K 1988:33)
aχa 'to lie down'  abχu '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.
Tagalog pluractional (Schachter & Otanes 1972:335)

mag-luto ‘cook’  mangagluto ‘cook (pl.)’
mag-alar ‘study’  mangagalar ‘study (pl.)’
magsi-kanta ‘sing (pl.)’  mangagsikanta ‘sing (pl.)’
magsi-pangisda ‘go fishing (pl.)’  mangagsipangisda ‘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)

<table>
<thead>
<tr>
<th>Base form</th>
<th>gloss</th>
<th>reduplicated form</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>jalwaji</td>
<td>‘mud’</td>
<td>j-alw-alwaji</td>
<td>‘very muddy’</td>
</tr>
<tr>
<td>bangal</td>
<td>‘egg’</td>
<td>b-ang-angalji</td>
<td>‘having a lot of eggs’</td>
</tr>
<tr>
<td>wangij</td>
<td>‘child’</td>
<td>w-ang-angij</td>
<td>‘children’</td>
</tr>
</tbody>
</table>
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)

\[ \text{Left edge of ROOT coincides with the left edge of PrWd.} \]

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  munjunji  ‘swim’
- yumpi  yumpumpi  ‘do’
- mungga  munggungga  ‘eat’
- thena  thenena  ‘stand’
- ngaya  ngayaya  ‘I (1sgNOM)’

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

(48) iiru-ma  iiriiru-ma  ‘here-EMPH’ *iiruru-ma
     ungpa  ungkungpa  ‘break’*  *ungpangpa

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’; wegeb → wegebge ‘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.

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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).
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.
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.

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.

\[
\begin{array}{|c|c|c|c|c|}
\hline
(52) & /\text{um, wawan}/ & \text{OCP}_{\text{um}} & \text{ALIGN}_{\text{BY-\sigma}} & \text{MPARSE} & \text{*CODA} & \text{ALIGN}_{\text{BY-SEG}} \\
\hline
\text{a. \text{wu.ma.wan}} & \ast! & \ast & \ast & \ast \\
\text{b. \text{w}.\text{a}.\text{w}.\text{a}.\text{num}} & \ast! & \ast & \ast & \ast \\
\text{c. \text{\emptyset}} & \ast! & \ast & \ast & \ast \\
\hline
\end{array}
\]

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

\[ M_{\text{ALIGN}} >> P \]

Here, \( M_{\text{ALIGN}} \) is understood to define a class of constraints on morphological alignment, while P stands for any phonotactic or prosodic constraints. The dominance of \( M_{\text{ALIGN}} \) 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 $\text{M}_{\text{ALIGN}} \gg \text{P}$ 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 $\text{P} \gg \text{M}$ 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 $\text{P}$-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 instances 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[γ]  η    x
   q    h
   ?
   i [i, iː]1  u [u, uː]
  ii [iː]  uu [uː]
e [ɛ, eː]  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 prevocally, 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 [ii] and [uu] before a vowel.
segment $m$ signifies active indicative when it is infixed, while indicating intransitivity or reciprocity when it is prefixed. 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)  
<table>
<thead>
<tr>
<th>hului</th>
<th>hmului</th>
<th>‘pull’</th>
<th>(Egerod 1965: 266)</th>
</tr>
</thead>
<tbody>
<tr>
<td>kaial</td>
<td>kmaial</td>
<td>‘talk’</td>
<td>(Egerod 1965: 266)</td>
</tr>
<tr>
<td>kamil</td>
<td>kmamil</td>
<td>‘scratch will nail’</td>
<td>(Egerod 1965: 266)</td>
</tr>
<tr>
<td>kuu</td>
<td>kmuu</td>
<td>‘too tired, not the mood’</td>
<td>(Egerod 1965: 266)</td>
</tr>
<tr>
<td>qalup</td>
<td>qmalup</td>
<td>‘hunt’</td>
<td>(Egerod 1965: 266)</td>
</tr>
<tr>
<td>qes</td>
<td>qmes</td>
<td>‘make boundary’</td>
<td>(Egerod 1965: 266)</td>
</tr>
<tr>
<td>quax</td>
<td>qmuax</td>
<td>‘wash (things)’</td>
<td>(Egerod 1965: 266)</td>
</tr>
<tr>
<td>qul</td>
<td>qmul</td>
<td>‘snatch’</td>
<td>(Egerod 1965: 266)</td>
</tr>
<tr>
<td>siuk</td>
<td>smiuk</td>
<td>‘give back, reciprocate’</td>
<td>(Egerod 1965: 266)</td>
</tr>
<tr>
<td>sual</td>
<td>smual</td>
<td>‘accept’</td>
<td>(Egerod 1965: 267)</td>
</tr>
<tr>
<td>tapeh</td>
<td>tmapeh</td>
<td>‘beckon’</td>
<td>(Egerod 1965: 267)</td>
</tr>
<tr>
<td>cinun</td>
<td>tminun$^4$</td>
<td>‘weave’</td>
<td>(Egerod 1965: 265)</td>
</tr>
<tr>
<td>heriq</td>
<td>hmeriq</td>
<td>‘break, demolish’</td>
<td>(Egerod 1965: 265)</td>
</tr>
<tr>
<td>hop</td>
<td>hmop</td>
<td>‘stab’</td>
<td>(Egerod 1965: 265)</td>
</tr>
<tr>
<td>hului</td>
<td>hmulusi</td>
<td>‘pull’</td>
<td>(Egerod 1965: 265)</td>
</tr>
</tbody>
</table>

---

$^2$ 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].

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

(4)  

<table>
<thead>
<tr>
<th>Root</th>
<th>Ending</th>
<th>Meaning</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>sgagai</td>
<td>smgagai</td>
<td>'take leave'</td>
<td>(Egerod 1965: 265)</td>
</tr>
<tr>
<td>qziu?</td>
<td>qmziu?</td>
<td>'contagious'</td>
<td>(Egerod 1965: 266)</td>
</tr>
<tr>
<td>sbil</td>
<td>sbil</td>
<td>'leave behind'</td>
<td>(Egerod 1965: 266)</td>
</tr>
<tr>
<td>spunj</td>
<td>spunj</td>
<td>'measure'</td>
<td>(Egerod 1965: 267)</td>
</tr>
<tr>
<td>hkanji?</td>
<td>hmkcanji?</td>
<td>'search.ACT'</td>
<td>(Egerod 1965: 266)</td>
</tr>
</tbody>
</table>

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

(5)  

<table>
<thead>
<tr>
<th>Root</th>
<th>Ending</th>
<th>Meaning</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>?agal</td>
<td>magal (*?magal)</td>
<td>'take'</td>
<td>(Egerod 1965: 263)</td>
</tr>
<tr>
<td>?aras</td>
<td>maras (*?m)</td>
<td>'take along'</td>
<td>(Egerod 1965: 263)</td>
</tr>
<tr>
<td>bazii</td>
<td>mazii (*bm)</td>
<td>'buy'</td>
<td>(Egerod 1965: 263)</td>
</tr>
<tr>
<td>bihii</td>
<td>mihi (*bm)</td>
<td>'beat'</td>
<td>(Egerod 1965: 263)</td>
</tr>
<tr>
<td>biki?</td>
<td>miki? (*bm)</td>
<td>'bend'</td>
<td>(Egerod 1965: 264)</td>
</tr>
<tr>
<td>buiau</td>
<td>muiau (*bm)</td>
<td>'wade'</td>
<td>(Egerod 1965: 264)</td>
</tr>
<tr>
<td>paña?</td>
<td>mana (*pm)</td>
<td>'carry'</td>
<td>(Egerod 1965: 264)</td>
</tr>
<tr>
<td>pgiai</td>
<td>mgiai (*pm)</td>
<td>'run away'</td>
<td>(Egerod 1965: 265)</td>
</tr>
<tr>
<td>phau</td>
<td>mhau (*pm)</td>
<td>'to fine'</td>
<td>(Egerod 1965: 265)</td>
</tr>
<tr>
<td>rahau</td>
<td>mahau (*rm)</td>
<td>'trap'</td>
<td>(Egerod 1965: 265)</td>
</tr>
</tbody>
</table>
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.
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., sbmil ‘leave behind.ACT’ vs. msbil ‘leave for each other’ (Egerod 1965: 266); see more examples below).
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, *m, *rm).

(11) ?agal magal (*ʔm) ‘take’ (Egerod 1965: 263)
     mʔagal ‘take each other’

?aras maras (*ʔm) ‘take along’ (Egerod 1965: 263)
     mʔaras ‘elope together’

bihii mihii (*bm) ‘beat’ (Egerod 1965: 263)
     mbihii ‘fight’

biq miq (*bm) ‘give’ (Egerod 1965: 264)
     mbiq ‘give to each other’

     mbiru? ‘make contrasting lines’

lpuu mpuu ‘count’ (Egerod 1965: 264)
     lmpuu

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, ?agal/ ‘take’ → /?magal/ → [magal]). 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) *_{o[\{r, ?, p, b\}] > [m]} ‘The segments \{r, ?, b, p\} cannot appear before [m].’

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) /p₁g₂ai₃, m₄/ ‘run away, ACT’

<table>
<thead>
<tr>
<th></th>
<th>ALIGN-m</th>
<th>*BM</th>
<th>*COMPLEX</th>
<th>MORPHDIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. m₁₄g₂ai₃</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. p₁m₄g₂ai₃</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. p₁q₂ai₃m₄</td>
<td><em>!</em>***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. m₃p₁g₂ai₃</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. p₁q₂iam₃₄</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 infixeding.
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 $M_{ALIGN} \gg P$. 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

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.

\[
\begin{align*}
\text{(15)} & \quad \text{a. } & '\sigma\sigma' & '\sigma\sigma\text{-ma-}' & '\sigma\sigma\text{-ma-}' \\
& & \text{saxophone} & \text{saxo-ma-phone} & \text{Mississippi} & \text{Missi-ma-ssippi} \\
& & \text{telephone} & \text{tele-ma-phone} & \text{Alabama} & \text{Ala-ma-bama} \\
& & \text{wonderful} & \text{wonder-ma-ful} & \text{dialectic} & \text{dia-ma-lectic} \\
& \quad \text{b. } & '\sigma\sigma' & '\sigma\sigma\text{-ma-}' & '\sigma\sigma\text{-ma-}' \\
& & \text{feudalism} & \text{feuda-ma-lism} & \text{hippopotamus} & \text{hippo-ma-potamus}
\end{align*}
\]

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

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.  (σσ)(σσ)(σ)  (σσ)(σσ)-ma-(σ)  
underestimate  underesti-ma-mate

b.  (σσ)(σσ)(σσ)  (σσ)-ma-(σσ)(σσ)
unsubstantiated  unsub-ma-stantiated

c.  (σσ)(σσ)(σσ)  (σσ)(σσ)-ma-(σσ)
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_{oo})

‘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 *oboé-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.
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*.

<table>
<thead>
<tr>
<th>(20)</th>
<th>oboe</th>
<th>oba-ma-boe</th>
<th>washing</th>
<th>washa-ma-shing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>opus</td>
<td>opa-ma-pus</td>
<td>water</td>
<td>wata-ma-ter</td>
</tr>
<tr>
<td></td>
<td>party</td>
<td>parta-ma-ty</td>
<td>wonder</td>
<td>wonda-ma-der</td>
</tr>
<tr>
<td></td>
<td>piggy</td>
<td>piga-ma-gy</td>
<td>aura</td>
<td>aura-ma-ra</td>
</tr>
<tr>
<td></td>
<td>purple</td>
<td>purpa-ma-ple</td>
<td>music</td>
<td>musa-ma-sic</td>
</tr>
<tr>
<td></td>
<td>scramble</td>
<td>scramba-ma-ble</td>
<td>Kieran</td>
<td>Kiera-ma-ran</td>
</tr>
<tr>
<td></td>
<td>stinky</td>
<td>stinka-ma-ky</td>
<td>joking</td>
<td>joka-ma-king</td>
</tr>
<tr>
<td></td>
<td>table</td>
<td>taba-ma-ble</td>
<td>listen</td>
<td>lisa-ma-sten</td>
</tr>
<tr>
<td></td>
<td>tuba</td>
<td>tuba-ma-ba</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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) \(\text{ALIGN (L, } ma, \ R, \ FT_{00}) \text{ a.k.a. L-ALIGN}\)

'Align the left edge of \(-ma-\) to the right edge of a disyllabic foot.'

\(\text{ALIGN (R, } ma, \ L, \ sigma) \text{ a.k.a. R-ALIGN}\)

'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/

<table>
<thead>
<tr>
<th>('telə),(foun), ma</th>
<th>L- ALIGN</th>
<th>R- ALIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. (telə)-ma-(foun)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. (te.-mə-)lə,(foun)</td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>c. (telə),(foun)-ma</td>
<td></td>
<td>*!</td>
</tr>
</tbody>
</table>

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/

<table>
<thead>
<tr>
<th>('lisə), ma</th>
<th>L-ALIGN</th>
<th>R-ALIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. (lisə)-mə-ŋ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. (lisə)-mə</td>
<td></td>
<td>*!</td>
</tr>
</tbody>
</table>
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/

\[
\begin{array}{c|c|c}
(lajv)l\, m\varepsilon & \text{L-ALIGN} & \text{R-ALIGN} \\
\hline
\text{a. (lajva)-m\varepsilon-l}\, & & \\
\text{b. (lajv)-m\varepsilon-l}\, & *! & \\
\end{array}
\]

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

(25) \begin{align*}
\text{multiply} & \quad \text{multipli-ma-cation} \\
\text{Mediterranean} & \quad \text{Mediter-ma-ranean} \\
\text{delicacy} & \quad \text{delica-ma-cy}
\end{align*}

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/

\[
\begin{array}{c|cc}
(mul.ti)pli(ca tion), ma & L-ALIGN & R-ALIGN \\
\hline
a. \textcolor{red}{\mathcal{F}}(mul.ti)pli-ma-(ca tion) & *! & \\
b. \textcolor{red}{\mathcal{M}}(mul.ti)-ma-pli.(ca tion) & & \\
c. (mul.ti.pli)-ma-(ca tion) & *! & \\
\end{array}
\]

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)

\[
\begin{array}{c|cc}
\text{FT} & \\
\text{FT} & \\
\sigma \sigma & \sigma \\
\text{mul.ti} & \text{pli} & \text{cation} \\
\end{array}
\]

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

(28)

\[
\begin{array}{c|cc}
\text{FT} & \\
\text{FT} & \\
\sigma \sigma & \sigma \\
\text{Ta.ta} & \text{ma} & \text{gou.chee} \\
\end{array}
\]
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

\[
\begin{align*}
\text{Homeric word} \\
\begin{array}{c}
\text{PHON} \\
\varphi(#1, \text{ma})
\end{array} \\
\text{stem} \\
\begin{array}{c}
\text{PHON} \\
#1
\end{array}
\end{align*}
\]

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

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 (′cine)<ma>. Disyllabic words receive similar treatment. For example, *lively* is given the following foot parse: (′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/

<table>
<thead>
<tr>
<th>w</th>
<th>L-ALIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. /lajv/-mə--l</td>
<td></td>
</tr>
<tr>
<td>b. /lajv/-mə</td>
<td>*!</td>
</tr>
</tbody>
</table>
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/

\[
\begin{array}{c|c}
\text{\textsuperscript{1}lisn}, \text{mə} & \text{ALIGN} \\
\hline
\text{a. } \overset{\text{x}}{\text{\textsuperscript{1}lisn}}-\text{mə-}\text{sn} & \\
\hline
\text{b. } \overset{\text{\textbullet}}{\text{\textsuperscript{1}lisn}}-\text{mə} &
\end{array}
\]

The final syllable of underived verbs in English is generally not extrametrical. The word \textit{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 \textit{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 '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., ('Cana)<da>). Now, consider the infixed version of this word 'Cana-ma-da. Primary stress remains initial. Yet, if stress placement occurs concomitant with infixation, antepenultimate stress (e.g., Ca('na-ma)-<da> similar to A'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 'Cana-ma-da, not Ca'nma-da, is because the Homeric infix takes ('Cana)da as the input. The outcome of infixation is ('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), \textit{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.

\begin{tabular}{lll}
\hline
(34) & Variant A & Variant B \\
\hline
piggy & pig\text{\texttext{-}gy} & pig[\text{o}]\text{-}ma-gy \\
\hline
table & table\text{-}ma-ble & tab[\text{a}]\text{-}ma-ble \\
\hline
listen & li\text{\texttext{-}snl}\text{-}ma-\{sn\} & lis[\text{a}]\text{-}ma-sten \\
\hline
obo\text{e} & oboe\text{-}ma-boe & ob[\text{a}]\text{-}ma-boe \\
\hline
purple & purple\text{-}ma-ple & purp[\text{a}]\text{-}ma-ple \\
\hline
scramble & scramble\text{-}ma-ble & scramb[\text{a}]\text{-}ma-ble \\
\hline
stinky & stinky\text{-}ma-ky & stink[\text{a}]\text{-}ma-ky \\
\hline
party & party\text{-}ma-ty & part[\text{a}]\text{-}ma-ty \\
\hline
\end{tabular}

When the stressed syllable is closed there is no variation in the realization of the reduplicant. Only schwa-epenthesis is allowed.
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 \textit{tuba-ma-ba}, but never \textit{tuta-ma-bal}?

### 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 \texttt{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. 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).
Following Rose & Walker 2001 and Hansson 2002, I propose that directionality be stated as a correspondence relationship. 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) $(C_1V_1)C_2V_2C_3, m\alpha$ SCORRI$_L$

<table>
<thead>
<tr>
<th></th>
<th>a. $\neg(C_1V_1C_2C_2C_3-m\alpha-C_2V_2C_3)$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>b. $(C_1V_1C_1C_1C_3)-m\alpha-C_2V_2C_3$</td>
</tr>
<tr>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

Let us now return to the earlier dilemma. The fact that words like *lively* Homerize as *[lajv\-m\-li]*, never *[lajv1-m\-li]* 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 v. 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 $\sigma_i$ contains a segment $S_i$ that is in surface correspondence with segment $S_j$ in syllable $\sigma_j$, all segments in syllable $\sigma_i$ must be in correspondence with segments in syllable $\sigma_j$.’

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 $\sigma_i$ contains a segment $S_i$ that is in surface correspondence with segment $S_j$ in syllable $\sigma_j$, all segments in syllable $\sigma_i$ must be in correspondence with segments in syllable $\sigma_j$. 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
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. 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) $[^{1}C_{1}V_{1}][C_{2}V_{2}]$, mə | L-ALIGN | SCORRI$_L$ | L-ANCHOR$_\sigma$ | R-ANCHOR$_\sigma$
---|---|---|---|---
| a. $[^{1}C_{1}V_{1}][C_{2}V_{2}], \text{-mə-[}C_{2}V_{2}]$ | | | | $*$
| b. $[^{1}C_{1}V_{1}][V_{2}], \text{-mə-[}C_{2}V_{2}]$ | | | | $*$

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.
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.

\[(44) \quad (p^h_i)g_{ij}, \, m\alpha \quad \text{DEP} \]
\[
\begin{array}{c|c}
\text{a. } & ^G(p^h_i.g_{ij})-m\alpha-g_{ij} \\
\text{b. } & ^G(p^h_i.\?\alpha)-m\alpha-g_{ij}
\end{array}
\]

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 $\exists$-DEP$_{10}$ more severely than one with reduplicative epenthesis (45)b.

\[(45) \quad (p^h_i)g_{ij}, \, m\alpha \quad \exists$-DEP$_{10}$
\[
\begin{array}{c|c}
\text{a. } & ^G(p^h_i.g_{ij})-m\alpha-g_{ij} \\
\text{b. } & (p^h_i.\?\alpha)-m\alpha-g_{ij}
\end{array}
\]

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)

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.

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’.

\[
\begin{array}{c|c}
(48) & (p^h)gi, m\phi \\
\hline
\text{a. (p}^h\text{i}g_1i_2\text{)-m}\alpha-g_1i_2 & \text{REDUCE} \quad \exists-\text{DEP}_{10} \\
\text{b. }\sigma(p^h_i g_1\sigma_2)-m\alpha-g_1i_2 & *!
\end{array}
\]

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:
The faithfulness between these corresponding segments is regulated by featural IDEN-VV constraints. In this case, I posit a $\text{IDEN-VV}_{\text{reduced}}$ which demands that surface corresponding vowels must have identical [reduced] specification. This constraint is assumed to be co-ranked with respect to the constraint, $\text{REDUCE}$. 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.

\begin{tabular}{|c|c|c|c|}
\hline
(a) & (p^{h_1}i, m\varepsilon) & $\text{REDUCE}$ & $\text{IDEN-VV}_{\text{reduced}}$ & $\exists\text{-DEP}_{10}$ \\
\hline
a. & (p^{h_1}i,g_{1i_2})-m\varepsilon-g_{1i_2} & *! & & \\
\hline
b. & (p^{h_1}i,g_{1i_2})-m\varepsilon-g_{1i_2} & & & \\
\hline
(b) & (p^{h_1}i, m\varepsilon) & $\text{IDEN-VV}_{\text{reduced}}$ & $\exists\text{-DEP}_{10}$ & $\text{REDUCE}$ \\
\hline
a. & (p^{h_1}i,g_{i_2})-m\varepsilon-g_{i_2} & & *! & \\
\hline
b. & (p^{h_1}i,g_{i_2})-m\varepsilon-g_{i_2} & *! & & \\
\hline
\end{tabular}

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).
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.

\[
\begin{array}{lll}
\sigma(\sigma)&\text{Before }'Ft&\text{After }'Ft \\
\text{repellant}&\text{rep}a-ma-\text{pellant}&\text{re}'pella-ma-lant
\end{array}
\]
The analysis developed in the last section can easily accommodate this variation, though not without some slight modification. Consider the following:

| L-ALIGN | R-ALIGN | 3-DEP|O |
|---------|---------|-----|
| (53) ($\mu$)($p^b$)$\varepsilon$)lant, $m\alpha$ |
| a. $\not\gamma$ ($\mu$($p^b$)$\varepsilon$)-m-$\alpha$-(lant) |
| b. $\not\gamma$ ($\mu$($p^b$)$\varepsilon$)-m-$\alpha$-(lant) |
| c. ($\mu$($p^b$)$\varepsilon$)-m-$\alpha$-(lant) | ! |
| d. $\not\varepsilon$ ($\mu$($p^b$)$\varepsilon$)-($m\alpha$)-lant |
| e. $\not\varepsilon$ ($\mu$($p^b$)$\varepsilon$)-m-$\alpha$-(lant) |

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$_{10}$(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$_{10}$(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) $(\mu)(p^b)e$-lont, m\o

<table>
<thead>
<tr>
<th></th>
<th>L- ALIGN</th>
<th>R- ALIGN</th>
<th>I-ANCHOR$_{Ft}$</th>
<th>F-ANCHOR$_{Ft}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. $\phi$ $(\mu\pi\o)$-m\o-$(p^b)e$-lont</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. $\phi$ $(\mu)$-$(p^b)e$-lont</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. $(\mu)$-$(p^b)e$-m\o-lont</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. $(\mu)p^b$-$(m\lambda)$-lont</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. $(\mu)p^b$-m\lambda-lont</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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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) \( \sigma(\sigma)\sigma \) Before 'Ft After 'Ft

<table>
<thead>
<tr>
<th>Variant</th>
<th>Before 'Ft</th>
<th>After 'Ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alberta</td>
<td>Ala-ma-berta</td>
<td>Alberta-ma-ta</td>
</tr>
<tr>
<td>computer</td>
<td>coma-ma-puter</td>
<td>computa-ma-ter</td>
</tr>
<tr>
<td>disgusting</td>
<td>disa-ma-gusting</td>
<td>disusta-ma-ting</td>
</tr>
<tr>
<td>suspension</td>
<td>susa-ma-pension</td>
<td>suspensa-ma-sion</td>
</tr>
</tbody>
</table>

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

(57) \((\AE)('b\&t)a, m\&\) I-ANCHOR\(_{Ft}\) F-ANCHOR\(_{Ft}\) \(\exists\)-DEP\(_{IO}\)

<table>
<thead>
<tr>
<th></th>
<th>I-ANCHOR(_{Ft})</th>
<th>F-ANCHOR(_{Ft})</th>
<th>(\exists)-DEP(_{IO})</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. (\AE)(\AE)-m&amp;-'b&amp;t)a (\AE)</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>b. (\AE)('b&amp;t)a-m&amp;-t&amp;a (\AE)</td>
<td>*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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\(^\circ\) the effect of \(\exists\)-DEP\(_{IO}\). The constraint is none other
than the generic $\text{DEP}_{10}$. 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 $A \gg [B, C] \gg D$ 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: $A \gg B \gg D$ and $A \gg C \gg D$. Following this line of analysis, I propose that the two $\text{DEP}$ 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.

\[
\begin{array}{ccc}
(58) & \text{(a) } & \text{(b)} \\
\hline
\text{i.} & \text{(a)} & \text{I-ANCHOR}_{\text{FI}} & \text{F-ANCHOR}_{\text{FI}} & \text{DEP}_{10} \\
\text{a.} & \text{\textcircled{3}} & \text{\textcircled{3}} & \text{\textcircled{3}} & \text{\textcircled{3}} \\
\text{b.} & \text{\textcircled{3}} & \text{\textcircled{3}} & \text{\textcircled{3}} & \text{\textcircled{3}} \\
\hline
\text{ii.} & \text{(a)} & \text{I-ANCHOR}_{\text{FI}} & \text{F-ANCHOR}_{\text{FI}} & \text{DEP}_{10} \\
\text{a.} & \text{\textcircled{3}} & \text{\textcircled{3}} & \text{\textcircled{3}} & \text{\textcircled{3}} \\
\text{b.} & \text{\textcircled{3}} & \text{\textcircled{3}} & \text{\textcircled{3}} & \text{\textcircled{3}} \\
\end{array}
\]

The variant with schwa epenthesis (58)ia is predicted by a partial ranking with the traditional $\text{DEP}_{10}$. 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 $\exists$-DEP$\iota_0$ 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

\[
\text{R-ALIGN, L-ALIGN} \gg \text{I-ANCHOR, SCORRI}_L, \text{L-ANCHOR}_\sigma \gg \{ \text{REDUCE} \\
\langle\langle\rangle\rangle \text{IDEN-VV}_{\text{reduced}} \} \gg \text{R-ANCHOR}_\sigma, \text{F-ANCHOR} \gg \{ \text{DEP}_\iota_0, \exists$-DEP$\iota_0 \}$
\]

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 $-\text{ma}$- 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.\textsuperscript{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

\textsuperscript{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).

\[
\begin{array}{llllll}
(60) & p & t & k & ? \\
    & b & d & z & g \\
    & p' & t' & c' & k' \\
    & s & \text{\textparagraph} & h \\
\text{M[n]} & \text{\textparagraph} & \text{N[ŋ]} \\
\text{m} & \text{n} & \eta \\
\text{W[w]} & \text{L[l]} & \text{Y[j]} \\
\text{w} & \text{l} & \text{y[j]} \\
\end{array}
\]
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

<table>
<thead>
<tr>
<th>Singular</th>
<th>Plural</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>'da?a</td>
<td>da'?a?a</td>
<td>'mother's brother'</td>
</tr>
<tr>
<td>'e'elel</td>
<td>?e'l'elel</td>
<td>'mother's father'</td>
</tr>
<tr>
<td>'gewe</td>
<td>ge'wewe</td>
<td>'coyote'</td>
</tr>
<tr>
<td>'bik'i</td>
<td>bi'k'ik'i</td>
<td>'grandmother's sister'</td>
</tr>
<tr>
<td>'suku?</td>
<td>su'kuku?</td>
<td>'dog'</td>
</tr>
<tr>
<td>'gušu?</td>
<td>guššu?</td>
<td>'pet'</td>
</tr>
</tbody>
</table>

- 153 -
Reduplication is stem internal, and thus never copies derivational or inflectional prefixes or suffixes (e.g., *t’e:diw* ‘to be a man’ (J64:325); *t’eliwhu* ‘man’ (K07:272); *t’eli:diw* ‘to be a man.PL’ (J64:325); *t’eli:diw-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, *p’i:sese?* ‘ear’ might be parsed as *p’i:se-se-w*. However, consider the examples below.

\(^{13}\) 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 'lewśi' 'father's brother' would be lew śiści, which is incorrect. The actual form is leśiści, 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 'mokgo is mok.go; the reduplicant appears before the coda of the initial syllable of the single stem, rather than the final syllable (e.g., mok.go-k.go, rather than *mok.go.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) haňakmuwe (K07:311) haňakmuwewe ‘elks’ (K07: 272)
malosaņ (K07:272) malosasāņ ‘stars’ (K07: 272)
meskitset16 (K07:272) meskitssetsat ‘arrows’ (K07: 272)
baloxat (K07:310) baloxaxat ‘bows’ (K07: 272)
ta’momo17 (K07:308) tamo’moomo ‘women’ (K07: 272)
mem’dewi (J64: 292) memde’wëwi ‘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 malosan on p. 272, but ma’losani 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 ṣ̌ in Kroeber’s orthography correspond to [ŋ] in Jacobsen 1964.
16 Cited as mesg’ic’et on p. 104, Jacobsen suggests that mesg- might have been a prefix to the stem ic’ed ‘to prick, sting’ on p. 494, even though this is the only word with this ‘prefix’.
17 da’amó’dno? (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 /-i?/ are not stressed. Stress remains on the stem-initial syllable.

(65) 

<table>
<thead>
<tr>
<th>'pelel</th>
<th>'mother’s father'</th>
<th>(J64:476)</th>
</tr>
</thead>
<tbody>
<tr>
<td>le-'pelel-i?</td>
<td>‘my daughter’s child (of a man)’</td>
<td>(J64: 413)</td>
</tr>
</tbody>
</table>

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?'peleli? ‘my daughter’s child (man sp.)’ literally means ‘the one who has me as mother’s father’.
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
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>'e'lel</td>
<td>?e'lelel</td>
<td>‘mother’s father’ (J64:335)</td>
</tr>
<tr>
<td>'suku?'</td>
<td>su'kuku?</td>
<td>‘dog’ (J64:336)</td>
</tr>
<tr>
<td>'gušu?'</td>
<td>gu'sušu?</td>
<td>‘pet’ (J64:336)</td>
</tr>
<tr>
<td>'damal</td>
<td>da'mamal</td>
<td>‘to hear’ (J64:336)</td>
</tr>
<tr>
<td>'bokoq</td>
<td>bo'kokor</td>
<td>‘to snore’ (J64:336)</td>
</tr>
<tr>
<td>'biŋil</td>
<td>bi'ŋiŋil</td>
<td>‘to try’ (J64:336)</td>
</tr>
</tbody>
</table>

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

(67) | ‘e'lel | ‘mother’s father’ (J64:476) |
| le-'e'lel-i? | ‘my daughter’s child (man sp.)’ (J64:413) |
| le-'e'lelel-i? | ‘my daughter’s children (man sp.)’ (J64:413) |
Formally, the assignment of stress on the stem-penultimate syllable can be captured in terms of the following constraints.

(68) ALIGN<sub>FT</sub>  '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<sub>FT</sub>, (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<sub>FT</sub> 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.
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, 'FOOT)

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) \text{RED}=\text{σ}_\mu \quad \text{‘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, ANCHOR\textsubscript{BR}-RIGHT.

(72) \text{ANCHOR}\textsubscript{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\textsubscript{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 \textit{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.\footnote{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).}
The 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.

<table>
<thead>
<tr>
<th>(73)</th>
<th>/saksag, RED/</th>
<th>ALIGN-R</th>
<th>RED=\sigma_u</th>
<th>ANCHOR_{BR}</th>
<th>MAX_{BR}</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>sa-(sa-k.sag)</td>
<td></td>
<td>*</td>
<td>k.sag</td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>sak-(sa-sag)</td>
<td></td>
<td>*</td>
<td>g</td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>sak-(sag-sag)</td>
<td></td>
<td>*</td>
<td>s</td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>sak-(sa-sa-g)</td>
<td>*</td>
<td>*</td>
<td>g</td>
<td></td>
</tr>
<tr>
<td>e.</td>
<td>sa-(kag-sag)</td>
<td>*</td>
<td>*</td>
<td>s</td>
<td></td>
</tr>
<tr>
<td>f.</td>
<td>sak-(sag-sag)</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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. hi.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).

MAX₁₀⁻μ ‘The number of moras in the output must correspond to those in the input.’

DEP₁₀⁻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 ALIGN₂ and PTFORM 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.

All codas are assumed to be underlyingly weightless in Washo. As noted, overcopying fatally violates the high-ranking templatic constraint, RED=σμ (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=σ₁ 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.

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=σi | ALIGN-R | ANCHOR-R | MAXi0 | MAXbr

| a. p’i(šếw) | | * | | | *
| b. p’i(šếw) | | * | | | *

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-SiSj (SCORRIiL)

‘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 SCORRIiL since the ‘reduplicant’ follows the ‘base’ when the ‘base’ is supposed to follow the ‘reduplicant’. 
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) /deɪw.hɪ.wi, RED/  | LINEARITY | MAX\(\mu\) | WSP | WBP | DEP\(\mu\)
---|---|---|---|---|---
\(\varphi\) a. deɪw.(hi, wi) | | * | | | |
\(\varphi\) b. deɪ.(hiw, wi) | *! | * | | |
\(\varphi\) c. deɪw.(hi, wi) | | *! | * | |

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 /d1e2w3.h4i5.w6i7/ /s1a2k3.s4a5g6, RED/
OUTPUT d1e2.h4i5w3.w6i7 (80)b s1a2.s4ak3.s4a5g6 (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) Singul ar Plural Gloss
a. 'ʔelel ?e'lelel 'mother’s father’ (J64:335)

'sukuʔ su'kukuʔ ‘dog’ (J64:336)

- 167 -
"gušu?  gušušu?  'pet'  (J64:336)
'damal  da'mamal  'to hear'  (J64:336)
'bokoŋ  bo'kokoŋ  'to snore'  (J64:336)
'binjil  bi'njilil  'to try'  (J64:336)

b.  '?att'u  ?att'o:to  'older brother'  (J64:341)
'magu  ma'gogo  'sister's child'  (J64:341)
'mok'oo  mo'koko  'knee'  (J64:325)
'tel:liw  teliliw  'to be a man'  (J64:325)
'meshu  mehuhu  'to be a boy'  (J64:325)
'?ebu  ?ebubu  'mother's father's brother'  (J64:325)
'wašiwi  wašišiwi  'Washo'  (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 /a:/, yet, in the plural, thus reduplicated, form, the long vowel is /i:/.
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., 'jali? → ba jali?' 'to shoot') should be considered irregular in
light of their vowel coalescence rule (i.e., V → ə / 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 *wa si:siw* ‘Washos’ is *-siw* 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\textsubscript{RT} (83)c. Finally, if the vowel-length-contributing mora were deleted in the output, it would violate the high ranking MAX\textsubscript{IO}-\(\mu\), which penalizes mora deletion, even if it would satisfy both ALIGN\textsubscript{RT} and WSP. Also, while a length-contributing mora associates to the reduplicant syllable, it does not violate the templatic RED=\(\sigma\text{\_}\mu\) 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.
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_{\mu}, which penalizes any insertion of a mora not already present in the input (see (84)b).

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)  
\[
\begin{array}{|l|l|l|}
\hline
\text{Singular} & \text{UR} & \text{Gloss} \\
\hline '\text{t'anu} & 't'anono & \text{'person'} \\
\hline '\text{?a:t'u} & '\text{?a:t'o} & \text{'older brother'} \\
\hline '\text{ma:gu} & '\text{ma:go:go} & \text{'sister's child'} \\
\hline '\text{al?mul} & '\text{?mol?mol} & \text{'big and round'} \\
\hline '\text{a\u0161u\u0107} & '\text{so\u0161o\u0107} & \text{'red'} \\
\hline '\text{amk'um} & '\text{k'omk'om} & \text{'arched'} \\
\hline
\end{array}
\]

Urbanczyk 1993 proposes that the underlying forms of the examples in (85) actually contain an underlying /o/ instead of /u/. Thus, 't'anu 'person' is underlyingly /t'ano/. She observes that /o/ occurs only in a stressed syllable or in the vicinity of a stressed /o/.

There are no affixes in Washo that contain the vowel /o/ either.

(86)  
\[
\begin{array}{|l|l|l|}
\hline
\text{Singular} & \text{UR} & \text{Gloss} \\
\hline '\text{t'anu} & /'t'ano/ & \text{'person'} \\
\hline '\text{?a:t'u} & /'\text{?a:t'o}/ & \text{'older brother'} \\
\hline
\end{array}
\]

\[\text{21 The only exception appears to be golsisi? 'wild potato' (J64: 180). However, Jacobsen reports, on p. 471, that one of his informants produces gusisi.}\]
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, '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.
For example, the reduplicated form of 'ahad ‘across’ should be *a- ha-had. Following Winter 1970’s theory that initial onsetless unstressed vowels are deleted in the output, a- 'ha-had becomes '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_{wv} since there are no surface counter-examples (89).

Consider now the examples in (90).

(90) 'ayam 'yam ‘to hit with an instrument’ (J64:332)
'ayaw 'ya:w ‘black’ (J64:332)
'ayab 'ya:b ‘through a narrow opening’ (J64:332)

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Here, the singular form is disyllabic, while the pluralized form appears to be monosyllabic. The analysis in (89) predicts, for example, the plural of 'ayaw 'black' to be *

\[ *'ya'-yaw, \]

with the initial onsetless unstressed vowel dropped. However, the actual output is 'ya.m, which shows that an intervocalic glide is dropped between to identical vowels (91).

\[
(91) \quad *V_i^yV_i \quad '/y/ \text{ is banned between identical vowels}'
\]

This glide deletion analysis is supported by Jacobsen (1964)'s report that some dialects of Washo still preserve the intervocalic glide (e.g., 'yo.k is sometimes '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., 'ayam 'to hit with an instrument', '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/ \( \rightarrow \) /ayoyok/ while /ayos/ \( \rightarrow ayoyos/, yielding [yok] and [yos] 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 yos. Jacobsen (1964:333) gives the plural a morphological analysis that includes a raised # (i.e. \( y^\#a\# \)). No known phonological rule in Washo deletes \( a \) 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)  'ʔ-ahu-y-i  ‘they are standing’ (J64:262)

3rd-stand-IMPERF

'p'i?li-y-i  ‘fish with hook and line’ (J64:262)

3rd-fish with hook and line-IMPERF

'l-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)  *'V_iV_j  ‘/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.,
Here, NDEB is assumed to be a co-phonological effect, as in Yu 2000 and Inkelas
By assuming that the *V_yV_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.

<table>
<thead>
<tr>
<th>(94) /ay_1a_2w_3, RED/</th>
<th>*#V</th>
<th>*V_yV_i</th>
<th>ALIGN-R</th>
<th>SCORRI_L</th>
<th>MAXBR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. a-(y_a-y_1a_2w_3)</td>
<td>*!</td>
<td>*</td>
<td></td>
<td>aw</td>
<td></td>
</tr>
<tr>
<td>b. (y_a-a_2w_3)</td>
<td></td>
<td></td>
<td></td>
<td>w</td>
<td></td>
</tr>
<tr>
<td>c. (y_a-y_1a_2w_3)</td>
<td>*!</td>
<td></td>
<td></td>
<td>w</td>
<td></td>
</tr>
</tbody>
</table>

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.

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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 (empty stem)  (J64:340)

'iʔib  'ʔeʔb  'cry, weep’  (J64:340)

'iʔiw  'ʔeʔweʔw  ‘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)  /iʔiš/

'iʔib  ‘cry, weep’  /iʔib/

'iʔiw  ‘to eat’  /iʔiw/

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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)  ‘i?iw  ‘to eat (something)’  k-i?w-i  ‘he’s eating it’
     ‘a?ag  ‘to carry on one’s back’  k’-a?g-i  ‘he’s packing it’
     ‘i?ib  ‘to cry’  ‘?-i?b-i  ‘she’s crying’
     ‘da’la?ag  ‘mountain’  da’la?g-a  ‘on the mountain’
     ‘de?eg  ‘rock’  ‘de?g-a  ‘on the rock’
     ‘ma?ag  ‘wood, stick’  ‘ma?g-a  ‘on the wood’
     ‘i?ib  ‘navel’  ‘t’-i?b-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 -PC 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

<table>
<thead>
<tr>
<th>UR</th>
<th>Plural</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>/ips/</td>
<td>‘peps’  ‘up from a surface’</td>
</tr>
</tbody>
</table>

(J64:331)
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, /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 Urbanczyk’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., /emlu/ ‘to eat; food’ (J64:328)). The final reinterpretation of the forms in (95) is given in (99).

25 The only exception to this generalization is the word /etg/ ‘seed’ (J99: 27).
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.
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=σ₁ 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, 'sesm 'to vomit'. Its plural form is disyllabic, i.e. se'sesm. 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) /seɪsm, RED/  
<table>
<thead>
<tr>
<th>ALIGN&lt;sub&gt;FT&lt;/sub&gt;</th>
<th>FtBIN</th>
<th>FtFM</th>
<th>WSP</th>
<th>WBP</th>
<th>PARSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. se.(seɪsm')</td>
<td></td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. (seɪ.s-\textit{sm})</td>
<td></td>
<td></td>
<td>*!</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>c. (seɪ.s-\textit{sm})</td>
<td></td>
<td></td>
<td><em>!</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\textit{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., \textit{lelel 'mother's father'} is parsed as \textit{le( lelel}); 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) /\textit{ep2s}, RED/  
<table>
<thead>
<tr>
<th>ALIGN&lt;sub&gt;FT&lt;/sub&gt;</th>
<th>FtBIN</th>
<th>FtFM</th>
<th>WSP</th>
<th>WBP</th>
<th>PARSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. '(\textit{ep}-\textit{ps})</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. (\textit{ep}-\textit{ps})</td>
<td></td>
<td></td>
<td>*!</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

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)  'akd  'kakd  'slowly'  (J64:331)

'awd  'wawd  ‘over the summit’  (J64:331)

'a?m  '?a?m  ‘to the west, from the east’  (J64:332)

'a:m  'mam  ‘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)  'im  ‘out from’  'mem  (J64:339)

'iw  ‘in a certain direction’  'wew  (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.
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.

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) \[C_1 V_1 C_2 V_2 C_3 \rightarrow C_1 -V_1 C_2 V_2 -V_1 C_2 V_2 C_3\]

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. \[\text{Root}[(C)\_\_\_ X] \quad (\text{Taken from B&M 1983: 50})\]

26 Winter’s (1970) analysis is a generalized version of Jacobsen’s (1964) analysis. Jacobsen proposes that the morphological analysis, for example, of ‘anono ‘persons’ should be ‘-an-\_\_ 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 ‘au arises, for example, it becomes /a/.

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)

\[
\begin{align*}
    &\text{a. } \left[ V \begin{array}{l}
    \langle +\text{round} \rangle \\
    +\text{low}
    \end{array} \right] \langle +\text{round} \rangle \Rightarrow \emptyset \begin{array}{l}
    \langle +\text{round} \rangle \\
    2
    \end{array} \\
    \begin{array}{l}
    1 \\
    2
    \end{array} \langle +\text{back} \rangle \\
    \text{b. } V \rightarrow \emptyset / V
\end{align*}
\]

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) \[ V \rightarrow \emptyset / V \]

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., 't'ano 'person', according to Winter, ought to be *t'a hono). To summarize, the derivations using B&M's analysis of the reduplicated forms of 'ahad 'across' and t'anu 'person' are given in (111).
(111) Underlying form

'ahad ‘across’  t’anu

‘person’

Reduplication:  (C)+VCV+X

aha'+ahad  t'+anu+a'nu

V-coalescence I:  \( V_{1[\text{round}]} V_{2[\text{+low}]} \Rightarrow \emptyset V_{2[\text{round}, +\text{back}]} \)

aha'ahad  t'a'nonu

V-coalescence II:  \( V \Rightarrow \emptyset / V \)

a'ahad  ta'nonu

Initial unstressed vowel deletion

'hahad  t'a'nonu

O-Vowel Harmony

'hahad  t'a'nono

Output

'hahad  t'a'hono

B&M’s approach erroneously predicts that the VCV reduplicant should appear after the first consonant of polysyllabic words. For example, the word, mem de\text{\textipa{w}}i  ‘deer’ appears as memde\text{\textipa{w}}i\text{\textipa{w}}i  ‘deer’ (J64: 292), instead of the expected *medemde\text{\textipa{w}}i. 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

Urbaniczky (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).
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 *mem'de.wi 'deer' is predicted to be *medem'de.wi, 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. 'emlu 'mumlu "to eat; food" (J64:328)
      ṣawlam ᵣa'wawlam "to be a girl"28 (J64:328)
      helme he'elme "three" (J64:328)
      hesge he'sesge "two" (J64:328)
      'ašdim 'šašdim "to hide" (J64:328)

b. 'mayņa ma'yayņa "fawn" (J64:328)

c. 'aʔsam 'aʔsam "to lie" (J64:328)
  'maʔsaʔ maʔaʔsaʔ "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 'emlu 'to eat' is expected to be *lumlu, rather than 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 ᵣowlam 'to be a girl' (J64:328) which reduplicates as ᵣo wowlam.
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. 'ewši? di-ššišši? ‘father’s brothers’

   'ent'uš net'unt'uš-u ‘old women: -u=nominalizing’

   'saksag sa'saksag ‘father’s father’s brother’

   'mokgo mo'gokgo ‘shoe’

   b. 'aynay 'aynay ‘muddy, gooey’

   ñawñañ ñawñañ ‘to be a child: children’

   c. 'i?deb 'i?deb ‘wrinkled’

   'i?si? 'i?si? ‘fast’

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 /s, d/ even though the sonority generalization predicts the copying of $C_1$; on the other hand, $C_1$ is copied in a cluster like /yñ/ 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)

<table>
<thead>
<tr>
<th></th>
<th>$C_2$ copied</th>
<th>$C_1$ copied</th>
</tr>
</thead>
<tbody>
<tr>
<td>obstruent</td>
<td>bc', gs, gg, ?s, ?d, sk, sp'</td>
<td>?$s$, sd, sg, sm</td>
</tr>
<tr>
<td>sonorant</td>
<td>mh, mk', mc', nk, ny', nt', $\eta$k</td>
<td>ml</td>
</tr>
<tr>
<td></td>
<td>lp', lb, lm', ls</td>
<td>lm</td>
</tr>
<tr>
<td></td>
<td>yn, yp, yc', wk, w$\ddagger$</td>
<td>y$\ddagger$, w$\ddagger$</td>
</tr>
</tbody>
</table>

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

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29 Another form that is unaccounted for is the plural of *bali? 'to shoot', which should be reduplicated as *balili?, the attested form is balali?, 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.
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

<table>
<thead>
<tr>
<th>Psycholinguistic prominent positions</th>
<th>Infixal pivots</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial syllable</td>
<td>First consonant</td>
</tr>
<tr>
<td></td>
<td>First vowel</td>
</tr>
<tr>
<td></td>
<td>First syllable</td>
</tr>
<tr>
<td>Final syllable</td>
<td>Final vowel</td>
</tr>
<tr>
<td></td>
<td>Final syllable</td>
</tr>
<tr>
<td>Stressed syllable</td>
<td>Stressed vowel</td>
</tr>
<tr>
<td></td>
<td>Stressed syllable</td>
</tr>
<tr>
<td></td>
<td>Stressed foot</td>
</tr>
</tbody>
</table>
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 invariably 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 source 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 Exogogenesis 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
entrainment 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 -un- and -in-, and Delaware third person -w-, 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 xyZ, 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:

<table>
<thead>
<tr>
<th></th>
<th>Class I</th>
<th>Class II</th>
<th>Class III</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>*-li</td>
<td>*-li</td>
<td>*-kali</td>
</tr>
<tr>
<td>2</td>
<td>*iš-</td>
<td>*-ši(-)</td>
<td>*-iška</td>
</tr>
<tr>
<td>P1</td>
<td>*il-/V</td>
<td>*hili(-)</td>
<td>*(h)i(l)i</td>
</tr>
<tr>
<td></td>
<td>*ili-/C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>*haš-</td>
<td>*-haši(-)</td>
<td>*-(h)aš(i)ka</td>
</tr>
</tbody>
</table>

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.
Inflecting 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.

\[
\begin{array}{|c|c|c|c|c|}
\hline
& \text{Choctaw} & \text{Koasati} & \text{Hitchiti} & \text{Creek} \\
\hline
2 & iš- & -ci(-) & -ci & -(h)iska & -icka & -ick \\
P1 & il-/V & -hili(-) & -li & -(h)ilka & -i:ka & -iy-/V \\
& i:-/C & & & & -i:-/C \\
2 & haš- & has- & -haci(-) & -haci & -(h) aska & -a:cka & -a:cck- \\
\hline
\end{array}
\]

(3) CVCV stem -li suffix stem geminate Ci final Stem Subject affix

\begin{align*}
\text{‘to weave’} & \quad \text{‘to scratch’} & \quad \text{‘to split’} \\
S1 & \text{tačarī} & \text{kalasčari} & \text{pačari} & -li \\
2 & \text{tačči} & \text{kalasčči} & \text{pačči} & -ci \\
3 & \text{tača} & \text{kalasči} & \text{pačči} & \text{zero} \\
P1 & \text{tačhili} & \text{kalashili} & \text{pačhili} & -hili \\
2 & \text{tačhači} & \text{kalashacheči} & \text{pačhači} & -hachi \\
3 & \text{hututá} & \text{hukalasči} & \text{hupačči} & \text{zero (+distr.)} \\
\end{align*}
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., *paṭṭi* ‘to split’ < *pəṭ-li*), *lakawwli* ‘to lift’ < *lakaw-li*, *hummu* ‘to whip’ < *hum-li*). Most CVCC 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).

<table>
<thead>
<tr>
<th>(4)</th>
<th>Stem with suffix</th>
<th>Subject affixes</th>
<th>CVCCV stem</th>
<th>Subject affixes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>-li + -ci</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘to thresh (e.g., rice)’</td>
<td>Class IIB</td>
<td>‘to dig’</td>
<td>Class IIC</td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>buklicif</td>
<td>-li</td>
<td>huhcalif</td>
<td>-li-</td>
</tr>
<tr>
<td>2</td>
<td>bukcicif</td>
<td>-ci-</td>
<td>hueihcă</td>
<td>-ci-</td>
</tr>
<tr>
<td>3</td>
<td>buklicif</td>
<td>zero</td>
<td>huhcă</td>
<td>zero</td>
</tr>
<tr>
<td>P1</td>
<td>bukhi licif</td>
<td>-hili-</td>
<td>huhlihcă</td>
<td>-li-</td>
</tr>
<tr>
<td>2</td>
<td>bukhacif</td>
<td>-haci-</td>
<td>huhacihcă</td>
<td>-haci-</td>
</tr>
<tr>
<td>3</td>
<td>hubuklicif</td>
<td>zero (+distr.)</td>
<td>huhuhcă</td>
<td>zero (+distr.)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>VERB STEM</th>
<th>AUX</th>
</tr>
</thead>
<tbody>
<tr>
<td>1s.g.</td>
<td>li</td>
<td>-li</td>
</tr>
<tr>
<td>2 s.g</td>
<td>ši-</td>
<td>li</td>
</tr>
<tr>
<td>3s.g.</td>
<td>li</td>
<td></td>
</tr>
<tr>
<td>1 pl.</td>
<td>(hi)li-</td>
<td>li</td>
</tr>
<tr>
<td>2 pl.</td>
<td>haši-</td>
<td>li</td>
</tr>
</tbody>
</table>

b. Intransitive auxiliary verb conjugation

<table>
<thead>
<tr>
<th></th>
<th>VERB STEM</th>
<th>AUX</th>
</tr>
</thead>
<tbody>
<tr>
<td>1s.g.</td>
<td>ka</td>
<td>-li</td>
</tr>
<tr>
<td>2 s.g</td>
<td>(h)iş-</td>
<td>ka</td>
</tr>
<tr>
<td>3s.g.</td>
<td>ka</td>
<td></td>
</tr>
<tr>
<td>1 pl.</td>
<td>(h)ili-</td>
<td>ka</td>
</tr>
<tr>
<td>2 pl.</td>
<td>(h)aši-</td>
<td>ka</td>
</tr>
</tbody>
</table>

The auxiliary verbs grammatized 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 infixed 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-  imhopa- 'eat (PL)'

Creek  lik.w-i:  likhow-i '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 suffixed 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-lhica ‘be taken care of’
    Chickasaw  a-pi:sa ‘measure’  a-tpisa ‘be measured’

b. PM:  *oho-icca ‘shoot’  *oho-il-icca ‘be shot’
    Al.  hocca ‘shoot’  holicca ‘be shot’
    Choctow.  hossa ‘shoot at’  holisso ‘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:lti ‘kindling’
    Cs.  o:ti ‘kindle’  o:lti ‘be kindled’

b. Al.  takco ‘rope (v.)’  talikco ‘be roped’
    Cs.  takci ‘tie’  talakci ‘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 prounon affixes appears with transitive verbs and with inalienable possessed nouns as shown below:

<table>
<thead>
<tr>
<th></th>
<th>Singular</th>
<th>Dual</th>
<th>Plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>d-</td>
<td>ra?-</td>
<td>r-</td>
</tr>
<tr>
<td>2</td>
<td>g-</td>
<td>2/3 pa?</td>
<td>2/3 p-</td>
</tr>
<tr>
<td>3</td>
<td>Ø</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These pronominal affixes are generally prefixed as illustrated in the following paradigms:
(10) Nominal Verbal

<table>
<thead>
<tr>
<th></th>
<th>Nominal</th>
<th>Verbal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sg. 1</td>
<td>d-za? 'my hand'</td>
<td>d-ge 'he sees me'</td>
</tr>
<tr>
<td>2</td>
<td>g-za? 'your hand'</td>
<td>g-ge 'he sees you'</td>
</tr>
<tr>
<td>3</td>
<td>Ø-za? 'his/her hand'</td>
<td>Ø-ge 'he sees him/her'</td>
</tr>
<tr>
<td>Du. 1</td>
<td>ra?-za? 'our hand'</td>
<td>ra?-ge 'he sees us two'</td>
</tr>
<tr>
<td>2/3</td>
<td>pa?-za? 'your/their hand'</td>
<td>pa?-ge 'he sees you/them'</td>
</tr>
<tr>
<td>Pl. 1</td>
<td>r-za? 'our hand'</td>
<td>r-ge 'he sees us'</td>
</tr>
<tr>
<td>2/3</td>
<td>p-za? 'your/their hand'</td>
<td>p-ge 'he sees you/him'</td>
</tr>
</tbody>
</table>

In a small number of extremely common nominal and verbal roots, these pronouns are sometimes infixed.

(11) Hua personal markers (Haiman 1998:561)

<table>
<thead>
<tr>
<th>Person</th>
<th>haipai- 'explain, tell'</th>
<th>hamu' 'namesake'</th>
</tr>
</thead>
<tbody>
<tr>
<td>1sg.</td>
<td>ha-nd-apai-</td>
<td>ha-nd-amu?</td>
</tr>
<tr>
<td>2sg.</td>
<td>ha-g-apai-</td>
<td>ha-g-amu?</td>
</tr>
<tr>
<td>3sg.</td>
<td>hapai-</td>
<td>hamu?</td>
</tr>
<tr>
<td>1du.</td>
<td>ha-ra?-apai-</td>
<td>ha-ra?-amu?</td>
</tr>
<tr>
<td>2/3du.</td>
<td>fa'apai-</td>
<td>fa?amu?</td>
</tr>
<tr>
<td>1pl.</td>
<td>ha-r-apai-</td>
<td>ha-r-amu?</td>
</tr>
<tr>
<td>2/3pl.</td>
<td>fapai-</td>
<td>famu?</td>
</tr>
</tbody>
</table>
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 *ha*. 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., *hāivuva* ‘root of tree’ → *ha-ndāivuva*).

Haiman demonstrates that a homophonous, but unstressed sequence *ha* was historically a prefix, based partly on the following pair examples:

\[
\begin{align*}
(12) & & \text{gai} & \text{‘look after’} & & \text{ha’gai} & \text{‘stuff’} \\
& & \text{u} & \text{‘go’} & & \text{hau} & \text{‘go up’} \\
& & \text{to} & \text{‘leave’} & & \text{ha’to} & \text{‘scoop’} \\
& & \text{go} & \text{‘see’} & & \text{ha’go} & \text{‘well up, gather’} \\
& & \text{kro} & \text{‘alight, perch’} & & \text{ha’kro} & \text{‘pick leaves’} \\
& & \text{pai} & \text{‘harden in fire’} & & \text{ha’pai} & \text{‘wrang out’} \\
& & \text{tgi} & \text{‘split (wood)’} & & \text{ha’tgi} & \text{‘finish’}
\end{align*}
\]

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
‘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 → ha*). Haiman argues that a pre-Hua speaker might have reinterpreted all words beginning in the stressed *ha* as underlyingly a sequence of *ha+á* using abductive reasoning (Andersen 1973), which creates an ambiguity when the word is in the 3rd person singular. Take, for example, the word 'hamu ‘namesake’. There are two possible analyses of the homophonous sounding 'hamu ‘his namesake’. The 3rd person singular marker could be analyzed as prefixing (i.e. $∅+ha+amu$) or between the prefix *ha* and a hypothetical stem *amu* (i.e. *ha+∅+amu*), 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 'hako ‘look for’ takes an oblique case, the benefactive with which no object pronoun agrees. However, instead of *dhake*, one finds *dgaisi phake*. A strictly semantic explanation would not be able to account for why 'hake with the null 3rd person marker is possible.
Let us now return to the word 'hamu '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+amu or *ha+d+amu). The prefixing option is duly discouraged as a result of the ban on C+h sequences (i.e. *d+ha+amu).

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 identical. 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’

<table>
<thead>
<tr>
<th></th>
<th>Prefixed stem</th>
<th>Infixed stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 sg.</td>
<td>$wa$-$nuni$</td>
<td>$ma$-$wa$-$ni$</td>
</tr>
<tr>
<td>2 sg.</td>
<td>$va$-$nuni$</td>
<td>$ma$-$va$-$ni$</td>
</tr>
</tbody>
</table>
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 ?an- to monosyllabic stems (15), while infixing -an- in disyllabic stem (15) (Omar 1975).

(15)  
a. /co/ ‘speaks’  ?anco ‘speaks.IMPRF’  
/cãs/ ‘excretes’  ?ancãs ‘excretes.IMPRF’  
b. /citoh/ ‘cooks’  canitoh ‘cooks.IMPRF’  
/sapoh/ ‘sweeps’  sanapoh ‘sweeps, is sweeping’

Admittedly, 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 -an- is taken to appear after the initial consonant, co ‘speaks’ should appear as *cano 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’  kanui  ‘something carried on back’  
tôl  ‘to put post in’  tanÔl  ‘post’  
pó  ‘to dream’  pänô  ‘a dream’
kuöl ‘to have resources’  kanuöl ‘resources, strength’
tēeng ‘to work’  tanēeng ‘work’
pók ‘to make idol’  panók ‘idol’

Displacement Theory fares no better either. DT predicts infixation of -ən- 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 -ən- 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. /kahwistaʔeks/ → [kʰawisdʔaes] ‘it strikes, chimes (a clock)’

b. /akekahaʔ/ → [agékhaaʔ] ‘my eye’

c. /koʔnikōhaʔ/ → [gʔoníkhwaʔ] ‘her mind’

d. No change:

/akahwitaʔek/ → [agahwisdāʔek] ‘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 facilitated 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.

\[(18) \quad *A+B > B+A\]

\(^2\) 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'.

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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.
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 palatalization 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).
The 3\textsuperscript{rd} person marker was historically a prefix *i- (e.g., Sierra Popoluca \textit{\textbar{ik}ama:} ‘his cornfield’ < Proto-Zoque *k\textbar{a}m\textbar{a}(k) ‘cornfield’), which lenited into a glide (e.g., South Zoque \textit{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).
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).

Benedict (1943) found that the infix originates from the Tibeto-Burman causative prefix *s-, as illustrated by the following cognate forms in Tibetan:

Benedict (1943) found that the infix originates from the Tibeto-Burman causative prefix *s-, as illustrated by the following cognate forms in Tibetan:
The palatal glide was originally conditioned by the initial s. After the loss of *s in initial consonant clusters, previous coarticulatory palatalization was interpreted as morphological. This metathesis, of course, was not restricted to the intransitive / transitive alternation. Other words with s-initial consonant clusters 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 > mjān ‘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 ontologically 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.

<table>
<thead>
<tr>
<th>Singular (cl. 3)</th>
<th>Plural (cl. 4)</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>kwen</td>
<td>ken</td>
<td>'firewood'</td>
</tr>
<tr>
<td>gwéŋ</td>
<td>gén</td>
<td>'root'</td>
</tr>
<tr>
<td>mbwesem</td>
<td>mbesem</td>
<td>'green grasshopper'</td>
</tr>
<tr>
<td>twéŋ</td>
<td>téŋ</td>
<td>'vine branch'</td>
</tr>
<tr>
<td>fwéw</td>
<td>féw</td>
<td>'thorn'</td>
</tr>
</tbody>
</table>

The reflex of this co-articulatory stage is found in the cognate construction in Aghem, where class 3 nouns are marked by a prefix -o-, as well as an infix -w-.

Aghem class 3 (singular) nouns (Hyman 1972:21 cited in Garrett & Blevins 1998)

<table>
<thead>
<tr>
<th>Singular (cl. 3)</th>
<th>Plural</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-kwíŋ</td>
<td>é-kíŋ (cl. 4)</td>
<td>'mortar'</td>
</tr>
<tr>
<td>6-kwáŋ</td>
<td>é-káŋ (cl. 4)</td>
<td>'hill, mountain'</td>
</tr>
<tr>
<td>6-twíŋ</td>
<td>ń-tíi (cl. 12)</td>
<td>'medicine'</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th>Tzutujil passive</th>
<th>English translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>toj 'pay'</td>
<td>to?jik ‘to be paid’</td>
</tr>
<tr>
<td>k’is 'finish'</td>
<td>k’i?seem ‘to end, finish’</td>
</tr>
<tr>
<td>tij 'eat, consume'</td>
<td>ti?jik ‘to be paid’</td>
</tr>
</tbody>
</table>

In Yucateco, which is a Mayan language distantly related to Tzutujil, the passive of transitive root has the shape CV?C. The glottal stop used to be a suffix /b'/ in the 16th century (i.e. *CVC-b' > *CVC-? > CV?C) (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 yagalgàala ‘tear to shreds’
*kucina kucincinaa ‘break pieces off’
*takare takarkàree ‘strive hard’

Synchronously, however, most pluractional verbs are formed by reduplicating the initial CVC- of the stem, where C₂ assimilates to the following abutting consonant or undergoes rhotacization.
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 > gaṛgadaa ‘rutted road’

Place assimilation of a coda nasal: *jāaṛũntakāa > jāaṛũntakāa ‘bravery’

Complete assimilation of certain consonants: *zāafzaafaa > zàzzaafaa ‘very hot’

Shortening of long vowels and lowering of mid vowels in closed syllables:
*saaboon gidaan abookinsà > saaban gidan abookinsà ‘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 > fīrfita    ‘go out’
bugàà     → *bugbuga > bubbùgaa    ‘beat’
jèveefa     → *jeefjeefa > jàjjeefa    ‘throw’
soomàà     → *soomsooma > sansòoma    ‘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., bugàà/bubbùgaa ‘beat’; soomàà/sansòoma ‘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’
    *fīrfita     > fīrfita    ‘go out’
    *jàjjeefa    > jàjjeefa    ‘throw’
    *sansòoma    > sansòoma    ‘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) Sound change $x, y, z...$

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 involved 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) faetaen ‘walk’ \(\rightarrow\) faef-faetaen ‘be in the habit of walking’  
    mo:t ‘sit’ \(\rightarrow\) mom-mo:t ‘be sitting’  
    sotu- ‘attempt’ \(\rightarrow\) sos-sot ‘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. *\(inu\) > \(win\)).

(35) win ‘drink’ \(\rightarrow\) w-ikk-in ‘be in the habit of drinking’  
    wiik ‘week’ \(\rightarrow\) w-ikk-iik ‘be for a number of weeks’  
    isonī ‘keep it’ \(\rightarrow\) ikk-isoni ‘be keeping it’  
    osom\text{w}\text{o}:nu ‘pay chiefly \(\rightarrow\) okk-osom\text{w}\text{o}:nu ‘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- ‘classifier: food’

*kakakásu akkas ‘treat as a sibling-in-law of the same sex’

*kasamwónu osomwónu ‘pay chiefly respect to’

The reason for the *kvk-k- → *vkk- reanalysis can be most effectively illustrated with the word osomwónu ‘pay chiefly respect to’. Historically, it as *kasamwónu, its reduplicated form would presumably be *kak-kasamwónu. After the dropping of the initial *k, the reduplicated form became *ak-kasamwónu, which was then reanalyzed as *akk-asamwónu since *kasamwónu would have become *asamwónu. 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 wót ‘coconut husking stick’

*ínu win ‘drink’

*kuku wi:k ‘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 \(wot\) ‘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).
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)e:- reduplication (39).

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.
a. helomey- 'to dance'  \(?n\)elomeyek' 'I dance'
   hunkeks 'to open'  \(?n\)unkeksok' 'I open'
   ho\:loh 'basket'  k'\:loh  'your basket'
   ha?a:g 'rock'  \(?w\)a?a:g  'her, his, etc. rock'

b. tmo:l- 'to shoot'  \(?n\)e-tmo\:lok' 'I shoot'
   skewip'- 'to put in order'  k'e-skewip'ak' 'you (sg.) put in order'
   tepo: 'tree'  \(?w\)e-tepo: 'her, his, etc. tree'

c. Original h-initial stems:

   verb *hVC- → intensive *he-hVC-

   Pronominal prefixes:

   * h-VC (etc.) → intensive *h-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. /?o he?m/ → ?o ge?m 'there s/he said'  (Robins 1958:157)
   /?o ho:k\'w/c'/ → ?o go:k\'w/c' 'there s/he gambled'  (Robins 1958:155)

b. Original h-initial stems:

   verb *hVC- → intensive hegVC-

   * hVC- (etc.) → intensive *hegVC- (etc.)

-234-
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. hePwonif- ‘to wake up’ (intr.) *he-hePwonif-> *hegePwonif->
   huPwonif-

   hohkum- ‘to make’ *he-hohkum > hegohkum-

   hoPomah ‘to make fire together’ *he-hoPomah > hegoPomah

   hoPc- ‘to gamble’ *he-hoPc- > hegoPc-

b. ck.Pk.- ‘to pierce’ ck.kck.k- ‘to pierce repeatedly’

   kelomen- ‘to turn’ (trans.) kekelomen- ‘to turn several things’

   *kePy- kekePy(e-) ‘to shine’

   *lek- ‘to fall down’ lePken- ‘to throw, to scatter’

   Pekol- ‘to hover’ PePekol- ‘to hover repeatedly’

The origins of the -Vkk- durative 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 affix.

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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)

<table>
<thead>
<tr>
<th>Base</th>
<th>Diminutive</th>
</tr>
</thead>
<tbody>
<tr>
<td>c’yé’c</td>
<td>c’yé’ey’</td>
</tr>
<tr>
<td>s+xén’x</td>
<td>sxéxnx’x</td>
</tr>
<tr>
<td>s+myéw’</td>
<td>smyéyú’</td>
</tr>
<tr>
<td>k?wáx’w’e</td>
<td>k?wák’sw’x’w’e</td>
</tr>
<tr>
<td>twít</td>
<td>twíw’t</td>
</tr>
<tr>
<td>xé’?</td>
<td>xéxe’?</td>
</tr>
</tbody>
</table>

b. Shuswap (Kuipers 1974)

<table>
<thead>
<tr>
<th>Base</th>
<th>Diminutive</th>
</tr>
</thead>
<tbody>
<tr>
<td>síc’m</td>
<td>sís’c’m</td>
</tr>
<tr>
<td>kykéyt</td>
<td>kykékyt</td>
</tr>
<tr>
<td>cwéx</td>
<td>cwéwx</td>
</tr>
<tr>
<td>twít</td>
<td>twíwt</td>
</tr>
<tr>
<td>cítx’w</td>
<td>cíctx’w</td>
</tr>
<tr>
<td>tsún=k’w-m</td>
<td>tsúsnk’w’m</td>
</tr>
</tbody>
</table>

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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 or not.

(46)  

a. Thompson (Thompson & Thompson 1996)

\[
\begin{align*}
\text{ia?x}=\text{ans} & \quad \text{'(grown person) eats'} \\
\text{ia?xa}^\text{n}=\text{es} & \quad \text{'(baby or animal) eats'} \\
\text{qw }\text{o}i\text{qw}i\text{n}=\text{e}^\text{m} & \quad \text{birch-bark basket'} \\
\text{q}^\text{w}o\text{t}q^\text{w}i\text{n}=\text{e} & \quad \text{small birch-bark baskets'}
\end{align*}
\]

b. Shuswap (Kuipers 1974)

\[
\begin{align*}
\text{x}^\text{w}o\text{x}^\text{w}y=\text{e} & \quad \text{absent, delayed'} \\
\text{x}^\text{w}o\text{x}^\text{w}y\text{y}=\text{es} & \quad \text{a loan, credit'} \\
\text{x+k}^\text{q}^\text{m}=\text{kn} & \quad \text{back side'} \\
\text{x+k}^\text{m}=\text{m}^\text{kn} & \quad \text{upper back'} \\
\text{t}^\text{q}=\text{e} & \quad \text{both, together'} \\
\text{t}^\text{q}^\text{w}=\text{e} & \quad \text{companion, comrade'} \\
\text{p}^\text{es}=\text{k}^\text{w} & \quad \text{lake'} \\
\text{p}^\text{es}=\text{k}^\text{w} & \quad \text{small lake'}
\end{align*}
\]
c. Lillooet (van Eijk 1997:60)

pal?-á?qa?    ‘one-year-old-buck’

(pála ‘one’, aqa? ‘barrel, cylindrical object’)


χəcp-qíqən?\-kst   ‘hundred’

(*χəcp element used in numerical units, -qin?\-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-kwápa?    ‘dog’

s-to-tal\’m    ‘little dog’

Kalispel

s\-l-k\-k\‘t\’us    ‘little face’

Spokane

χ\-χ\‘acin    ‘dog’

l\‘ul\‘ak\w    ‘small stick of wood’

Coeur d’Alene

hin-\‘u-\‘u\š\‘m\ɪn\‘\šən?    ‘dog’

\şə-\şə\‘t\‘um\‘x\‘n?    ‘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)

<table>
<thead>
<tr>
<th>Singular</th>
<th>Plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>s-qʷəbáyʔ</td>
<td>s-qʷiʔəbəyʔ</td>
</tr>
<tr>
<td>s-tiqɪw</td>
<td>s-títiqiw</td>
</tr>
<tr>
<td>tfáləs</td>
<td>tfátjaləs</td>
</tr>
<tr>
<td>s-túbʃ</td>
<td>s-tútubʃ</td>
</tr>
<tr>
<td>χáhəb</td>
<td>χáxahəb</td>
</tr>
</tbody>
</table>

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 Lilooet are given in (49) (see also discussion below on Spokane).
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 glottalization of the resonants in the resulting word. The data below show strong and weak CVC roots under the diminutive construction.

(50)  a. Strong roots (Bates & Carlson 1998:118)

    kʷwúkʷwí ‘something small is created, made’

    l'úl'kʷ ‘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’fn’č’-m’n’ ‘knife, jacknife’
s-xʷúxʷ’-e? ‘an ant’

b. Weak roots

śśfl’ ‘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.
Examples of Spokane stress assignment (Carlson 1989: 205)

a. /k'il'-nt-ex"/ [k'úl'ntx"

S -W-V ‘You made it’
make, do-TRANS-2S

b. /\sil-nt-ex"

W-W-V ‘You chopped it’
chop-TRANS-2S

c. /hec-\sil/

-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’ "úl’ntex" → k’ "úl’ntx" ‘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. \( ^1\text{C}_\text{V-V}\text{C}_\text{iVC} \)) was reinterpreted as infixing -C- reduplication due to the absence of the root vowel (i.e. \( ^1\text{C}_\text{V-V}^\sqrt{\text{C}}(\text{e})\text{C} \rightarrow ^1\text{C}_\text{V-V}^\sqrt{\text{C}}\text{iC} \)). 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 diminutive 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'i-m'T'-l' \quad \text{‘A little thing got mixed by accident’}
       
       \text{DIM-mix-OC}

   b. s-sl'-fl' \quad \text{‘Small things got all cut up.’}
       
       \text{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 \( \text{\textbackslash v} \) sign; the reduplicant is underlined.
stress is on diminutive reduplicant with the strong root /meiʃ/ 'mix' (i.e. m'ém'ʃ'), while stress is on the out-of-control suffix with the weak root /sil/ 'chop' (52)b (i.e. ššil'). 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

<table>
<thead>
<tr>
<th>Stage</th>
<th>Strong roots</th>
<th>Weak roots</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C̄V√CiVC̄-VC</td>
<td>C̄V√CiVC̄-VC</td>
<td>Pre-Northern Interior Salish</td>
</tr>
<tr>
<td>2</td>
<td>C̄V√Ci(α)C̄-(α)C</td>
<td>Ci(α)-√Ci(α)C̄-VC</td>
<td>Vowel reduction/deletion</td>
</tr>
<tr>
<td>3</td>
<td>C̄V̄CiC̄-C or C̄CiC̄-VC</td>
<td>C̄CiC̄-VC or C̄CiC̄-VC</td>
<td>Ambiguity between infixing vs. prefixing reduplication</td>
</tr>
<tr>
<td></td>
<td>C̄V̄CiC̄-C</td>
<td>C̄CiC̄-VC</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>C̄V̄CiC̄C̄-C</td>
<td>C̄CiC̄-VC</td>
<td>Leveling toward infixation</td>
</tr>
</tbody>
</table>

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

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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., *mef* ‘mix’ vs. *m’ém’f* ‘DIM-mix’), similar to what happened in Hausa pluractional reduplication discussed above.

Thus, in this case study, I demonstrate that infinal 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
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

<table>
<thead>
<tr>
<th>Subcategorization</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphological (Adfix)</td>
<td>English nominalizing -ness</td>
</tr>
<tr>
<td>Morphological/Prosodic</td>
<td>English comparative -er, Expletive infixation</td>
</tr>
<tr>
<td>Prosodic (P-affix &amp; infix)</td>
<td>English ma-infixation, Ulwa ka-infixation</td>
</tr>
</tbody>
</table>

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 reasons. 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:\(^7\)


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.
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:

*thingamabob*, *thingmabob*, *thingumbob*, *thingamajig*, *ringamajiggen*, *ringamajizzer*

b. Phrase words based on a question:

*whadyamecallit*, *whatchamacallit*, *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 whatchimacallum comes from the word ‘may’ in ‘what you may call him’. In contrast with whatchacallum
‘what you call him’, *whatchamacallum* would appear as if there is an inserted extra syllable *ma*.

The *ma* sequence in *thingumajig*, 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. (‘*whatcha*ma(*callit*)), 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(t)ʃɔmɔcɔlit’], -ma- was flanked by four to five segments to its left and five segments to its right, while in *thingumajig* [θɪŋmədʒɪg], -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. Particularly, 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 syllable had a prevocalic non-coronal obstruent, and when the liquid was r and the initial syllable had a prevocalic t.
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 promince. 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.\footnote{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...}

Anderson (1988) appeals to similar reasoning:
‘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=Mc⁴ (i.e. what is
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, $M_{ALIGN} \gg P$, 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

<table>
<thead>
<tr>
<th>Formalism</th>
<th>Generalized Phonological Subcategorization (GPS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explanation of the edge-bias</td>
<td>Exogenesis Theory of Infixation (EXOTI)</td>
</tr>
<tr>
<td>Provision against coerced morpheme movement (e.g., DT)</td>
<td>Subcategorization Non-violability Hypothesis: [ \text{ALIGN} \gg P ]</td>
</tr>
</tbody>
</table>

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, \( \text{ALIGN} \gg P \), which prevents subcategorization constraints from being violated for the purpose of satisfying constraints on the phonology of the language. Thus, \( \text{ALIGN} \gg P \) allows the possibility of conflict between competing subcategorization requirements (i.e. \( M_1 \gg M_2 \)). 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%).
Infixes involving: Cases Percentage

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasal</td>
<td>36 (19 from Austronesian; 6 from Austro-Asiatic)</td>
<td>41%</td>
</tr>
<tr>
<td>Liquid</td>
<td>24 (5 from Austronesian)</td>
<td>28%</td>
</tr>
<tr>
<td>Oral stop</td>
<td>14</td>
<td>16%</td>
</tr>
<tr>
<td>Fricative</td>
<td>9</td>
<td>10%</td>
</tr>
<tr>
<td>Affricate</td>
<td>3</td>
<td>3%</td>
</tr>
<tr>
<td>Vowel only</td>
<td>7</td>
<td>8%</td>
</tr>
</tbody>
</table>

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.
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, intransitiivizer, 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., *commanders-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, Moravec 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.
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

<table>
<thead>
<tr>
<th></th>
<th>Derivational</th>
<th>Inflectional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed segment infixation</td>
<td>59</td>
<td>28</td>
</tr>
<tr>
<td>Internal reduplication</td>
<td>45</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>104</td>
<td>37</td>
</tr>
</tbody>
</table>
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.

Areal distribution of infixation
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 sister 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
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):

<table>
<thead>
<tr>
<th></th>
<th>Clitic PMs</th>
<th>Independent pronouns</th>
</tr>
</thead>
<tbody>
<tr>
<td>1SG</td>
<td>-zu, -z</td>
<td>zu</td>
</tr>
<tr>
<td>2SG</td>
<td>-nu, -n, -ru, -lu</td>
<td>un</td>
</tr>
<tr>
<td>3SG</td>
<td>-ne, -le, -re, -n</td>
<td>meno, kano, šeno</td>
</tr>
<tr>
<td>1PL</td>
<td>-yan</td>
<td>yan</td>
</tr>
<tr>
<td>2PL</td>
<td>-nan, -ran, -lan</td>
<td>waż, efan</td>
</tr>
<tr>
<td>3PL</td>
<td>-q’un</td>
<td>met’öön, kat’öön, šet’öön</td>
</tr>
</tbody>
</table>

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 bʊyə-ne-b-e p’a ačik’alşey

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’

kayuz-ax a-z-q’-e

letter-DAT receive1-1SG-receive2-AORII

'I received the letter'

bašq- ‘steal’

q’ačay-ɣ-on bez täginax baš-q’un-q’-e

thief-PL-ERG my money steal1-3PL-steal2-AORII

'Thieves stole my money'
Let us now turn to endoclitization 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

<table>
<thead>
<tr>
<th>Clitic</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>me</td>
<td>1st singular</td>
</tr>
<tr>
<td>de</td>
<td>2nd singular</td>
</tr>
<tr>
<td>ye</td>
<td>3rd singular and plural</td>
</tr>
<tr>
<td>am</td>
<td>1st and 2nd plural</td>
</tr>
<tr>
<td>mo</td>
<td>1st and 2nd plural</td>
</tr>
</tbody>
</table>

Model Clitics

<table>
<thead>
<tr>
<th>Clitic</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>ba</td>
<td>will, might, must, should, may</td>
</tr>
<tr>
<td>de</td>
<td>should, had, better, let</td>
</tr>
</tbody>
</table>

Adverbial clitics

<table>
<thead>
<tr>
<th>Clitic</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>xo</td>
<td>indeed, really, of course</td>
</tr>
<tr>
<td>no</td>
<td>then</td>
</tr>
</tbody>
</table>
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

\[
\begin{align*}
\text{sâtôm} & \quad \text{ye} & & \text{sâtôm} & \quad \text{ye}^2 \\
\text{keep} & \quad \text{it} & & \text{keep} & \quad \text{it} \\
\text{\textquoteleft I keep it\textquoteright} & & \text{\textquoteleft I keep it.\textquoteright} \\
\text{pôrebdo} & \quad \text{me} & & \text{pôrebdo} & \quad \text{me} \\
\text{beat} & \quad \text{I} & & \text{beat} & \quad \text{I} \\
\text{\textquoteleft I was beating him\textquoteright} & & \text{\textquoteleft I was beating him.\textquoteright}
\end{align*}
\]

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

\[
\begin{align*}
\text{axistôlə} & \quad \text{me} & & \text{á-me-xistôlə} \\
\text{buy} & & \text{\textquoteleft I was buying them\textquoteright} & & \text{\textquoteleft I was buying them.\textquoteright}
\end{align*}
\]

\[\text{\textsuperscript{2}}\text{It is unclear from Tegey\textquoteright}s discussion what effect the change in stress has here. In other cases, the shift in stress could signify perfectivity (e.g., Tegey 1977:92).}\]
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-wahó me
push I
‘I was pushing it’

b. pacedlé ba
get up would
‘You would get up.’

ṭak-ahó me
lose I
‘I was shaking it’

baylodá me
‘I was losing it’

pore-westó me
bowó 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.  tülm-wəhə  b.  pábacedəle
     ‘I pushed it’       ‘You would get up.’

   tükm-ahə  báymelə
     ‘I shook it’       ‘I was losing it’

   pörme-wəstə  bòdətə
     ‘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 endoclitization 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)
   Qur qmul ‘snatch’
   kat kmat ‘bite’
   kuu kmuu ‘too tired, not in the mood’
   hŋu? hŋmu? ‘soak’
   skziap kmziap ‘catch’
   sbil smbil ‘leave behind’

   Chamorro verbalizer, actor focus (Topping 1973:185)
   gupu ‘to fly’  gumupu i paharu ‘the bird flew’
   tristi ‘sad’  trumisti ‘becomes sad’

   Tagalog focus construction (Orgun and Sprouse 1999)
   grad wet grumadwet ~ gumradwet ‘to graduate’
   plantsa plumantsa ~ pumlantsa ‘iron’
   preno prumeno ~ pumreno ‘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.

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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).
<table>
<thead>
<tr>
<th>Phylum</th>
<th>No.</th>
<th>Languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Afro-Asiatic</td>
<td>9</td>
<td>Akkadian, Bole, Hausa, Syrian Arabic, Amharic, Harari, Levantine Arabic,</td>
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<tr>
<td></td>
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<td>Tigre, Tigrinya</td>
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<tr>
<td>2. Algic</td>
<td>1</td>
<td>Yurok</td>
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<td>3. Altaic</td>
<td>1</td>
<td>Korean</td>
</tr>
<tr>
<td>4. Australian</td>
<td>7</td>
<td>Bunuba, Djingili, Kugu Nganhcara, Mangarayi, Uradhi, Wardaman, Yir Yoront</td>
</tr>
<tr>
<td>5. Austro-Asiatic</td>
<td>7</td>
<td>Chrau, Kamhmu?, Katu, Mlabri, Surin Khmer, Temiar, Kentakbong</td>
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<tr>
<td>6. Austronesian</td>
<td>25</td>
<td>Acehnese, Amis, Atayal, Chamorro, Ferhan Tetun, Kadasan, Kiriwina/</td>
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<td></td>
<td></td>
<td>Kilivila, Leti, Malagasy, Nakanai, Paiwan, Palauan, Pangasinan, Pazeh,</td>
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<td></td>
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<td>Samoan, Sundanese, Tagalog, Thao, Toba Batak, Toratan, West Tarangan,</td>
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<td>Nakanai, Timugon Murut, West Tarangan, Trukese</td>
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<td>7. Carib</td>
<td>1</td>
<td>Tiriyo</td>
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<td>8. Chimakuan</td>
<td>1</td>
<td>Quileute</td>
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<tr>
<td>9. Hokan</td>
<td>7</td>
<td>Kashaya Pomo, Kiliwa, Maricopa, Mojave, Yuma, Ineseño Chumash, Washo</td>
</tr>
<tr>
<td>10. Huavean</td>
<td>1</td>
<td>Huave</td>
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<tr>
<td>11. IE</td>
<td>3</td>
<td>English, Greek, Sanskrit</td>
</tr>
<tr>
<td>12. Mayan</td>
<td>3</td>
<td>Chontal, Tzeltal, Tzutujil</td>
</tr>
<tr>
<td>13. Misumalpan</td>
<td>2</td>
<td>Miskito, Ulwa</td>
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<tr>
<td>14. Mixe-Zoque</td>
<td>1</td>
<td>Zoque</td>
</tr>
<tr>
<td>15. Muskogean</td>
<td>6</td>
<td>Alabama, Choctaw, Koasati, Creek, Mikasuki, Chickasaw</td>
</tr>
<tr>
<td>16. Nakh-Daghestanian</td>
<td>4</td>
<td>Archi, Budukh, Hunzib, Rutul</td>
</tr>
<tr>
<td>17. Niger-Congo</td>
<td>5</td>
<td>Birom, KiChaga, IsiXhosa, Kinande, SiSwati, Noni</td>
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<tr>
<td>18. Penutian</td>
<td>1</td>
<td>Takelma</td>
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<td>19. Salishan</td>
<td>5</td>
<td>Colville, Lushootseed, Shuswap, Thompson, Lilloet</td>
</tr>
<tr>
<td>20. Sino-Tibetan</td>
<td>4</td>
<td>Cantonese, Lepcha, Peking Mandarin, Pingding Mandarin</td>
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<tr>
<td>21. Siouan</td>
<td>1</td>
<td>Dakota</td>
</tr>
<tr>
<td>22. Trans-New Guinea</td>
<td>3</td>
<td>Hua, Yagaria, Nabak</td>
</tr>
<tr>
<td>23. Tupi</td>
<td>1</td>
<td>Kamaiurá</td>
</tr>
<tr>
<td>24. Uto-Aztecan</td>
<td>1</td>
<td>Sonora Yaqui</td>
</tr>
<tr>
<td>25. Isolate</td>
<td>1</td>
<td>Zuni</td>
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</tbody>
</table>

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**Appendix II: Database of Fixed Segment Infixation (Arranged by language names)**

<table>
<thead>
<tr>
<th>Language</th>
<th>Infix</th>
<th>Location</th>
<th>Function</th>
<th>Phylum</th>
<th>Examples</th>
<th>Sources</th>
</tr>
</thead>
</table>
| Akkadian     | -ta-, -t- | after 1st C or first V | reflexive/ reciprocal | Afro-Asiatic: Semitic | ishtiq 'he stole'/ishtariq 'he stole for himself'  
paraesum 'to separate'  
iparras 'he separates. PRES'  
iptarras '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 epenthesis; 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'/kahno 'be better'  
kasatk 'be cold'/kasahka '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'/ilpa 'we eat'  
coopa 'buy'/coolpa 'we buy'  
takco 'rope'/taikko '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'/ispa 'you eat'  
coopa 'buy/coospa 'you buy'  
takco 'rope'/tacikko '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. |
<table>
<thead>
<tr>
<th>LANGUAGE</th>
<th>INFIX</th>
<th>LOCATION</th>
<th>FUNCTION</th>
<th>PHYLUM</th>
<th>EXAMPLES</th>
<th>SOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archi</td>
<td>-w-, r-, -b-</td>
<td>after 1st V or before the final syllable</td>
<td>number/class marker</td>
<td>Nakh-Daghestanian</td>
<td>aXa-s 'to lie down (indicative, class III)' abX-u 'to lie down (perfective, aorist)'</td>
<td>Kibrik 1998:458</td>
</tr>
<tr>
<td>Archi</td>
<td>-r++r</td>
<td>after 1st V or before the final syllable</td>
<td>durative</td>
<td>Nakh-Daghestanian</td>
<td>aXa 'to lie down' arXar 'to lie down, durative'</td>
<td>Kibrik 1998:457</td>
</tr>
<tr>
<td>Atayal</td>
<td>-m-</td>
<td>after 1st C</td>
<td>animate actor focus</td>
<td>Austronesian: Atayalic</td>
<td>qmul 'snatch, animate actor focus' hfgang/hmkang 'search' skziap/kmziap 'catch' prau/rmau 'help'</td>
<td>Egerod 1965:263-6, 1999</td>
</tr>
<tr>
<td>Birom</td>
<td>-w-</td>
<td>after 1st C</td>
<td>Class 3</td>
<td>Niger-Congo: Atlantic-Congo</td>
<td>gat 'bed 4, plural'/ gwat 'bed 3, singular'</td>
<td>Bouquiaux 1970</td>
</tr>
<tr>
<td>Bole</td>
<td>-gi-</td>
<td>after 1st syllable (CV) or before the final syllable</td>
<td>pluractional</td>
<td>Afro-Asiatic: Chadic</td>
<td>ngoruu/ngogiruu 'tied' yoruu/yogiruu 'stopped'</td>
<td>Gimba 2000 Ch. 10</td>
</tr>
<tr>
<td>Budukh</td>
<td>-R(V)-, Rer, l, n</td>
<td>after first V or before the final syllable</td>
<td>durative</td>
<td>Nakh-Daghestanian</td>
<td>choshu 'to stab (downwards)/ chorshu saq'a 'to die'/sarq?ar</td>
<td>Alekseev 1989:273</td>
</tr>
<tr>
<td>Budukh</td>
<td>-mV-</td>
<td>after first V/syllable or before the final syllable</td>
<td>prohibitive</td>
<td>Nakh-Daghestanian</td>
<td>yech'i 'to arrive'/ yemech'i yuc'u 'to give'/yumoc'u</td>
<td>Alekseev 1989:279</td>
</tr>
<tr>
<td>LANGUAGE</td>
<td>INFIX</td>
<td>LOCATION</td>
<td>FUNCTION</td>
<td>PHYLUM</td>
<td>EXAMPLES</td>
<td>SOURCES</td>
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</tr>
</tbody>
</table>
| Cantonese   | -gwai-  | after 1st syllable   | adjectival emphasis    | Sino-Tibetan:       | leuhnjeuhn 'clumsy'
|             |          |                      |                        | Chinese:              | 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:       | pinsam 'biased'
|             |          |                      |                        |                     | 'What do you mean, biased?'                                              |                         |
| Chamorro    | -in-    | before 1st V         | nominalization (?)     | Austronesian:       | tristi 'sad':
|             |          |                      |                        | Malayo-Polynesian:     | trinisti 'sadness'
|             |          |                      |                        |                     | hasso 'think'
|             |          |                      |                        |                     | i hinasso 'the thought'                                                 | Topping 1973,          |
|             |          |                      |                        |                     |                                                            | Anderson 1992: 207-208   |
| Chamorro    | -um-    | before first V       | verbalizer, actor      | Austronesian:       | gupu 'to fly'
|             |          |                      | focus                  | Malayo-Polynesian:     | gunupu i paharu 'the bird flew'
|             |          |                      |                        |                     | tristi 'sad':
|             |          |                      |                        |                     | trumisti 'becomes sad'                                                 | Topping 1973:185,      |
|             |          |                      |                        |                     |                                                            | Anderson 1992: 207-208   |
| Chickasaw   | -i-     | after 1st V          | medio-passive          | Muskogean:          | a-pisa 'measure'/ a-пisa 'be measured'
<p>|             |          |                      |                        | Western:             | oti 'kindle'/ oтi 'be kindled'                                           | Martin &amp; Munro 1994     |
| Choctaw     | -i-     | after 1st V          | passive                | Muskogean:          | aapitta 'to put into a container' --&gt; alpitta                           | Lombardi &amp; McCarthy 1991|
| Choctaw     | -h-     | before final syllable| instantaneous          | Muskogean:          | waaya 'to grow (of plants)'/ wahya                                      | Lombardi &amp; McCarthy 1991|</p>
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<tr>
<th>LANGUAGE</th>
<th>INFIX</th>
<th>LOCATION</th>
<th>FUNCTION</th>
<th>PHYLUM</th>
<th>EXAMPLES</th>
<th>SOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chontal</td>
<td>-olh-, -ulhy-</td>
<td>possibly after 1st C</td>
<td>plural (noun and verb)</td>
<td>Mayan: Cholan-Tzeltalan</td>
<td>akweʔ 'man'/ akylhyweʔ 'men' kon'iʔ 'grandchild'/ kolhn'iʔ 'grandchildren'</td>
<td>Waterhouse 1962:95</td>
</tr>
<tr>
<td>Chrau</td>
<td>-an-</td>
<td>after 1st C</td>
<td>nominalization</td>
<td>Austro-Asiatic: Mon-Khmer</td>
<td>tung 'carry'/ tanung 'armload' gon 'hunt'/ ganon 'hunting blind'</td>
<td>Thomas 1971, Bauer 1988</td>
</tr>
<tr>
<td>Colville</td>
<td>-aʔ-</td>
<td>before final C</td>
<td>diminutive</td>
<td>Salishan: Interior Salish</td>
<td>-itkw 'water'/ -itaʔkw 'little water'</td>
<td>Mattina 1973:91</td>
</tr>
<tr>
<td>Creek</td>
<td>-ho-</td>
<td>before final syllable</td>
<td>plural</td>
<td>Muskogean: Eastern</td>
<td>lik.w-i/ likhow-i 'rotten (PL)'</td>
<td>Martin 1994</td>
</tr>
<tr>
<td>Dakota</td>
<td>-wa-, -ma-</td>
<td>after 1st V</td>
<td>1st person</td>
<td>Siouan: Siouan Proper</td>
<td>napca ‘swallow’/ nawapca ‘I swallow it’ nawizi ‘jealous’/ nawawizi ‘I am jealous’</td>
<td>Moravcsik 1977</td>
</tr>
<tr>
<td>English</td>
<td>word</td>
<td>before stressed syllable</td>
<td>expletive</td>
<td>IE: Germanic</td>
<td>fan-bloody-tastic</td>
<td>McCarthy 1982</td>
</tr>
<tr>
<td>Hua</td>
<td>-raʔ-, -ng-, -g-, -r-</td>
<td>before 1st vowel</td>
<td>person</td>
<td>Trans-New Guinea: Main Section</td>
<td>raʔ-haie vs. ha-raʔ-aie ‘it please the two of us’ hapai ‘explain, tell’ ha-nd-apai ‘1sg.’ ha-g-apai ‘2sg.’ ha-raʔa-pai ‘1du.’ ha-r-apai ‘1pl.’</td>
<td>Haiman 1977:314, 1998:561</td>
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<td>LANGUAGE</td>
<td>INFIX</td>
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<td>FUNCTION</td>
<td>PHYLM</td>
<td>EXAMPLES</td>
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<tr>
<td>Huave</td>
<td>-ro-, -ra-, -r</td>
<td>after root V</td>
<td>indefinite actor</td>
<td>Huavean</td>
<td>-ndok ‘to fish’, ando-ro-k ‘there is fishing’</td>
<td>Stairs &amp; Hollenbach 1969:52; Suarez 1975</td>
</tr>
<tr>
<td>Hunzib</td>
<td>-a-, -(y/w)A-</td>
<td>possibly always on stressed position</td>
<td>pluractional</td>
<td>Nakh-Daghestanian</td>
<td>uhu/uwAhe ‘die’ ek/eyAk ‘fall’ a-c’E/(m)-a.a.c’E ‘see’</td>
<td>van den Berg 1995: 81-82</td>
</tr>
<tr>
<td>Kashaya Pomo</td>
<td>-t-, -h-</td>
<td>after the final vowel</td>
<td>pluractional</td>
<td>Hokan: Northern</td>
<td>phanem ‘hit with the first’ phanetm-aw ‘hit with the first (pl)’</td>
<td>Buckley 1994</td>
</tr>
<tr>
<td>Katu</td>
<td>-a-</td>
<td>after 1st C</td>
<td>nominalizer</td>
<td>Austro-Asiatic: Mon-Khmer</td>
<td>kloos ‘to exchange’ kaloos ‘an exchange’</td>
<td>Costello 1998</td>
</tr>
<tr>
<td>Language</td>
<td>Infix</td>
<td>Location</td>
<td>Function</td>
<td>Phylum</td>
<td>Examples</td>
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<tr>
<td>Katu</td>
<td>-an-</td>
<td>after 1st C</td>
<td>nominalizer</td>
<td>Austro-Asiatic: Mon-Khmer</td>
<td>phaar 'to feed animal'</td>
<td>Costello 1998</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>phanaar 'food given to animal'</td>
<td></td>
</tr>
<tr>
<td>Katu</td>
<td>-r-</td>
<td>after 1st V</td>
<td>nominalizer</td>
<td>Austro-Asiatic: Mon-Khmer</td>
<td>katas 'to name'</td>
<td>Costello 1998</td>
</tr>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>kartas 'name'</td>
<td></td>
</tr>
<tr>
<td>Katu</td>
<td>-ar-</td>
<td>after 1st C</td>
<td>nominalizer</td>
<td>Austro-Asiatic: Mon-Khmer</td>
<td>teh 'to hammer'</td>
<td>Costello 1998</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td>tarneh 'hammer'</td>
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<tr>
<td>Kentakbong</td>
<td>-ən-</td>
<td>before 1st V</td>
<td>imperfect</td>
<td>Austro-Asiatic: Mon-Khmer</td>
<td>/sapoh/ 'sweeps'</td>
<td>Omar 1975</td>
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<tr>
<td></td>
<td></td>
<td>(do not infix in monosyllabic forms)</td>
<td></td>
<td></td>
<td>sonapoh 'sweeps, is sweeping'</td>
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<td>/citoh/ 'cooks'</td>
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<td>conitoh 'cooks.IMPRF'</td>
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<tr>
<td>KiChaga</td>
<td>-n-</td>
<td>before final syllable</td>
<td>intensive</td>
<td>Niger-Congo: Atlantic-Congo</td>
<td>o.lon.ga/-olon-n-ga 'point'</td>
<td>Inkelas p. c.</td>
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<td></td>
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<td></td>
<td>-aamb.i.a/-aambi-n-a 'look at'</td>
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<td>Kiliwa</td>
<td>-n-</td>
<td>after 1st C</td>
<td>diminutive</td>
<td>Hokan: Esselen-Yuman</td>
<td>$?aaw 'give birth'</td>
<td>Mixco 1985</td>
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<tr>
<td></td>
<td></td>
<td>(even between /s/ and a glottal stop!)</td>
<td></td>
<td></td>
<td>s&lt;-&lt;n&gt;-?$aaw-u 'offstring'</td>
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<tr>
<td>Kiriwina/</td>
<td>-gu-, -m-, -le- etc.</td>
<td>before final syllable or after the first syllable.</td>
<td>possessive</td>
<td>Austronesian: Malayo-Polynesian: Oceanic (New Guinea Cluster)</td>
<td>lu-gu-ta 'my opposite sex sibling'</td>
<td>Lawton 1993; Senft 1986</td>
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<tr>
<td>Kilivila</td>
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<td>lu-m-ta 'your(sg.) opposite sex sibling'</td>
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<td></td>
<td>lu-le-ta 'his/her opposite sex sibling'</td>
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<tr>
<td>Koasati</td>
<td>-ho-</td>
<td>after 1st syllable</td>
<td>punctual</td>
<td>Muskogean: Eastern</td>
<td>okcayyan 'to be alive[sg]', plural ok-ho-cayyan</td>
<td>Kimball 1991</td>
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</table>

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<table>
<thead>
<tr>
<th>LANGUAGE</th>
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<th>LOCATION</th>
<th>FUNCTION</th>
<th>PHYLUM</th>
<th>EXAMPLES</th>
<th>SOURCES</th>
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<tr>
<td>Koasati</td>
<td>-s-</td>
<td>before final syllable</td>
<td>plural (verbal)</td>
<td>Muskogean: Eastern</td>
<td>aka:nonaka-s-non ‘to be hungry’ akopilin akopis-lin ‘to knock something away’</td>
<td>Kimball 1991</td>
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<tr>
<td>Lepcha (Rong)</td>
<td>-j-</td>
<td>After first consonant</td>
<td>transitive</td>
<td>Sino-Tibetan: Tibeto-Burman</td>
<td>nom ‘smell (intr.)’ njom ‘smell (tr.)’</td>
<td>Benedict 1943, Voegelin &amp; Voegelin 1976:9</td>
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<tr>
<td>Leti</td>
<td>-ni, -n-, -i-</td>
<td>after 1st C</td>
<td>nominalizer</td>
<td>Austronesian: Malayo-Polynesian</td>
<td>kaati ‘to carve’ k-ni-aa-ti ‘carving’ kini ‘to kiss’ knini ‘kissing’ mai ‘to come’ mai ‘arrival’</td>
<td>Blevins 1999</td>
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<tr>
<td>Peking Mandarin</td>
<td>-li-</td>
<td>after 1st syllable</td>
<td>emphasis in adjectives</td>
<td>Sino-Tibetan: Chinese</td>
<td>hwudu-de ‘muddled’ hwulihwudu-de ‘good and muddled’</td>
<td>Chau 1968</td>
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<tr>
<td>Mikasuki</td>
<td>-ho-</td>
<td>before last syllable</td>
<td>plural</td>
<td>Muskogean: Eastern</td>
<td>hi.ca ‘see’/ci-hi:ho:ca-laka ‘he will see you all’ im.pa/-imhopa- ‘eat (PL)’</td>
<td>Martin 1994</td>
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<td>INFIX</td>
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<td>FUNCTION</td>
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<td>Miskito</td>
<td>-m-</td>
<td>after 1st V</td>
<td>construct state</td>
<td>Misumalpan</td>
<td>na-m-pa 'your tooth'</td>
<td>Ultan 1975:170, Moravcsik 2000, Rouvier 2002</td>
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<tr>
<td>Mlabri</td>
<td>-r-, -m-</td>
<td>after 1st C</td>
<td>instrumental noun</td>
<td>Austro-Asiatic: Mon-Khmer</td>
<td>klaap 'to hold' krlaap 'forceps of split bamboo'</td>
<td>Rischel 1995: 85</td>
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<tr>
<td>Mojave</td>
<td>-uu-, -t-, -ch-</td>
<td>before last syllable</td>
<td>plural subject</td>
<td>Hokan: Esselen-Yuman</td>
<td>m-suivaàr-k 'you (pl.) sing' /-katnyewk-k 'we bend it out of shape' (sg. kanyewk)</td>
<td>Munro 1976</td>
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<td>Noni</td>
<td>-w-</td>
<td>after 1st C</td>
<td>Class 3</td>
<td>Niger-Congo</td>
<td>ken/kwen 'firewood' mbesem/mbwesem 'green grasshopper'</td>
<td>Hyman 1981; Garrett &amp; Blevins 1998</td>
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<td>Palauan</td>
<td>-me-, -m-, -u-, -o-</td>
<td>after 1st C</td>
<td>verb marker</td>
<td>Austronesian: Malayo-Polynesian Micronesian</td>
<td>l-m-uut 'return' ch-Em-iis 'escape' s-u-eb&quot;k 'fly'</td>
<td>Josephs 1975:150</td>
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<tr>
<td>Palauan</td>
<td>-il-, -ir-, -l-</td>
<td>after 1st C</td>
<td>past tense</td>
<td>Austronesian: Malayo-Polynesian Micronesian</td>
<td>l-il-uut 'returned' r-ir-eb't 'fell'</td>
<td>Josephs 1975</td>
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<tr>
<td>Palauan</td>
<td>-(E)i-</td>
<td>after 1st C</td>
<td>resulting state verb</td>
<td>Austronesian: Malayo-Polynesian Micronesian</td>
<td>k-i-imd 'cut' ch-al-sbrebor 'painted'</td>
<td>Josephs 1975</td>
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<td>Pangasinan</td>
<td>-in-(-RED)</td>
<td>before 1st V</td>
<td>frequentative</td>
<td>Austronesian: Malayo-Polynesian</td>
<td>bolan 'month'/binolanbolan nl-labilabi 'nightly, every night'</td>
<td>Benton 1971:104</td>
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<tr>
<td>Pingding Mandarin</td>
<td>مير</td>
<td>after 1st C</td>
<td>diminutive</td>
<td>Sino-Tibetan: Chinese</td>
<td>xua/ x</td>
<td>ua 'flower' m</td>
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<tr>
<td>Rutul</td>
<td>-r-</td>
<td>after first V</td>
<td>durative</td>
<td>Nakh-Daghestanian</td>
<td>haga 'to see' /harga</td>
<td>Alekseev 1989:228</td>
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<tr>
<td>Sanskrit</td>
<td>-N-</td>
<td>after root-V</td>
<td>present stem</td>
<td>IE: Indo-Aryan</td>
<td>yuj 'join'/ yufüg</td>
<td>Whitney 1889:251</td>
</tr>
<tr>
<td>Sundanese</td>
<td>-ar-</td>
<td>after 1st</td>
<td>plural</td>
<td>Austronesian: Malayo-Polynesian</td>
<td>budak 'child'/ barudak 'children' sare 'sleep'/ sarare 'sleep.PL' niis 'cool oneself/nariis 'cool oneself.PL'</td>
<td>Moravcsik 2000</td>
</tr>
<tr>
<td>Surin Khmer</td>
<td>-N-, rN-</td>
<td>after 1st C (raN is prefixed before labial, infixed after alveolar and palatal stops. All others take N.)</td>
<td>instrument/ locative nominalizer</td>
<td>Austro-Asiatic: Mon-Khmer</td>
<td>kvvc 'to knot' k^nvvc 'bamboo string' (note it induces aspiration) doot 'to pierce' tranoot 'to skewer for fish' (note the devoicing)</td>
<td>Thomas 1990</td>
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<tr>
<td>Surin Khmer</td>
<td>-N-, -nr-</td>
<td>after 1st C</td>
<td>Nominalizing to a Goal noun</td>
<td>Austro-Asiatic: Mon-Khmer</td>
<td>kuur 'to draw' knuur 'wavy line'</td>
<td>Thomas 1990</td>
</tr>
<tr>
<td>LANGUAGE</td>
<td>INFIX</td>
<td>LOCATION</td>
<td>FUNCTION</td>
<td>PHYLUM</td>
<td>EXAMPLES</td>
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<td>Syrian Arabic</td>
<td>-r-</td>
<td>before final syllable or after first vowel</td>
<td>augmentative &amp; frequentative</td>
<td>Afro-Asiatic: Semitic</td>
<td>xamas 'to scratch' / xarmas 'to scratch'</td>
<td>Ultan 1975:165,</td>
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<td>Cowell 1964:255,</td>
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<td>Moravcsik 2000</td>
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<tr>
<td>Tagalog</td>
<td>-um-</td>
<td>after the first C or before first V</td>
<td>actor focus</td>
<td>Austronesian: Malayo-Polynesian</td>
<td>bumilh 'X buys/ bought': bilih grumadwet 'X graduates/ graduated': gradwet</td>
<td>French 1988:25,</td>
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<td>32, Moravcsik 2000</td>
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<tr>
<td>Toba Batak</td>
<td>-um-</td>
<td>before 1st V</td>
<td>active compleve, intensification, tense</td>
<td>Austronesian: Malayo-Polynesian</td>
<td>tibbo/tumibbo 'tall/taller' las/lumas 'hot/hotter' pasak/uppasak 'beat/has beaten' ngali/ungngali 'cold/colder'</td>
<td>Crowhurst 1998,</td>
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<td>2001</td>
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<tr>
<td>Toratan (Ratahan)</td>
<td>-um-</td>
<td>before 1st V</td>
<td>agent voice non-past</td>
<td>Austronesian: Malayo-Polynesian</td>
<td>empo 'sit' /mempo kukuk 'cry out'/kumukuk</td>
<td>Himmelman &amp;</td>
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<td>Wolff 1999:13, 41</td>
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<tr>
<td>Toratan (Ratahan)</td>
<td>-im-</td>
<td>before 1st V</td>
<td>agent voice past</td>
<td>Austronesian: Malayo-Polynesian</td>
<td>tumpa 'jump down' / timumpa empo 'sit' /nempo 'sat'</td>
<td>Himmelman &amp;</td>
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<td>Wolff 1999:13, 41</td>
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<tr>
<td>Toratan (Ratahan)</td>
<td>-in-</td>
<td>before 1st V</td>
<td>patient voice past</td>
<td>Austronesian: Malayo-Polynesian</td>
<td>ni-ehom 'carried' ni-lutam 'shot' tuwang 'fall'/tinuewang 'fell'</td>
<td>Himmelman &amp;</td>
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<td>Wolff 1999:13, 41</td>
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<tr>
<td>Tzeltal</td>
<td>-h-</td>
<td>after root vowel</td>
<td>intransitivizer</td>
<td>Mayan: Cholan-Tzeltalan</td>
<td>puk 'to divide among' puhk 'to spread the word'</td>
<td>Slocum 1948,</td>
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<td>Nida 1:68</td>
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<tr>
<td>Tzutujil</td>
<td>-?-</td>
<td>after first V</td>
<td>mediopassive</td>
<td>Mayan: Quichean-Mamean</td>
<td>k'i'is 'finish' k'i'isem 'to end, finish'</td>
<td>Dayley 1985:112</td>
</tr>
<tr>
<td>LANGUAGE</td>
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<td>Tzutujil</td>
<td>-j-</td>
<td>after first V</td>
<td>simple passive</td>
<td>Mayan: Quichean-Mamean</td>
<td>loq' 'buy' lojq'ik 'to be bought'</td>
<td>Dayley 1985:55, 113-4</td>
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<tr>
<td>West Tarangan</td>
<td>-u-, -i-</td>
<td>after final V</td>
<td>agreement (1, 2, 3 singulars)</td>
<td>Austronesian: Malayo-Polynesian</td>
<td>karon/ karon-nga 'old, 1sg'</td>
<td>Nivens 1992:181</td>
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<tr>
<td>Yagaria</td>
<td>-da-, -ka-, -?a-, -?i-</td>
<td>after 1st syllable</td>
<td>possessive</td>
<td>Trans-New Guinea: Main Section</td>
<td>bo-?a-va?a his tutor e-?a-go?ga his older brother</td>
<td>Renck 1975</td>
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<tr>
<td>Yuma</td>
<td>-t-, -c-</td>
<td>after 1st V</td>
<td>distributive object</td>
<td>Hokan: Esselen-Yuman</td>
<td>an'uv 'to fight'/ acnyuv 'to be a fighter' xalp.qic 'to grasp'/ xacp.qic 'to grasp with both hands' utkədəm 'to point to something towards there'/ uxeκədəm 'to send in different directions'</td>
<td>Halpem 1946:277 Halpem 1947</td>
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<tr>
<td>Yuma</td>
<td>-u- + -v</td>
<td>before final syllable which is stressed</td>
<td>'to be one who does...' 'to have been doing...'</td>
<td>Hokan: Esselen-Yuman</td>
<td>wia:vkyáw 'to call someone paternal half-sibling' waa:vkyáw 'to have a paternal half-sibling'</td>
<td>Halpem 1946:273</td>
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<tr>
<td>Yuma</td>
<td>-u-</td>
<td>before final syllable which is stressed</td>
<td>distributive plural</td>
<td>Hokan: Esselen-Yuman</td>
<td>avsác 'to urinate' vursúcv 'to urinate (many)' apám 'to fall down'</td>
<td>Halpern 1946:278 Halpern 1947</td>
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<td>ixpácni 'to fall down (many)' /wa-ašq'ív/ → wa-štuq'ív 'to be noisy (distr. plu.)'</td>
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<td>Yurok</td>
<td>-eg-</td>
<td>after 1st C</td>
<td>pluractional</td>
<td>Algic</td>
<td>lây- 'to pass' l-eg-ary koʔmoy- 'to hear' k-eg-oʔmoy-</td>
<td>Robins 1958</td>
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<td>Zoque</td>
<td>-j-</td>
<td>after 1st C</td>
<td>3 person possessive</td>
<td>Mixe-Zoque</td>
<td>pjata 'his mat' bjuro 'his burro'</td>
<td>Wonderly 1951</td>
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## Appendix III: Database of Internal reduplication (Arranged by language names)

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<tr>
<td>Amharic</td>
<td>-Ca-</td>
<td>after 1st V</td>
<td>pluractional</td>
<td>Afro-Asiatic: Semitic</td>
<td>sabbar ‘break’</td>
<td>Rose to appear b:3</td>
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<td>sababbar ‘shatter in pieces’</td>
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<td>lamlu/lamlu ‘dices’</td>
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<td>Bole</td>
<td>-C-</td>
<td>after 1st syllable (CV)</td>
<td>pluractional</td>
<td>Afro-Asiatic: Chadic</td>
<td>bulaa/bullaa duuro ‘he dug out peanuts little by little’</td>
<td>Gimba 2000: chapter 10</td>
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<td>Bunftba</td>
<td>-VC(C)-</td>
<td>after 1st C</td>
<td>plural, intensification</td>
<td>Australian: Bunaban</td>
<td>ngarranyi ‘mother’</td>
<td>Rumsey 2000: 69</td>
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<td>ngarrangarranyi ‘mothers’</td>
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<td>jalunguru ‘good (one)’</td>
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<td>jalalunguru ‘good ones’</td>
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<td></td>
<td>or jalujalunguru ‘good ones’</td>
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<td>Chamorro</td>
<td>-CV-</td>
<td>after final V</td>
<td>adjectival intensification</td>
<td>Austronesian: Malayo-Polynesian</td>
<td>dankolo ‘big’</td>
<td>Topping 1973: 183</td>
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<td>dankololo ‘very big’</td>
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<td>metgot ‘strong’</td>
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<td>metgogot ‘very strong’</td>
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<td>Chamorro</td>
<td>-CV-</td>
<td>before stressed syllable</td>
<td>continuative</td>
<td>Austronesian: Malayo-Polynesian</td>
<td>hu’gango ‘play’</td>
<td>Topping 1973: 259; Moravcsik 2000</td>
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<td>hu’gagando ‘playing’</td>
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<td>badadaura ‘very good’</td>
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<tr>
<td>Harari</td>
<td>-Ca-</td>
<td>after 1st syllable</td>
<td>plurational</td>
<td>Afro-Asiatic: Semitic</td>
<td>magǝd-a ‘burn surface’ migǝd-a ‘burn a lot’</td>
<td>Rose to appear:2</td>
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<tr>
<td>Hausa</td>
<td>-CVC-</td>
<td>after 1st syllable</td>
<td>nominal plural</td>
<td>Afro-Asiatic: Chadic</td>
<td>cıkuna/cıkunkuna ‘bellies’</td>
<td>Hausa 2000: 430-431</td>
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<tr>
<td>Ineseño Chumash</td>
<td>-CV-</td>
<td>before final syllable or after the final CV</td>
<td>?</td>
<td>Hokan: Chumash</td>
<td>yuxwowon ‘to be high, tall’ oxoyon ‘to be crazy’</td>
<td>Applegate 1976</td>
</tr>
<tr>
<td>Kamaiurá</td>
<td>a foot</td>
<td>after final V</td>
<td>plurational</td>
<td>Tupi: Tupi-Guarani</td>
<td>omokon omokomokon ‘He swallowed it frequently’</td>
<td>Everett &amp; Seki 1986</td>
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<td>LANGUAGE</td>
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<tr>
<td>Koasati</td>
<td>-Co-</td>
<td>before final</td>
<td>punctual</td>
<td>Muskogean: Eastern</td>
<td>alotkan ‘to be full,’ plural a-lot-lo-kan</td>
<td>Kimball 1991</td>
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<tr>
<td>Levantine Arabic</td>
<td>-C-</td>
<td>before final V</td>
<td>Intensification, perjoration</td>
<td>Afro-Asiatic: Semitic</td>
<td>barad vs barbad ‘shaved unevenly’</td>
<td>Cowell 1964, Broselow &amp; McCarthy 1984</td>
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<tr>
<td>Mangarayi</td>
<td>-VCC-</td>
<td>after 1st C</td>
<td>intensification</td>
<td>Australian: Gunwingguan</td>
<td>gurjag ‘lily’/gurjurjagji ‘having a lot of lilies’</td>
<td>Merlan 1982, Kurisu &amp; Sanders 1999</td>
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<tr>
<td>Nabak</td>
<td>-CVN-</td>
<td>before final syllable</td>
<td>negative imperative</td>
<td>Trans-New Guinea: Main Section</td>
<td>kutu/ kututuping ‘(don’t) fold it’/ande/and-an-den-de-ping ‘(don’t) tie it’</td>
<td>Fabian, Fabian and Peck 1971, Kiparsky 1986:161</td>
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<tr>
<td>Ngizim</td>
<td>-Ca-</td>
<td>After 1st syllable or 1st V</td>
<td>pluractional</td>
<td>Afro-Asiatic: Chadic</td>
<td>gEnu/gEnanu ‘get many’ dEgEru/dEgagEru ‘pound floor’</td>
<td>Newman 1990 (p. 106)</td>
</tr>
<tr>
<td>Pangasinan</td>
<td>-CVC-</td>
<td>before stressed syllable</td>
<td>comparative intensification</td>
<td>Austronesian: Malayo-Polynesian</td>
<td>amputi ‘beautiful’ ampuputi ‘more beautiful’</td>
<td>Benton 1971: 117</td>
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<tr>
<td>Pazeh</td>
<td>-2 moras-</td>
<td>after final V</td>
<td>pluractional</td>
<td>Austronesian: Paiwanic</td>
<td>mubuut ‘to fart’ u-buu-buut ‘to fart repeatedly’ ma-gizem ‘strong’ ma-gize-gizem ‘very strong’</td>
<td>Blust 1999</td>
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<td>Quileute</td>
<td>-C-</td>
<td>after 1st V</td>
<td>pluractional</td>
<td>Chimakuan</td>
<td>tsisko 'he put it on' tsitsko 'frequentative'</td>
<td>Andrade 1933:188, Broselos &amp; McCarthy 1983:44</td>
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<tr>
<td>Samoan</td>
<td>-CV-</td>
<td>before a stressed</td>
<td></td>
<td>Austro-Asiatic:</td>
<td>alofa vs. alolofo 'love'</td>
<td>Broselos &amp; McCarthy 1984</td>
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<td></td>
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<td>syllable</td>
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<td>Malayo-Polynesian</td>
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<td>syllable</td>
<td>verbal form</td>
<td>Salish</td>
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<td>SiSwati</td>
<td>-foot-</td>
<td>before 1st C</td>
<td>pluractional</td>
<td>Niger-Congo:</td>
<td>enyela/e-nyela-nyela 'be hurt'</td>
<td>Downing 1999:74</td>
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<td></td>
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<td></td>
<td>Atlantic-Congo</td>
<td>engetisa/e-ngeti-ngetisa 'cause to increase'</td>
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<td>Sonora Yaqui</td>
<td>-CV-</td>
<td>before final</td>
<td>intensive (?)</td>
<td>Uto-Aztecan:</td>
<td>tekipanoa tekipapana 'to work'</td>
<td>Dedrick &amp; Casad 1999</td>
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<td></td>
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<td>syllable</td>
<td></td>
<td>Southern Uto-Aztecan</td>
<td>naamuke naamumuke 'to get drunk'</td>
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<tr>
<td>Takelma</td>
<td>-V-</td>
<td>after 1st CVC</td>
<td>aorist</td>
<td>Penutian: Oregon</td>
<td>hemg- 'take out' hemeg-</td>
<td>Golla, Victor (ed.) 1990</td>
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<td>Penutian</td>
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<tr>
<td>Takelma</td>
<td>-VC-</td>
<td>after 1st CVC</td>
<td>frequentative</td>
<td>Penutian: Oregon</td>
<td>hemg 'take out' hemeg (freq)</td>
<td>Sapir 1922:38</td>
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<td></td>
<td></td>
<td>(but between CC)</td>
<td></td>
<td>Penutian</td>
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<td>Temiar</td>
<td>-C-</td>
<td>after the first C</td>
<td>continual</td>
<td>Austro-Asiatic:</td>
<td>gòow 'to call' /kwkòow 'to lie down'/sgòw</td>
<td>Benjamin 1976, Gafos 1998:233-</td>
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<td>Mon-Khmer</td>
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<td>Tetun (Ferhan)</td>
<td>-aC-</td>
<td>before first V</td>
<td>deadjectival nominalization</td>
<td>Austronesian:</td>
<td>di'ak 'good' dadi'ak 'goodness'</td>
<td>Van Klinken 1999:45-6</td>
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<td></td>
<td>Malayo-Polynesian</td>
<td>krakat 'angry' krarakat 'anger'</td>
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<tr>
<td>Thao</td>
<td>-CCV-</td>
<td>after final V, (probably 2 mora)</td>
<td>pluralional</td>
<td>aggnu, to contemplate, m-arfar to keep flying around</td>
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<tr>
<td>Salishan: Interior</td>
<td>-C-</td>
<td>after stressed V</td>
<td>diminutive</td>
<td>s-s'en-x, 'rock', s-s'xn-x, 'small rock hill'</td>
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<tr>
<td>Thompson Salish</td>
<td>CV</td>
<td>after first V</td>
<td>intensive, frequentative</td>
<td>lawwat-s/lawwat-e, 'change constantly'</td>
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<tr>
<td>Tigre</td>
<td>-Cu-</td>
<td>after 1st V</td>
<td>frequentative</td>
<td>marmar-at / marmar-at, 'examine thoroughly'</td>
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<tr>
<td>Tigre</td>
<td>CV</td>
<td>after 1st syllable</td>
<td>frequentative</td>
<td>sabar-o/sababon-e, 'break in Buckley 1990, Rose Ms.'</td>
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<tr>
<td>Tigrinya</td>
<td>CVV, CCV</td>
<td>after initial vowel, if root is vowel-initial</td>
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<tr>
<td>Tiriyo</td>
<td>-CV-</td>
<td>before stressed foot</td>
<td>augmentative, frequentative etc.</td>
<td>enapka to wake O up'</td>
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<tr>
<td>Timagon Munut</td>
<td>-CV-</td>
<td></td>
<td></td>
<td>'tapampan-s, 'bathe'</td>
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<tr>
<td>Trukese</td>
<td>-Vkk-</td>
<td>before initial V after w-</td>
<td>plurational</td>
<td>Austronesian: Malayo-Polynesian</td>
<td>wiik 'week' / w-ikk-iik 'be for a number of weeks' isoni 'keep it'/ ikk-isoni 'be keeping it'</td>
<td>Goodenough and Sugita 1980, Garrett 2001</td>
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<td>Ulwa</td>
<td>CV</td>
<td>Before the stressed syllable</td>
<td>adjective distributive</td>
<td>Misumalpan</td>
<td>barás-ka/bararáśka 'black-ADJ' saháw-ka/sahaháwka 'nake-ADJ'</td>
<td>Green 1999:51</td>
</tr>
<tr>
<td>Wardaman</td>
<td>-VCC-</td>
<td>After 1st C</td>
<td>nominal plural</td>
<td>Australian: Gunwingguan</td>
<td>marluga 'old man' marlarluga 'old men'</td>
<td>Merlan 1994</td>
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<td>Washo</td>
<td>-CV-</td>
<td>within the stressed syllable</td>
<td>plural</td>
<td>Isolate/Hokan(?)</td>
<td>memdeewi 'deer' / memdewiwi 'deers'</td>
<td>Yu 2001</td>
</tr>
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<td>West Tarangan</td>
<td>-CVC-</td>
<td>before stressed syllable</td>
<td>?</td>
<td>Austronesian: Malayo-Polynesian</td>
<td>singalngalta 'flying fish'</td>
<td>Nivens 1992:189</td>
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<td>Zuni</td>
<td>-C-</td>
<td>before final V</td>
<td>medio-passive repetitive</td>
<td>Isolate</td>
<td>cholo 'to make the sound of crackling paper' cholo+?a 'it makes irregular crackling sounds'</td>
<td>Newman 1965:55, Broselow &amp; McCarthy 1983:43</td>
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</tbody>
</table>
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