OOWEKYALA SEGMENTAL PHONOLOGY

by

DARIN MATHEW HOWE

B.A. (Hons.), University of Ottawa, 1994
M.A., University of Ottawa, 1995

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

in

THE FACULTY OF GRADUATE STUDIES

(Department of Linguistics)

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THE UNIVERSITY OF BRITISH COLUMBIA

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Abstract

This dissertation treats the sound pattern of Oowekyala, a nearly extinct Wakashan language of British Columbia. Proposed analyses are set in Optimality Theory (Prince & Smolensky 1993). Following an introduction to the language (its speakers, their location, adjacent languages, etc.) and to the adopted theory, the discussion focuses on three dimensions of Oowekyala phonology: intrasegmental, intersegmental, and correspondence-related.

The segment-internal (paradigmatic) phonology results from the interaction between lexical faithfulness and context-free markedness constraints. This interaction is discussed with respect to the various features that cross-classify the segment inventory of Oowekyala. For instance, it is argued that laryngeals are [+sonorant], that affricates are [-continuant], that [+voice] and [+constricted glottis] occur as floating elements and that these floaters may cause lenition (insertion of [+sonorant]), and that gutturals (uvulars and laryngeals) are [-ATR].

Intersegmental (syntagmatic) patterns result from the interaction between lexical faithfulness and context-sensitive markedness constraints. Patterns discussed include: rounding of obstruents, degemination, spirantisation/deocclusivisation, continuancy dissimilation, voicing neutralisation, allophonic vowel lowering and resonant debuccalisation.

Exceptional phonological patterns that cannot be explained through the interaction between input-output faithfulness constraints and markedness constraints are addressed last. It is proposed that these exceptional patterns reflect various correspondence relations (cf. McCarthy & Prince 1995, 1999 on Correspondence Theory): base-reduplicant correspondence, output-to-output correspondence, and candidate-to-candidate correspondence.

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Acknowledgments

I wish to express my most heartfelt gratitude to Mrs. Hilda Smith who has been so very kind and diligent in sharing her extensive knowledge of her native language with me.

My greatest thanks go to my brilliant co-chairs Patricia Shaw and Douglas Pulleyblank. I am very proud of the academic and professional training I've received under their guidance and support. I am also deeply appreciative of the great kindness they've shown toward my family and me over the last 5 ½ years.

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Katie Fraser introduced me to the Wakashan family of languages and encouraged me to write a thesis on Oowekyala (after three years of working together on Ahousaht!). She has been a consistent source of sound advice throughout my studies and has been a very dear friend to my family.

The lively linguistics community in Vancouver has been a source of energy and inspiration for me. Many thanks especially to Tomio Hirose, Susan Blake, Laura Downing, Mary-Jane Dick, Dale Kinkade, Guy Carden, John Alderete, Su Urbanczyk, Charles Ulrich, Henry Davis, Strang Burton, Brian Gick, Joe Pater, Ted Pulleyblank, and Edna Dharmaratna.

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Key to sources cited

HS	Hilda Smith, p.c. (many glosses adapted from Rath 1981)
EW	Evelyn Windsor (Lincoln & Rath 1980)
WL	Unpublished word list compiled by David Stevenson
DS	Stevenson 1982
BC	Compton 1992
HSS	Hanuse, Smith & Stevenson 1983
JSS1	Johnson, Smith & Stevenson 1983a
JSS2	Johnson, Smith & Stevenson 1983e
JSS3	Johnson, Smith & Stevenson 1984

1. Introduction

This dissertation treats the sound pattern of Oowekyala, a First Nations language of the mountainous west coast of British Columbia, Canada. Proposed analyses are set in the conceptual framework of Optimality Theory (OT, Prince and Smolensky 1993), especially as recently developed by McCarthy and Prince (1995, 1999).

This first chapter provides some background information both on the language of study (section 1.1) and on the adopted theory (section 1.2).

1.1. Language background

This section gives some background information on Oowekyala: its speakers and their location, adjacent languages, previous documentation, and its syllable structure.

1.1.1. Speakers and location

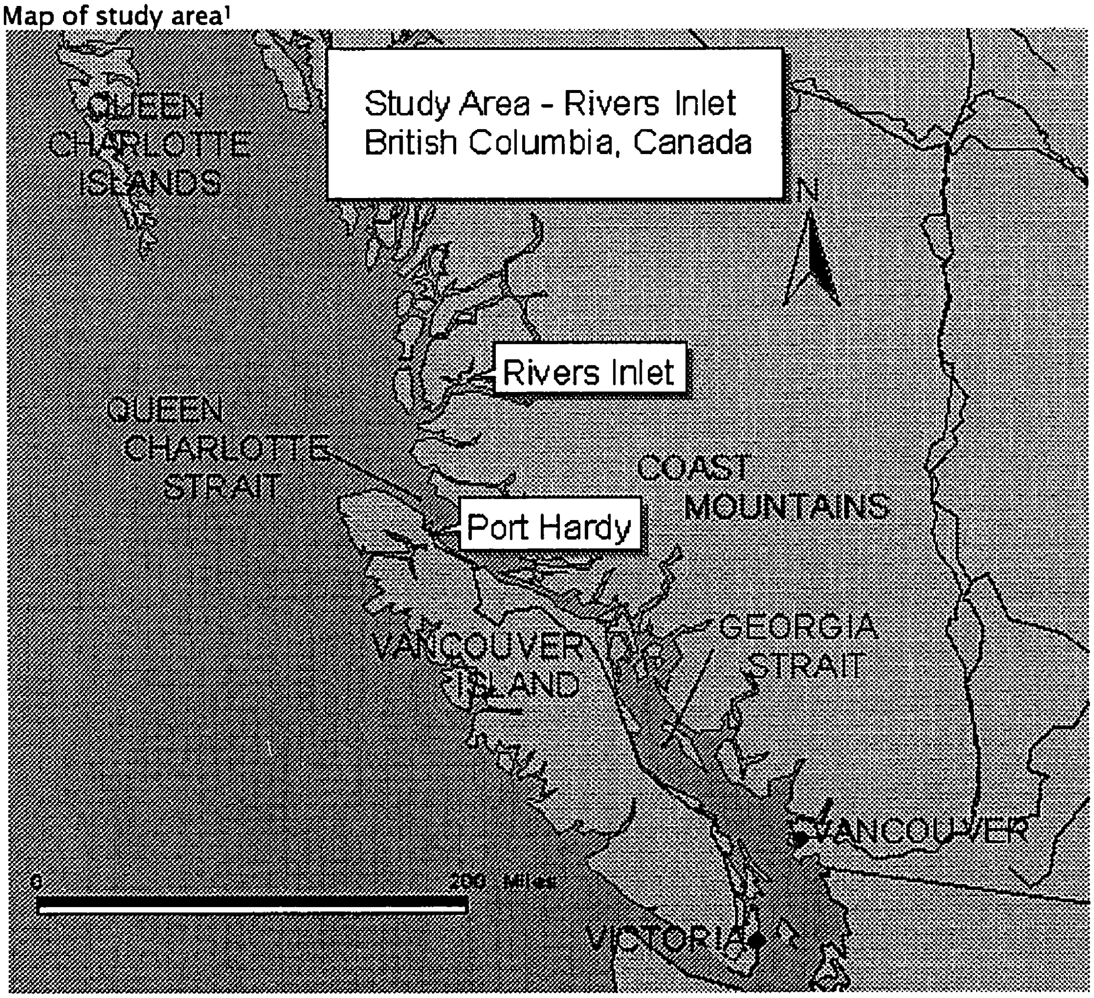
The name of the language of study is Oowekyala /ʔəwik̓ala/. The term apparently consists of the root ʔəwik- 'back, inland' and the suffix -k̓ala 'speech'. The root is also found in the tribal name of the original speakers of Oowekyala: ʔəwik̓inux̌ʷ (-inux̌ʷ 'tribe'). The latter term, which is also frequently used to designate Oowekyala, has been anglicized in the literature as Oowekeeno (name adopted here, after Hilton & Rath 1982), Oweekeno (McMillan 1999), Oweekano (name of the Band), Owikeno (name of the Lake), Wikeno, Awikenox, etc.

According to Thompson and Kinkade (1990), the Oowekeeno and their closely-related Heiltsuk neighbours originally lived in northern or northwestern Vancouver Island. From there, they expanded onto the mainland coast, isolating the Nuxalk from all other Salishan members, perhaps around 2500 BC (McMillan 1999:30-46). In contrast, Kinkade (1991) claims that the ancestors of the Oowekeeno (the Wakashans) occupied not only all of Vancouver Island, but also the south-central coast of British Columbia. On this account, the Nuxalk are the 'newcomers' in Oowekeeno-Heiltsuk territory: "[Wakashans] were supplanted by Salishans moving north and by Bella Coolas moving across from the interior" (Kinkade 1991:151). In support of this view, Kinkade (1991:149) shows that the Nuxalk vocabulary for local flora and fauna is mostly borrowed from Wakashan languages.

The Oowekeeno formerly inhabited several villages around Owikeno Lake and Wannock River. "The Owikeno were at one time perhaps the most numerous of the Kwakiutl-speaking tribes" (Olson 1950:78). They were the source of many important ceremonial elements (legends, names, masks, songs and dances) which spread (e.g. through marriage) to the Kwakwaka'wakw (Kwakiutl), the Heiltsuk (Waglisla, Klemtu), the Tsimshian, the Tlingit, the Haida, and the Nuxalk (Bella Coola) (Stevenson 1980). Most notably, Stevenson (1982) argues rather convincingly that the Oowekeeno at the mouth of Shumahant River (sumx̌uɬitx̌ʷ) originated the whole Cannibal Dance complex (hamac̓a), including the highly influential myth of the Cannibal Spirit (baxʷbakʷalan̓usiwa).

Like other First Nations in British Columbia, the Oowekeeno were devastated by the European invasion. They were decimated physically by the introduction of foreign diseases and alcohol; they were removed from their traditional sociocultural structures and placed at the bottom of a new eurocentric hierarchy; their ancestral lands were seized illegally and reassigned to them in an apartheid system; they became economically repressed as underpaid labourers in a capitalist system of commercial fur trade, fishing, and logging; the potlatch, which gave material expression to their culture, was banned; children were removed from their families and placed in residential schools which alienated them from their language and traditional beliefs. According to Olson (1954), from the beginning of the 20th century the declining Oowekeeno population gradually amalgamated into a single village —k̓itit. This village, where the ceremonial materials of the Oowekeeno were kept, was destroyed by fire in 1935. The survivors eventually moved to the village of Rivers Inlet, where most Oowekeeno now live (approximately 100; Hilton & Rath 1982:6).

(1) Map of study area[1]



[1] Thanks to David Burhoe (Dept. of Geography, Univ. of Ottawa) for this map.

By 1980, the number of Oowekyala speakers had decreased to "a handful" (ibid.). By the early summer of 1998, Emmon Bach (University of Northern British Columbia and University of Massachussetts, Amherst) learned that only one fluent speaker remained in Rivers Inlet. Later that summer, Patricia Shaw (University of British Columbia) learned that two speakers lived outside Rivers Inlet on nearby Vancouver Island (in Kwakwaka'wakw territory). In August, when I visited these speakers in their Port Hardy and Fort Rupert homes,[2] I learned that two other speakers lived in Port Hardy. Two more speakers live in Waglisla (in Heiltsuk territory). One of them —Mrs. Evelyn Windsor— collaborated with the linguist John Rath in the late 1970's and early 1980's when both were employed at the Bella Bella Cultural Centre (Mrs. Windsor teaches the Heiltsuk language there).

Altogether, then, there are now (October 31, 2000) reportedly 7 speakers of Oowekyala living in four different localities. The geographic separation between them is such that they are unable to sustain their language through regular interaction. The three speakers who live in Port Hardy do not visit each other (mostly for health-related reasons). The speaker who lives in Fort Rupert occasionally visits Mrs. Hilda Smith (his older sister). They always speak in Oowekyala together.

Apparently there are no second language speakers of Oowekyala (at least according to fluent speakers). Mrs. Hilda Smith conducted Oowekyala classes in the school in Rivers Inlet from 1979-1986. Approximately 8 or 9 students ranging in age from 6 to 17 participated in these classes. More recently, Mrs. Smith tried holding classes in her own Port Hardy home for a small group of adults and children (approximately 8 or 9). These classes were held twice a week over a period of two months, but unfortunately were discontinued.

1.1.2. Adjacent languages

1.1.2.1. Adjacent unrelated languages

As mentioned in the previous section, Oowekeeno territory is geographically adjacent to that of the Nuxalk, a Salishan people (Bella Coola is about 30 miles northeast of Rivers Inlet). The Oowekeeno and Nuxalk use English to communicate together (the Nuxalk language, a.k.a. Bella Coola, is virtually as endangered as Oowekyala is; Dr. Ross Saunders, lecture notes 1998). However, according to Mrs. Hilda Smith, her people used Chinook Jargon as a lingua franca in their dealings with the Nuxalk, given the complete lack of mutual intelligibility of their languages. As an example, Mrs. Hilda Smith recalls that her late mother Maggie Bernard could speak some Chinook Jargon but no English. Stevenson (1982:27) calls into question the Oowekeeno's supposed knowledge of Chinook Jargon and claims instead that the Nuxalk and Bella Coola simply knew each other's languages: the Oowekeeno at the top of Owikeno Lake had regular contact with the Nuxalk of South Bentick Arm, and intermarriage between the two tribes was not infrequent (McIlwraith 1948).

A dramatic story by Willy Gladstone (Heiltsuk) in Boas (1928:132-5) might be taken as evidence in favour of Stevenson's claim. According to the narrator, a vengeful Heiltsuk delega-

[2] I was accompanied by Mrs. Katie Fraser (Nuuchahnulth speaker-linguist) during this visit.

tion once visited Chief Walkus of the Oowekeeno in the evening. One of the Heiltsuk pointed at several Oowekeeno, saying "All are about to die!" in Chinook Jargon. The Oowekeeno, who did not understand, asked what he had said, and the Heiltsuk replied "You will have plenty to eat, is what I said." The next morning, several unsuspecting Oowekeeno were killed by the Heiltsuk. Crucially, in a footnote to this story, it is explained that "Chinook Jargon ... at that time [of war between the Oowekeeno and the Heiltsuk] was understood by the Bella Bella [Heiltsuk] but not by the Rivers Inlet people [Oowekeeno]" (ibid.:133, fn. 1).

There is another, perhaps more solid, piece of evidence that the Oowekeeno and Nuxałk had extensive and direct linguistic contact. The extremely rare consonant clustering property for which Nuxałk is notorious (see e.g. Nater 1984, Bagemihl 1991) is also found in Oowekyala, e.g. c̓k̓ʷx̌tƛkc 'the invisible one here-with-me will be short'.

1.1.2.2. Closely-related languages

According to Lincoln & Rath (1980), Oowekyala is one of four closely-related North Wakashan (previously known as Kwakiutlan) languages, all spoken in the same western coastal area of British Columbia. The others are Heiltsuk, Haisla, and Kwakwala (formerly Kwakiutl). The linguistic division between Kwakwala and Oowekyala is undisputed. Even Boas, who has been criticised by Hilton & Rath (1980) and Stevenson (1982) for treating all North Wakashan languages as dialects of one language, acknowledges the reality of this division in the introduction to his Kwakiutl Grammar (1947:205):

> North of the Kwakiutl area, beginning at Rivers Inlet another dialect of the language is spoken which differs considerably from the Kwakiutl here discussed. The languages are not easily mutually intelligible, partly on account of differences in vocabulary, partly on account of differences in grammatical forms.

The relation between Haisla and Oowekyala is somewhat more controversial. Lincoln and Rath (1980:2) claim that Haisla is not mutually intelligible with either Oowekyala or Heiltsuk (the latter are mutually intelligible) and they warn that "A great deal of intermarriage takes place within this northern area and the tendency is to minimize the very real differences which exist between Haisla and Heiltsuk-Oowekyala" (ibid.:4). The claim that Haisla and Heiltsuk-Oowekyala are mutually unintelligible is abandoned, however, in the introduction to their Haisla dictionary (Lincoln & Rath 1986). Mrs. Hilda Smith tells me that she is able to converse in "Indian" with her son-in-law from Kitimat (Haisla territory). Significantly, the Haisla are assumed to have originated from the Rivers Inlet area according to the Oowekeeno version of the Great Flood story. Legend has it that several canoes were carried away to the Kitimat area by the strong current. Bach (p.c.) notes, however, that a comparison between Henaksiala and Haisla origin and flood stories remains to be done. Moreover, Bach notes that Haisla shares some traits with Kwakwala not evident in Heiltsuk-Oowekyala, e.g. unrounding before u.

Finally, John Rath, who had prolonged experience working on both Heiltsuk and Oowekyala (Lincoln & Rath 1980; Rath 1981; Hilton & Rath 1982), proposes a linguistic division between these two languages which has generally been rejected by linguists. Oowekyala is not listed separately from Heiltsuk by Jabobsen (1979), nor by Bach (1995:5). As McMillan (1999:10) writes, "the Oweekeno of Rivers Inlet speak a distinct dialect but are usually included [in Heiltsuk]". It is also noteworthy that in Lincoln & Rath (1980), roots from Oowekyala and Heiltsuk are combined in a single column, while Haisla roots and Kwakwala roots are listed in separate columns. As Lincoln & Rath (1980:4) explain, "since the Heiltsuk and Oowekyala languages had essentially the same roots, they could justifiably be combined in a single column." Moreover, in Hilton & Rath (1982:33), we are told:

> For readers interested in checking the translation [of the Oowekyala texts] in more detail, the Heiltsuk vocabulary and syntax in Rath 1981 can be helpful because of the high degree of regular correspondence and mutual intelligibility of Oowekyala and Heiltsuk. ... Mindful of pronunciation and hence spelling difference between Oowekyala and Heiltsuk, one can find a listing of some of the pertinent morphemes in Rath (1981:70–73).

Nonetheless, there are two a priori reasons for linguists *not* to collapse Oowekyala and Heiltsuk into a single language. First, Oowekyala is definitely viewed by the speakers as a distinct language. "From the perspective of the Oowekeeno people themselves, the Kwakiutl are a Kwakwala speaking Indian subdivision with which they no more identify than with their Bella Bella [Heiltsuk] or Bella Coola [Nuxalk Salishan] neighbours" (Hilton & Rath 1982:7). (Significantly perhaps, according to historical accounts in Boas (1928:124–135), the Oowekeeno and Heiltsuk were frequently at war with each other.) Apparently, the Heiltsuk feel the same way about Oowekyala. Thus, according to Stevenson (1982:3–4) "the term Heiltsuk can be rendered literally into English as 'those who speak correctly'. This term emphasizes their differences with their Oowekeeno neighbours".

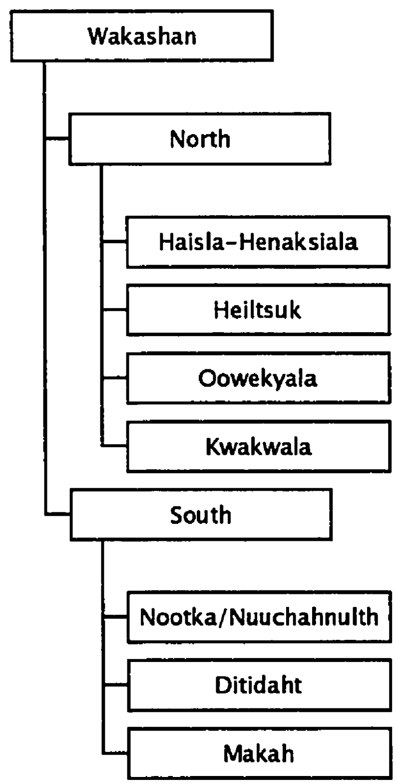
Second, from a linguistic perspective Lincoln & Rath (1980:2) state "Although the [North Wakashan] languages are undoubtedly very similar phonologically and, as is attested in the present work, in root structure, they are much less similar in their inventories of suffixes, in morphophonology, and in syntax." Lincoln and Rath do not identify these dissimilarities, but it is relatively easy to find even phonological differences between Oowekyala and Heiltsuk.

For example, Heiltsuk has tone (k̓ʷás 'mussels' versus k̓ʷàs 'sit outside'), Oowekyala doesn't (Kortlandt 1975); Oowekyala has contrastive vowel and resonant length (y̓ak̓ 'bad' vs. t̓aːx 'gun powder'; ƛ̓mq̓ 'yew tree' vs. smːs 'mouth'), Heiltsuk doesn't; Oowekyala allows glottalization in syllable-final position (ɬl̓ 'dead') whereas Heiltsuk doesn't; and the extensive consonant clustering characteristic of both languages is broken in Heiltsuk by epenthetic schwas after glottalized stops and affricates, but not in Oowekyala (He t̓əxt̓ək̓ʷəs vs. Oo t̓xt̓k̓ʷs 'fish hawk'; Lincoln & Rath 1980:31).

There are also numerous idiosyncratic segmental differences between Oowekyala and Heiltsuk. There are differences in voicing, e.g. Oo k̓iskc̓a vs. He giskc̓a 'an unidentified edible shellfish'; Oo cuq̓ʷqəla vs. He dzúq̓ʷəqəlá 'sleet'; Oo taqila 'to make an oolichan net' vs. He dáqał 'an oolichan net'. There are differences in continuancy, e.g. Oo ɬinəma vs. He ƛ̓ínəmá 'to take back lent out property'; Oo kʷuta vs. He xʷuta 'to suspect, guess'; Oo kʷumitəla vs. He xʷúmítəla 'to rock, to seesaw'. There are differences in place of articulation: Oo ǧʷəlik̓ vs. He ğʷəl̓iq 'spruce pitch'; Oo bgʷ- (e.g. plural bipgʷanm) vs. He dkʷ- (e.g. plural dítgʷánm̓) 'humans, men, people'. There are differences between the presence vs. absence of vowels, e.g. Oo ğiğis vs. He qqs 'eye'; Oo n̓ixn̓ika vs. He n̓əxn̓əká 'to say repeatedly', as well as between the presence vs. absence of consonants, e.g. Oo c̓ɬtxa vs. He c̓ɬx?it 'to squirt (clam)'; Oo k̓əyus vs. He k̓ús 'not the case, nonexistent'. There are differences in segment order (metathesis), e.g. Oo tíxsala ~ tíxsəla vs. He tisxálá ~ tisxəlá 'splashing'.

Lastly, it should be acknowledged more generally that linguistic comparison of Oowekyala with Kwakwala, Haisla or Heiltsuk is premature as there are poorly understood dialectal distinctions within Kwakwala, Haisla and Heiltsuk themselves. This is especially true of Kwakwala, which subsumes several dialects, including ğuc̓ala (Quatsino Sound Tribes), kwak̓wala (Gilford Island, Knight Inlet, Kwakiutl and Nimpkish), lik̓ʷala (Lekwiltok Tribes), n̓ak̓ʷala (Northern Tribes), ƛ̓aƛ̓asik̓ʷala (Nahwitti Tribes). Only the first of these is well-documented (e.g. Boas 1947). Haisla is also used as a cover term for two divergent dialects: Henaksiala (Lincoln & Rath 1986) and Haisla proper (Bach 1999). Bach (1995:5) lists these as two separate North Wakashan languages, alongside Heiltsuk and Kwakwala. Finally, Heiltsuk too has at least two divergent dialects, spoken in Bella Bella and Klemtu respectively. The differences between the various dialects in these languages clearly needs more detailed and extensive research before we are able to decide on their precise genetic relation with Oowekyala.

1.1.2.3. Distantly-related languages



As a Wakashan language, Oowekyala is distantly related to the so-called Nootkan (or South Wakashan) languages, which include Nootka-Nuuchahnulth (perhaps 50 speakers) and Ditidaht-Nuuchahnulth (Di:ti:d'a:tx̌, Nitinat, perhaps 7 speakers) spoken along the west coast of Vancouver Island, as well as Makah spoken on Cape Flattery (the only Wakashan language spoken outside British Columbia; no. of speakers unknown). 'Nootka' is actually a cover term for at least twelve dialects: Ahousaht (ʕa:ħu:sʔatħ), Ucluelet (yu:ɬuʔiɬʔatħ), Ehattisaht (ʔi:ħatisʔatħ), Hesquiat (ħiškʷi:ʔatħ), Kyoquot (qa:y̓u:k̓atħ), Mowachaht (muwač ʾatħ), Nuchatlaht (nuča:ɬʔatħ), Ohiaht (hu:ʔi:ʔatħ), Tseshaht (c̓iša:ʔatħ), Clayoquot (ƛaʔu:kʷiʔatħ), Toquaht (t̓uk̓ʷa:ʔatħ), and Uchuklesaht (ħu:čuqƛisʔatħ). The genetic relation between these South Wakashan languages and the North Wakashan (Kwakiutlan) ones was recognised by Franz Boas in 1889 (see Jacobsen 1979 for a poignant account). The relation is most clearly evidenced by the locational lexical suffixes, e.g. -iɬ 'indoors', -as 'outdoors on the ground', -is 'on the beach', -a 'on a rock', which are of tremendous frequency in all Wakashan languages. The differences between Nootkan and Kwakiutlan are such that Swadesh (1953) estimates them to have separated 29 centuries ago, a time-depth which Jacobsen (1979:789) finds "plausible".[3]

The term Wakashan, like Nootka, may have originated from Captain James Cook's observations in Nootka Sound in 1778:

> The word wakash ... was frequently in their mouths. It seemed to express applause, approbation, and friendship. For when they appeared to be satisfied, or well please with anything they saw, or any incident that happened, they would, with one voice, call out wakash! wakash!" (Cook 1784:337)

Cook suggested that the Nation he encountered in Nootka Sound be called Wakashians. According to Boas, the term Wakashan "probably derived from a Kwakiutl chief's name Wakash, Real River, which is used in this form by the Nootka" (Boas 1947:205).

Whatever its provenance, the term Wakashan became standard when J. W. Powell (1891) applied it to Boas' findings in his authoritative classification of 'Indian Linguistic Families of America North of Mexico.'

1.1.3. Previous documentation

Documentation of Oowekyala exists in the form of texts, word lists, sound recordings, and phonological descriptions.

1.1.3.1. Texts

There are eight Oowekyala texts interspersed throughout Boas' (1928) Bella Bella Texts. These texts, which are listed in (2), are likely the oldest ones available, having been collected by Boas in 1897. Unfortunately, they are problematic in terms of linguistic authenticity. Regarding them, Boas states:

> Conditions in Rivers Inlet in 1897 were exceedingly unfavorable because the majority of the people were away and only two sickly men could be found who were able to dictate. Since they did not know English and only a very short time was available at Rivers Inlet, the texts were laid aside. (Boas 1928:iv)

Some twenty-six years later, Boas read the texts to mainly one speaker of Heiltsuk, Willy Gladstone, who then repeated them for Boas. As already mentioned, Boas estimated the differences between Oowekyala and Heiltsuk to be "very slight" (ibid.). Mr. George Hunt, Boas' main Kwakwaka'wakw consultant, was evidently also involved in the translation of at least one of the Oowekyala texts, since Boas states: "Although on the whole the translation is accurate, there are a number of places in which the Kwakiutl informant misunderstood the Rivers Inlet words"

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[3] The time-depth is calculated to be much larger (5505/6099 years) in Embleton (1985, 1986). This lexicostatistical work seems overly speculative, however.

(ibid.). In sum, the Oowekyala content of Bella Bella Texts cannot be considered fully authentic linguistically, having been 'processed' not only by Boas himself, but by a speaker of Heiltsuk as well as by a speaker of Kwakwala.

(2) Oowekyala texts in Boas (1928) [original transcription system]

a. Bax̣ᵘbakwā'lanux̣ᵘsīwaᵋyē (p. 58)
b. Wren and Grizzly Bear (p. 64)
c. A'sdas (p. 70)
d. Wā'walis (p. 90)
e. The Jealous Brother
f. War between the ᵋwī'k˙!ēnoxᵘ and Hē'ɫdzaqᵘ
g. HänL!ēkŭnas (p. 156)

The only other Oowekyala texts I am aware of,[4] aside from those collected by Boas in 1897, are the stories and songs recorded by Susanne (Storie) Hilton in Rivers Inlet during the summers of 1968-1969 on behalf of the then British Columbia Indian Advisory Committee. Storie (1973) is an English rendition drawn from these materials. The stories (N=12) and songs (N=3) recorded from Chief Simon Walkus, Sr. (1892?-1969) have been transcribed and translated by Mrs. Evelyn (Walkus) Windsor, the late Chief's daughter, and have been carefully edited in Hilton & Rath (1982). One of these stories has been amalgamated with a story by the late Maggie Bernard, also recorded by Susanne (Storie) Hilton in 1969. The resulting text has been edited in Hanuse, Smith & Stevenson (1983).

1.1.3.2. Word lists

Three types of Oowekyala word lists are available. First, upwards of 1000 Oowekyala words (identified "R") are included in Boas' (1928) Heiltsuk vocabulary list. Most Oowekyala words in this list are also identified as Heiltsuk. As explained in the previous section, Oowekyala materials in Boas (1928) are to be used with caution, since they were obtained through the intermediary of Heiltsuk and Kwakwaka'wakw speakers.

Second, Mrs. Evelyn (Walkus) Windsor provided approximately 1800 Oowekyala words to exemplify entries in Lincoln & Rath's (1980) comparative listing of North Wakashan roots.

Third, didactic materials prepared under the (now defunct) Oowekyala Language Project in Rivers Inlet consisted of short word lists for children (Johnson, Smith & Stevenson 1983a,b,c,d,e) and a short children's pictorial dictionary (Johnson, Smith & Stevenson 1984).

1.1.3.3. Recordings

A single tape recording is archived at the British Columbia Provincial Museum which contains stories and songs collected during the summers of 1968 and 1969 by Susanne (Storie) Hilton (as mentioned above). This collection includes contributions from two consultants: Chief Simon Walkus, Sr., and Maggie Bernard. The Walkus materials have been transcribed and published under Hilton & Rath (1982) (see above). Of the 3 texts and 5 songs recorded with Maggie Ber-

[4] There may well also be some "missionary" materials on Oowekyala but I have not come across any.

nard, only one text has been partially transcribed and translated in Hanuse, Smith & Robinson (1983) (see above).

1.1.3.4. Descriptions

Lincoln & Rath (1980) includes approximately 13 pages of technical notes on Oowekyala phonetics and phonology. Hilton & Rath (1982:11-32) gives a non-technical guide to transcription and pronunciation.

1.1.3.5. Orthography

Oowekyala is a recently written language. The orthography was devised for Heiltsuk by John C. Rath, employed as a linguistic consultant at the Bella Bella Cultural Centre from the mid-1970's to the mid-1980's. This orthography was then extended to Rivers Inlet. The orthography is known and used by two of the speakers of Oowekyala, Mrs. Hilda Smith and Mrs. Evelyn Windsor, and forms the basis of Hilton & Rath (1982), of Stevenson (1982), and of the teaching booklets developed in the 1980's by Johnson, Smith and Stevenson. However, it is not understood by or in general use in the community. The orthography's deviations from the americanist transcription adopted in this dissertation are listed here:

(3) Differences between orthography and thesis transcription system

Orth.	Thesis	Orth.	Thesis	Orth.	Thesis	Orth.	Thesis
z	ʣ[5]	k̓v	k̓ʷ	’ă	ʔ	el	(ə)l
th	ƛ	xv	xʷ	em	(ə)m	el͡l	lː
dh	λ	qv	qʷ	em͡m	mː	ell’	əl’
t̓h	ƛ̓	ğv	ğʷ	emm̓	əm̓	aa	aː
lh	ɬ	q̓v	q̓ʷ	en	(ə)n	ii	iː
kv	kʷ	x̌v	x̌ʷ	en͡n	nː	uu	uː
gv	gʷ	hă	h	enn̓	ən̓		

1.1.4. On "degenerate" syllables

Although this dissertation focuses on the segmental phonology of Oowekyala, it seems important to remark on the special challenge that this language provides for syllable theory. One of the most striking properties of Oowekyala phonology is its high tolerance of obstruent clusters, indeed even of all-obstruent words. Some representative examples are given here:

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[5] Lincoln & Rath (1980) use z to represent the voiced affricate ʣ in North Wakashan, seeing that these languages lack voiced fricatives. The digraph will be used here instead to avoid confusing non-Wakashanist readers. On the other hand, c is used for ʦ following Herzog et al.'s (1934:631) widely accepted recommendation (see section 2.2.2 below for some minimal pairs with c versus ts in Oowekyala). Note that the IPA use of c for 'palatal stop' is rarely needed in American linguistics (Quechua is an exception in this regard; it distinguishes palatal, velar, and uvular stops; see Rogers 2000:201 for some examples).

(4) Some two-obstruent words

a.	qʷx̌ʷ	powder	HS, EW
b.	k̓ʷc̓	leather, hide	HS, EW
c.	k̓ʷs	light (in weight)	HS, EW
d.	tx̌	thus (interjection)	EW

(5) Some three-obstruent words

a.	x̌ʷtkʷ	(sth.) cut with a knife	HS
b.	tpkʷ	something squeezed	EW
c.	t̓kʷkʷ	(sth.) clawed, (sth.) carried in or as if in claws or talons; suit-case, luggage	HS
d.	kʷp̓s	loose dirt (not mud)	EW, HS
e.	pk̓ʷs	man-like animal with a hairy body, sasquatch; name of a dance in the λəw̓əlax̌a Series; his penis is so long he must carry it around rolled up; name of a dance of Kwakwala speaking peo-ple at Alert Bay, the wild man of the woods	DS126
f.	p̓ƛ̓s	to bend down to the ground (as branches)	HS
g.	pqʷc̓	drowsy, sleepy	EW
h.	q̓ckʷ	hair seal meat that has been cut up	JSS3, WL
i.	q̓kkʷ	dried and pounded salmon eggs, "Indian cheese"	HS
j.	ƛ̓k̓s	round and/or bulky thing (e.g. a boulder) in the woods or on the field	HS
k.	ƛ̓pkʷ	(sth.) closed (as e.g. a building or the door of a building)	HS

(6) Some four-obstruent words

a.	c̓k̓ʷx̌t	short (said of a person)	HS
b.	ƛxx̌s	canoe thwart	HS
c.	c̓łc̓kʷ	plural of: short	HS
d.	qʷsqʷs	low mountain (dwarf) blueberry (Vaccinium ?caepitosum); fruits eaten	BC98
e.	kʷsk̓ʷs	refers to bluejay; mythical name of bluejay, the sister of Raven, from the story of how Raven obtained the salmon, story is located at Nuxʷns	DS98

(7) Some five-obstruent words

a.	k̓ʷp̓sps	nice fine dirt, store-bought good earth	HS
b.	k̓ʷx̌k̓ʷq̓s	just about daylight, early dawn (as when one begins to see one's way outdoors)	HS
c.	t̓xt̓k̓ʷs	fish hawk	EW, HS
d.	ƛ̓xƛ̓k̓s	plural of: round and/or bulky thing (e.g. a boulder) in the woods or on the field (this word used in Heiltsuk for strawberry)	HS

Obstruent-only words can also be combined with obstruent-only lexical suffixes and obstruent-only enclitics, yielding obstruent-only 'sentences' (as Lincoln & Rath 1980:31 remark).

(8)

a.	tpa	to squeeze	HS
b.	tpkʷ	something squeezed	HS
c.	tpxʷps	something that undergoes squeezing and that is nice or pleasant	HS
d.	tpxʷpsƛ	(ib. future)	HS
e.	tpxʷpsƛk	(subject specified: the-one-here-with-me)	HS
f.	tpxʷpsƛkc[6]	(ib. invisible)	HS

In Bagemihl's (1991) well-known study of comparable strings in geographically-adjacent[7] Nuxalk Salish (e.g., kxlqsłcxʷ 'you struck a match for me'; Ross Saunders, p.c.), it is concluded that obstruent-only sequences are never syllabified. Bagemihl's evidence is as follows:

> If the syllabicity of obstruents is phonologically significant, we would expect this to be reflected in the behavior of such words under reduplication. That is, we should expect to find syllables consisting only of obstruents to be copied, just as syllables containing sonorant nuclei can be copied. For example, a word such as kł- 'fall' consists of one syllable under the Obstruent Syllabicity Hypothesis (with k as onset and ł as nucleus), so we would predict that it could undergo CV- reduplication to yield kłkł-. Similarly, we should expect to find single consonant reduplications ..., since in words such as t̓x̌t the first consonant constitutes a syllable all by itself and therefore should be able to be reduplicated as something like t̓t̓x̌t. ... Not only are bare consonant and stop-fricative reduplications unattested; the majority of obstruent-only words do not even participate in reduplication at all. (Bagemihl 1991:606-7)

If the same standard of evidence is applied to Oowekyala, it can be concluded that obstruent sequences do get syllabified, since they do occur in reduplicants in this language (cf. Shaw 1992, 1993, 1995, 1996a,b on "degenerate" or "minor" syllables in Berber, Mon-Khmer, etc.; see also McCarthy & Prince 1990). As the following examples illustrate, Oowekyala has both CC-shaped reduplicants as well as C-shaped reduplicants.

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[6] Lincoln & Rath (1980:31) give tpxʷpsƛktskts (from Mrs. Evelyn Windsor). The repetition of kts is evidently a mistake, as is the use of ts for c (Mrs. Hilda Smith).

[7] The influence of Oowekyala (and Heiltsuk) on neighbouring Nuxalk has not been acknowledged in the literature on obstruent clusters. As Nater (1984:xvii) remarks, "Substantial lexical influence has been exercised by neighboring North Wakashan languages, more noticeably Heiltsuk; some 30% of the Bella Coola roots and stems with etymological counterparts in other Amerindian tongues are of Wakashan origin."

(9) Some obstruent & fricative reduplicants

a.	k̓ʷx̌-k̓ʷq̓s	just about daylight, early dawn (as when one begins to see one's way outdoors)	HS
	k̓ʷqa	daylight, to dawn, to become light in the morning	EW, HS
b.	t̓x-t̓k̓ʷs	fish hawk	EW, HS
	t̓kʷa	to scrape, scratch, claw, grab with the fingers or claws, to open a fish with the fingers	EW
c.	ƛ̓x-ƛ̓k̓s	plural of: round and/or bulky thing (e.g. a boulder) in the woods or on the field (this word used in Heiltsuk for straw-berry)	HS
	ƛ̓ka	to put a round and/or bulky thing somewhere, e.g. to iron, to lay bricks, to roast shellfish by the side of the fire	EW, JSS3
d.	c̓ɬ-c̓kʷ	plural of: short	HS
	c̓kʷ	short	EW, HS
e.	p̓ɬ-p̓ɬa	to blink repeatedly	HS
	p̓ɬa	to blink	EW, HS
f.	ɬx̌ʷ-ɬqʷac̓wa	brain	EW
	ɬqʷa	to eat the inside of sea eggs (urchins)	EW
g.	k̓s-k̓səyu	wrinkled forehead, to have a wrinkled forehead	Check
	k̓sa	wrinkled	EW

(10) Some single-obstruent reduplicants

a.	ƛƛx̌ʷma	to stroke the face with the flat of the hand	HS
	ƛx̌ʷa	to rub, stroke, or press with the flat of the hand	EW
b.	ttxstu	bulging eyes, to have...	HS
	txla	having the eyes open	EW
c.	ccxstwa	to wipe the eyes	HS
	cka	to rub	HS, EW
d.	q̓ʷq̓ʷɬma	to scratch an itchy face	HS
	q̓ʷɬa	to scratch (an itch)	EW
e.	t̓t̓kʷma	to mark the face with scratches, by or as if by clawing	HS
	t̓kʷa	to scrape, scratch, claw, grab with the fingers or claws	EW
f.	qǧənm[8]	plural of: woman	HS, SW
	ǧənm	woman	HS
g.	p̓p̓akn	overworked	HS
	p̓a:la	to work, to work on something, to fix, repair sth.; workers, crew	EW
h.	q̓ʷq̓ʷaskn	worn out with crying	HS
	q̓ʷasa	to cry, weep, wail; term refers to mourning songs sung at a me-morial potlatch	EW, DS138
i.	t̓t̓aulikn	passed out (as e.g. after drinking too much liquor)	HS
	t̓ulixla	drunk, intoxicated	EW

[8] The devoicing of initial-/ǧ/ to [q] is discussed below in section 3.6, p. 129ff.

Note that the CC-reduplicants show a process of spirantisation that occurs in what can arguably be described as the coda position of the reduplicative syllable. This process is treated in section 3.4, p. 104ff. With regard to the C-reduplicants, note that they are all obstruent stops/affricates. In the absence of evidence to the contrary, it is assumed that single fricatives and single sonorants cannot form C-reduplicants. This restriction is understandable if C-reduplicants are interpreted as onset-only syllables. As Prince and Smolensky (1993, chap. 8) discuss at length, obstruent stops/affricates form the best onsets because they are the least sonorous segments; see especially Prince & Smolensky's (1993:155) "Onset Inventory Parameter Value". It is possible, then, that only the best-formed onsets are licensed in single-C syllables in Oowekyala.

Speaker judgments also appear to support the possibility of one-obstruent and two-obstruent syllables. When I ask Mrs. Smith to "break up" all-obstruent words or to say them slowly, she "syllabifies" them as in the following examples:

(11) Native speaker judgements on syllabification

a.	t.p.kʷ	something squeezed	HS
b.	ƛ.x.x̌s	canoe thwart	HS
c.	c̓ł.c̓.kʷ	plural of: short	HS
d.	ƛ̓x.ƛ̓.k̓s	plural of: round and/or bulky thing (e.g. a boulder) in the woods or on the field (this word used in Heiltsuk for strawberry)	HS
e.	t.pxʷ.ps.ƛ.k.c	something invisible here with me that is nice or pleasant will undergo squeezing	HS

When asked whether e.g. tpkʷ is "more like" a monosyllabic word (e.g. ta), a disyllabic word (e.g. tata), or a trisyllabic word (e.g. tatata), Mrs. Smith chooses the trisyllabic form. Similarly for ƛ̓xƛ̓k̓s. More detailed and controlled experimentation along these lines is needed to verify the systematicity of speaker judgements.[9]

Note that the onset appears to be an obligatory syllabic constituent in Oowekyala, such that there are no vowel-initial words. The obligatoriness of onsets is evident from epenthesis in loan adaptations, e.g. vowel-initial 'apples' is borrowed into Oowekyala as .ʔa.bls. (not *.a.pls.). In fact, the onset may be the only obligatory syllabic constituent in Oowekyala, if the reduplicants in e.g. (10) are construed as syllables (see discussion above).

Next, note that no prevocalic clusters are observed with sonorant consonants in Oowekyala. That is, none of the sequences in (12) are attested, where "." is a syllable boundary, "R" is a sonorant consonant (including glottalised ones), "O" is an obstruent, and "V" is a vowel.

(12) Some unattested clusters in Oowekyala

a. .ROV e.g. **lba*

b. .RRV e.g. **mla*

c. .ORV e.g. **bla*

[9] Shaw (p.c.) points out that [tatata] is prosodically ambiguous: it has three syllables and three moras.

The absence of .ROV in Oowekyala is unsurprising. The sonorant consonant in this sequence cannot be syllabic, as the syllable so formed (*.R̥.OV) would lack an onset —an intolerable deficiency as just mentioned. The R cannot form an onset either (*.R.OV), since (as noted above) obstruent stops/affricates are the only segments permitted in onset-only syllables in Oowekyala. Nor can the sonorant consonant form a branching onset with the following prevocalic obstruent (*.ROV), as the resulting onset would stand in severe violation of the sonority sequencing principle.

(13) *Sonority Sequencing Principle*

Between any member of a syllable and a syllable peak, only sounds of higher sonority are permitted. (Clements 1990:285)

Regarding the absence of .RRV in Oowekyala, it is once again the case that the first sonorant consonant in this sequence cannot be syllabic (*.R̥.RV) without violating the onset principle. It is not the case, however, that a branching onset with two sonorants is impossible in principle. Branching onsets with two sonorant consonants, such those in Classical Greek *mrotós* 'mortal man' (Vennemann 1988:20), in Old Common Slavic *mlěko* 'milk' (Bethin 1998:35), or in French *lien* [ljɛ̃] 'link', each have appropriate rises in sonority (among sonorant consonants, nasals are less sonorous than liquids, which in turn are less sonorous than glides). Why, then, are such onsets not found in Oowekyala?

Before answering this question, let us consider the absence of .ORV in Oowekyala. OR-shaped onsets are relatively frequent crosslinguistically, presumably because their cline constitutes an ideal submission to the sonority sequencing principle. In fact, according to Bagemihl (1991), such onsets are permitted in Nuxalk —Oowekyala's immediate geographic neighbour: "obstruent plus resonant clusters are tautosyllabic in prenuclear position" (Bagemihl 1991:616). Note that other possible types of branching onsets (obstruent-obstruent, sonorant-sonorant, sonorant-obstruent) do not occur in Nuxalk; that is, this language admits only the most harmonious type of branching onset (obstruent-sonorant), where relative harmony is determined by the sonority sequencing principle.

Since Oowekyala rejects what even its linguistic neighbour recognises as an ideal type of branching onset (obstruent-sonorant), we can only conclude that branching onsets *tout court* are inadmissible in this language. This also explains the absence of RR-shaped onsets. Specifically, all syllable-initial clusters involving sonorants —i.e., OR, RO, and RR— are apparently 're-paired' by schwa-epenthesis in Oowekyala.

(14)

RO	/mɬ-/	məɬuyala	northeast wind
	/m̓kʷ-/	m̓əkʷila	the changing of a boy's voice when reaching adolescence
	/np-/	nəpa	to break through a surface, to collapse or cave
	/n̓xʷa-/	n̓əxʷala	to be near, close
	/my-/	məya	fish
	/lk-/	ləka	to play games with stones

	/l̓q-/	l̓əqa	to be, handle (said of moist materials such as putty, berry cake, bread dough, etc.)
	/wƛ-/	wəƛm	to have antler or horns
	/y̓x̌ʷ-/	y̓əx̌ʷa	to rise (said of the tide), to flood
OR	/gm-/	gəm̓inux̌ʷ	clan, fellow clansmen
	/pn-/	pəna	to fill sth. up
	/ʣn̓-/	ʣən̓asu	a frequented place, person whose company is preferred
	/bl-/	bəla	to forbid, to prevent s.b. from doing sth.
	/sw-/	səwala	to get, take, hold, carry in one's hand
	/dy-/	dəyala	wiping
	/ƛ̓y̓-/	ƛ̓əy̓ala	buying
RR	/my-/	məya	fish
	/m̓n-/	m̓ənaqa	to gather, pick up (small things)
	/nm-/	nəmał	a short while
	/n̓y-/	n̓əya	to string up (fish, beads), thread (needle, rope)
	/lw-/	ləw̓a	firmament
	/yw-/	yəwala	wind, draft
	/wl-/	wəla	to arrest, imprison
	/w̓n-/	w̓əna	to hide, to sneak about

Turning now to prevocalic obstruent clusters, there are several reasons to doubt that they ever form a complex syllable onset in Oowekyala. First, in contrast to better-known languages which allow a maximum of three consonants in syllable onsets, there is no upper limit on the number of prevocalic obstruents, e.g. txʷsx̌ƛaqa 'to jump over and beyond sth.'; ƛxx̌sƛki 'this absent one will be a thwart'.

Second, languages with complex onsets usually impose sequencing restrictions whereas Oowekyala imposes no such restriction, e.g.

(15) No sequencing restrictions on prevocalic obstruents

a.	spa	to flash, reflect, beam out, echo, reach (said of light or sound)	EW
	psa	to clean and soften by soaking; to soften and clean herring eggs by soaking; to clear the way (as when walking through the bush)	EW, WL
b.	pƛa	fin (of fish or sea mammal)	EW
	ƛpa	to spread out, unfold, open up, split apart	EW
c.	ƛxa	to put the crosspiece on (e.g. on the canoe)	Check
	xƛa	to move to another place	EW
d.	łkʷa	to slide something out (e.g. a drawer)	EW
	kʷła	to collapse (said of a pile of something), become separated (salmon eggs when about to be laid), disintegrate	EW
e.	pkʷu	to borrow a boat	EW
	kput	to unbutton, unwedge, or untuck sth.	HS

Third, OR onsets are universally less marked that OO onsets, because the former rise in sonority while the latter result in an (undesirable) plateau of sonority (Clements 1990:287-90). From this markedness relation, it follows that one expects to find languages with OR onsets, and languages with both OR and OO onsets, but no languages with only OO onsets (and without OR onsets). Now recall from our earlier discussion that Oowekyala disallows OR onsets. We do not, therefore, expect to find instances of the more marked type of onset —OO. This means that prevocalic obstruent clusters in Oowekyala should not be interpreted as complex onsets.[10]

A fourth argument concerns laryngeal features. Obstruents in the same syllable onset typically agree in laryngeal features. This is not the case for prevocalic obstruents in Oowekyala, however, e.g.:

(16) No laryngeal agreement in prevocalic obstruents

plain-[voi]	pgʷis	merman, mermaid
	cdəwlkʷ	dolphin
	kdau	form of address of one's female child (vocative form)
	kʷdəyn	goldeneye duck
	ƛgʷit	thick (in girth)
	qʷǧʷuqʷ	swan
	qǧiga	a species of white diving bird that says q̓q̓q̓a
plain-[cg]	pc̓ini	easy
	tk̓i	female with a big belly (as when pregnant)
	tq̓ʷa	octopus
	tq̓ani	lake trout
	cq̓ʷlc	whetstone
	sk̓aukʷ	five
	łk̓ʷani	old woman
	qc̓us	rack for drying things (e.g. seaweed, fish slices, etc.)
[cg]-plain	p̓xʷəla	to be floating, sth. floating
	p̓sa	to dent, dent
	p̓qa	to taste
	t̓pa	to fish with baited hook and sinker
	t̓sa	to hit with a stone
	t̓kʷa	to scrape, scratch, claw, grab with the fingers or claws, to open a fish with the fingers
[voi]-plain	n/a	See section 3.6 below.
[cg]-[voi]	t̓gʷn	kind of canoe (probably a funeral canoe)
	k̓dlx̌əla	dizzy

Note that this problem worsens with longer clusters, e.g. plain-glottalised-voiced tq̓bəwa 'chest', plain-glottalised-plain-voiced xʷc̓x̌λanu 'crosspiece of a set of halibut hooks'), glottal-

[10] This argument is adapted from Urbanczyk (1996) on Lushootseed.

ised-plain-glottalised c̓sp̓ala ‘to smell unwashed, to smell sour (fish, from not being properly dried)’, plain-glottalised-plain tq̓ła ‘to itch’, etc.[11]

In sum, it appears that syllables in Oowekyala may consist of just one stop/affricate or of two obstruents; in the latter case the second obstruent apparently must be a fricative.

(17) Degenerate syllables in Oowekyala

a. σ	b. σ
stop/affricate	obstruent fricative

There are two reasons to interpret the single consonant in (17a) and the first consonant in (17b) as onsets. First, onsets are unmarked syllabic constituents whereas codas are marked syllabic constituents (Trubetskoy 1939, Prince & Smolensky 1993); all else being equal, the single consonant in (17a) and the first consonant in (17b) therefore ought to be interpreted as onsets rather than as codas. Second, onsets are obligatory in Oowekyala whereas codas are not obligatory in Oowekyala (or in any language). Third, the fact that the single consonant in (17a) must be a stop/affricate and that the first consonant in (17b) can be a stop/affricate suggests that they are onsets, which tend to favour the least sonorous segments.

Shaw (1993, 1995, 1996a,b,c) claims (on the conceptual basis of a coherent "degenerate" syllable typology and on the empirical basis of Berber, Mon-Khmer, Semai, etc. —but not Oowekyala) that in any structure like (17b), the second consonant must be moraic.[12] More research is needed to verify the validity of this claim with respect to Oowekyala. In the meantime, it is worth noting that obstruents are presumed to be consistently nonmoraic in all Wakashan languages (e.g., Stonham 1994, Zec 1995). In other words, it is possible that both consonants in (17b) are nonmoraic in Oowekyala. This leaves open the possibility that these two consonants may in fact form a branching onset, rather than an onset-coda complex. But there are at least two good reasons for not interpreting (17b) as a branching onset. First, as discussed above there is cause to believe that Oowekyala disallows branching onsets in general. Second, the apparent fact that the second consonant in (17b) must be a fricative is consistent with it being in coda position (see section 3.4, p. 104ff.). Closely-related Haisla actually requires that all coda obstruents be fricatives (Bach 1997), and a comparable generalisation holds for Nisga'a (Tarpent 1987, Shaw 1991).

The prosodic —not only syllabic but also moraic and metrical—phonology of Oowekyala clearly deserves more detailed research. However, since the focus of this dissertation is the segmental phonology of Oowekyala, syllable structure will not be discussed further.[13]

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[11] To be fair, it should be noted that Oowekyala has a general process of preobstruent devoicing which may appear to block voicing agreement between obstruents (see section 3.6, p. 129ff). Still, voicing agreement could be achieved by devoicing obstruent clusters uniformly, e.g. /bga/ → [pka] (cf. pgʷis ‘merman, mermaid’).

[12] E.g., Shaw (1995:11): "Obstruent-only syllables are maximally binary, non-nuclear, and monomoraic. Obstruent-only syllables are therefore constrained to occur only in languages where obstruents are moraic."

[13] My postdoctoral research (Social Sciences and Humanities Research Council Award No. 756-2000-0272)

1.2. Theoretical background

This section briefly introduces the theories that are assumed in this dissertaton.

1.2.1. Optimality Theory

Although an infinite number of (mutually incompatible) theories will be consistent with the finite set of Oowekyala facts to be introduced in this dissertation, Optimality Theory (OT, Prince and Smolensky 1993) will be adopted here since much recent work has rendered its propositions on phonology considerably more plausible than known alternatives (see, e.g., McCarthy and Prince 1993, 1995, 1999; Myers 1997; Pater 1999). For brief overviews of OT, see Burzio (1995), Sherrard (1997), Prince & Smolensky (1997), Gilbers & de Hoop (1998). Current texts on OT include Archangeli & Langendoen (1997) and Kager (1999). *The Linguistic Review* 17(2-4), Dec. 2000, is a special triple issue of which focuses on a critical review of phonological OT.

OT derives from two basic observations about human language. First, grammars contain constraints on the well-formedness of linguistic structures, and these constraints are heavily in conflict, even within a single language. Second, there is a strength asymmetry between conflicting constraints in language: it does not matter how much or how little a weaker constraint is violated; only the success of the stronger constraint matters. Extending these two observations, Prince and Smolensky (1993, 1997) hypothesise that all humans share a set of linguistic well-formedness constraints, which are ranked in a strict dominance hierarchy on a language-particular basis. A linguistic form is grammatical in a given language if it is optimal in terms of the constraint hierarchy of that language, and it is ungrammatical if it is suboptimal in terms of the constraint hierarchy.

(18) Central OT premises (cf. Tesar and Smolensky 2000:5)

- Oowekyala shares with other languages a set of constraints on phonological well-formedness. It differs from other languages only in which constraints have priority in case of conflict.
- Grammatical forms in Oowekyala are the optimal ones: each is a structural description of an input that least violates the higher priority constraints of Oowekyala.

Given the premises of OT, the goal of this dissertation is twofold: to characterise some of the covert segmental structures that underlie grammatical forms in Oowekyala, and to propose a hierarchy of constraints that explains well (if not best) why these forms are grammatical in Oowekyala. Note that a basic distinction is made between context-free and context-sensitive well-formedness conditions. These two kinds of well-formedness conditions are discussed with respect to Oowekyala in Chapters 2 and 3, respectively.

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which begins in January 2001 will focus on Wakashan prosody.

1.2.2. Correspondence Theory

Suppose Prince and Smolensky (1997:1605) are correct in assuming that

> the set of well-formedness constraints is universal: not just universally available to be chosen from, but literally present in every language. Also universal is the function that determines, for each input to the grammar, the set of candidate output structures that compete for optimality; every language considers exactly the same set of options for realizing an input.

This raises an obvious issue, which Chomsky (1995:380, n. 4) describes as follows: "In Prince and Smolensky 1993 there seems to be no barrier to the conclusion that all lexical inputs yield a single phonetic output, namely, whatever the optimal syllable might be (perhaps /ba/)." In fact, Prince & Smolensky (1993) as well as McCarthy & Prince (1993, 1994) recognised and addressed this issue by adding input-output correspondence —termed "faithfulness"— to the set of universal constraints in OT. Prince & Smolensky (1993:80) describe faithfulness as a "non-obvious assumption" which they have "found essential" (ibid.). Prince and Smolensky (1997:1605) further describe "faithfulness" as "a direct consequence of the optimization perspective." In other words, it looks as if Prince and Smolensky are begging the question. In order to accept the optimisation perspective (i.e., OT), we must already accept the conclusion that faithfulness exists.

The arbitrariness of the notion "faithfulness" is overcome by McCarthy and Prince (1995, 1999). They demonstrate that the notion of correspondence between two strings is independently motivated in the domain of prosodic morphology. The clearest cases of correspondence are found in reduplication. McCarthy and Prince discuss numerous parallels between the input-output relation and the base-reduplicant relation, including: completeness of mapping, dependence on input/base, contiguity of mapping, linearity of mapping, anchoring of edges, and feature identity. They use this wide range of parallels to motivate a unified theory of input-output and base-reduplicant relations, viz. Correspondence Theory.

The notion of correspondence also usefully extends to pairs of paradigmatically related outputs (output-to-output correspondence), as most recently argued by Benua (1999), Buckley (1999), Burzio (2000), and Tesar & Smolensky (2000) among others. In this way, Correspondence Theory revives the notion of 'paradigm uniformity' that was influential in pre-generative phonological theory (e.g. Kuryłowicz 1949).

Finally, McCarthy (1999) argues that correspondence relations can also be established between pairs of candidates, where the latter are those output forms generated by the grammar, one of which is selected as optimal.

These three extensions of faithfulness —base-to-reduplicant correspondence, output-to-output correspondence, and candidate-to-candidate correspondence— are discussed with respect to Oowekyala segmental phonology in Chapter 4 of this dissertation.

Several kinds of correspondence relations between related strings (S_1, S_2) are distinguished in this dissertation. They are given here, after McCarthy & Prince (1995:122-4; 1999:293-6).

(19) Max(imality)

Every element of S_1 has a correspondent in S_2.

Dep(endency)

Every element of S_2 has a correspondent in S_1.

(20) {Right, Left}-Anchor

Any element at the designated periphery of S_1 has a correspondent at the designated periphery of S_2.

(21) Uniformity

No element of S_2 has multiple correspondents in S_1.

Note that 'element' here may signify not only a segment (root node) but also a feature, i.e. correspondence constraints may refer directly to features, following Shaw (1994) and Pulleyblank (1998a) (among others). The sensibleness of such an interpretation is acknowledged by McCarthy & Prince (1999:228): "[I]t is a reasonably straightforward matter ... to extend the correspondence relation to features as well as to segments." Indeed, at least some feature-specific Max constraints are needed to account for "floating" feature phenomena (e.g., tonal downstep; Pulleyblank 1986) and "stability effects" (e.g., high tone and nasal stability; ibid.). It is argued below that Oowekyala has floating laryngeal features (section 2.3, p. 30ff.) and shows rounding stability (section 3.3.3, p. 100ff.).

2. Intrasegmental phonology

2.1. Introduction: the segment inventory of Oowekyala

This chapter treats the paradigmatic component of Oowekyala phonology, that is, the part of Oowekyala grammar that establishes the inventory of Oowekyala segments. This inventory is given in (22).

(22) Segment inventory of Oowekyala

	labial	alveolar	sibilant	lateral	velar	lab. vel.	uvular	lab. uv.	glottal
Plain stops and affricates	p	t	c	ƛ	k	kʷ	q	qʷ	
Voiced stops and affricates	b	d	ʣ[14]	λ	g	gʷ	ǧ	ǧʷ	
Glottalised stops and affricates	p̓	t̓	c̓	ƛ̓	k̓	k̓ʷ	q̓	q̓ʷ	
Fricatives			s	ɬ	x	xʷ	x̌	x̌ʷ	
Plain resonants	m	n		l	y	w			h
Glottalised resonants	m̓	n̓		l̓	y̓	w̓			ʔ
Long resonants	mː	nː		lː					
Plain vowels					i	u	a		
Glottalised vowels					i̓	u̓	a̓		
Long vowels					iː	uː	aː		
Schwa						ə			

The chapter is organised according to the major phonological features that cross-classify the repertory of Oowekyala segments (22). Stricture features are discussed first in section 2.2 (p. 22ff.): [±consonantal], [±sonorant], [±continuant]. Laryngeal features are treated next in section 2.3 (p. 30ff.): [±voice], [±constricted glottis], [±spread glottis]. The articulators (and related features) that implement the stricture features are considered in section 2.4 (p. 56ff.): Lips, Tongue Blade, Tongue Body, Tongue Root, Larynx.

Note that all features are assumed to be binary in the traditional sense (Trubetzkoy 1939, Chomsky & Halle 1968, Lombardi 1996), excepting the primary articulator features which are considered terminal unary elements, after Sagey (1986) and Halle, Vaux & Wolfe (2000). The Tonal node is not discussed as it is not directly relevant in Oowekyala (though it is in closely-related Heiltsuk; see Kortlandt 1975).

[14] See fn. 5.

2.2. Stricture features

2.2.1. Major class features

Oowekyala segments are grouped by major class features in (23). This classification is uncontroversial except for the labeling of laryngeal glides as [+sonorant] which calls for some justification.[15]

(23) Oowekyala segments by major class features

		[sonorant]	[consonantal]	
"consonants"	obstruents	-	+	p, b, p̓, t, d, t̓, c, dz, c̓, s, ƛ, λ, ƛ̓, ł, k, g, k̓, x, kʷ, gʷ, k̓ʷ, xʷ, q, ğ, q̓, x̌, qʷ, ğʷ, q̓ʷ, x̌ʷ
	nasals & liquids	+	+	m, m̓, mː, n, n̓, nː, l, l̓, lː
	glides	+	-	y, y̓, w, w̓, h, ʔ
	vowels	+	-	i, i̓, iː, u, u̓, uː, a, a̓, aː, ə

The weakest evidence that laryngeals are [+sonorant] in Oowekyala may be drawn from the fact that laryngeals /h, ʔ/ are contrastive with respect to the feature [constricted glottis]. The laryngeals call for no special comment if they are assumed to be [+sonorant] in Oowekyala, as all sonorants in this language contrast for [constricted glottis] (/y, y̓/, /w, w̓/, /m, m̓/, etc.) (see section 2.3.3, p. 50). But if laryngeals are treated as [-sonorant], /h/ is the only fricative with a glottalised counterpart, viz. /ʔ/ (it will be shown below that /h/ becomes [ʔ] when glottalised). That is, the treatment of /h, ʔ/ as [+sonorant] contributes to the symmetry of laryngeal contrasts (reducing entropy) in Oowekyala phonology. This treatment should therefore be preferred, if all else is equal.

A stronger piece of evidence is that /h/ is phonetically voiced (i.e., [ɦ]) in Oowekyala and the other North Wakashan languages. Indeed, Lincoln and Rath (1980:9, 21) describe /h/ as "voiced" in Oowekyala as well as in Heiltsuk and Kwakwala. Similarly, according to Lincoln and Rath (1986:13) /h/ is always pronounced with "breathy vibration of the vocal cords" in Henaksiala (but not in Haisla according to Bach, p.c.). This phonetic property is surprising if /h/ is construed as a fricative, since all fricatives are voiceless in North Wakashan (see Table 1), i.e., /s, ł, x, xʷ, x̌, x̌ʷ/ are never pronounced [z, ɮ, ɣ/ʝ, ɣʷ, ʁ, ʁʷ]. On the other hand, we expect /h/ to be voiced if it is [+sonorant], as sonorants are inherently voiced.[16]

A third piece of evidence that /h, ʔ/ are [+sonorant] is that they pattern with sonorants in the following way: word-initially, they are always separated by schwa from a following obstruent (Lincoln & Rath 1980:9-11, 13-4, 19, 28; Hilton & Rath 1982:14). Examples are given in (24) and (25). (Roots and examples from Lincoln & Rath 1980.) The necessity of schwa in these

[15] This classification is implicit in Lincoln and Rath (1980) where /h, ʔ/ are referred to as 'laryngeal resonants'. Zec (1995:106) classifies closely-related Kwakwala laryngeals as obstruents.

[16] /ʔ/ is here considered [+son] even though it is not voiced (it is [+cg]). Note that treating /ʔ/ as [-son] is also problematic, since the [+cg] specification of /ʔ/ (for which there is phonological evidence in Oowekyala) is also marked in combination with a [-son] specification.

cases is arguably a product of constraints on syllabification, such as: syllables must have onsets (e.g., $*_\sigma[\text{n̩}]$), sonorants must not be onsets to headless syllables (e.g., $*_\sigma[\text{n}\varnothing]$), onsets must not be more sonorous than rhymes (e.g., $*_\sigma[\text{ms}]$) (see Prince & Smolensky 1993, chap. 8).[17]

(24) Word-initial sonorant+obstruent clusters

a.	√mxs-	məxsaqʷ (*mxsaqʷ)	rainbow	EW, JSS3
b.	√m̓s-	m̓əstqa (*m̓stqa)	to drop something, let go of something	EW
c.	√nkʷ-	nəkʷa (*nkʷa)	to pick salal berries	EW; DS
d.	√n̓xʷ-	n̓əxʷala (*n̓xʷala)	in the vicinity, near to, close to sth.; closely related or connected to s.o. or sth.	EW
e.	√lk-	ləka (*lka)	to play the stone throwing game	EW
f.	√l̓q-	l̓əqa (*l̓qa)	to be, to handle (said of moist materials such as putty, berry cake, bread dough, etc.); to mash and dry berries, to spread berries on a surface for drying, to putty	EW
g.	√yp-	yəpa (*ypa)	to arrange strips of cedar bark into a mat	EW
h.	√y̓x̌ʷ-	y̓əx̌ʷəla (*y̓x̌ʷəla)	rising of the water, rising of the tide	HS
i.	√wx̌-	wəx̌a (*wx̌a)	to split	EW

(25) Word-initial laryngeal+obstruent clusters

a.	√hp-	həpx̌taʔi (*hpx̌taʔi)	moustache, chin-beard	EW
b.	√hɬ-	həɬaqa (*hɬaqa)	to pay (salary), to pay for	EW
c.	√hxʷ-	həxʷəwa (*hxʷəwa)	to howl (dog, wolf, coyote)	EW
d.	√hx̌ʷ-	həx̌ʷa (*hx̌ʷa)	to climb (tree, rope, or steep rock)	EW
e.	√ʔb-	ʔəbukʷ (*ʔbukʷ)	mother	EW, HS
f.	√ʔp-	ʔəpa (*ʔpa)	to go after abalone	EW
g.	√ʔd-	ʔədai (*ʔdai)	son! (term of endearment, always used in direct address and limited to males)	EW, HS
h.	√ʔʣ-	ʔəʣi (*ʔʣi)	sasquatch; the child-snatching monster with the basket	EW
i	√ʔx̌ʷ-	ʔəx̌ʷa (*ʔx̌ʷa)	when, if	EW

Crucially, obstruents do not behave in this way. The sequence C_iəC_j is impossible where C_i and C_j are obstruents, e.g., (26). The fact that laryngeals are banned from initial position in obstruent clusters suggests that they are not obstruents.

(26) Word-initial obstruent+obstruent clusters

a.	√px-	pxa (*pəxa)	to warm, to heat, hot (like metal)	EW
b.	√x̌ʷt-	x̌ʷta (*x̌ʷəta)	to cut with a knife	EW
c.	√ɬkʷ-	ɬkʷa (*ɬəkʷa)	to slide something out (e.g. a drawer)	EW

[17] Schwa-less roots are used here to illustrate that the grammar actively bans RO-initial roots; in reality, it may be that schwas are part of the input.

d.	√t̓x-	t̓xa (*t̓əxa)	game of springing things away with the fingers	EW
e.	√ƛx̌ʷ-	ƛx̌ʷa (*ƛəx̌ʷa)	to rub, stroke, or press with the flat of the hand	EW
f.	√kp-	kpa (*kəpa)	to plug (hole), tuck in, jam in, to button up, insert (lever)	EW
g.	√xƛ-	xƛa (*xəƛa)	to move to another place	EW

A final piece of evidence that laryngeals are [+sonorant] is that a morphologically provided [+constricted glottis] feature which otherwise targets sonorants only, also targets the laryngeals. The relevant pattern occurs in the plural, which involves not only CV-reduplication — typically with [i] as a fixed vowel in the reduplicant— but also glottalisation of root-initial modal (i.e. plain, unmarked) sonorants, as shown in (27).

(27) Sonorant glottalisation in Oowekyala plural forms

	singular	*plural*		
a.	mam	mim̓am	blanket, bedding, bedcover	EW, HS, JSS3
b.	nusa	nin̓usa	to tell stories, legends, myths	EW, DS112
c.	lanca	lil̓anca	to go underwater	HS
d.	wi:kʷ	wiw̓i:kʷ	eagle	EW, HS, BC, JSS3
e.	ylx̌a	yiy̓lx̌a	to rub, smear (body part)	EW, HS

Observe that laryngeals pattern with sonorants in this respect, i.e. root-initial /h/ changes to [ʔ] in the plural.

(28) Laryngeal glottalisation in Oowekyala plural forms

	singular	*plural*		
a.	husa	hiʔusa	to count, to tally	EW
b.	həxc̓as	hiʔəxc̓as	singing for the dancers	JSS3
c.	hm̓gila	hiʔmgila[18]	to cook	JSS2, JSS3

The following examples illustrate that root-initial obstruents are unaffected by the process of glottalisation, in spite of the fact that they are (i) glottalisable segments in Oowekyala in general (cf. inventory (22) on p. 21; also section 2.3.1), and (ii) glottalisable segments in the plurals where the reduplicated consonant is glottalised in the base.

(29) No glottalisation of obstruents in plural forms

	singular	*plural*		
a.	pais	pipais	flounder	EW
b.	təwa	titəwa	to walk	EW, DS146
c.	qsu	qiqsu	it is you	EW

[18] Glottalisation is lost on syllabic sonorants in the second syllable. See section 2.3.4, p. 53 below.

d.	ɬiɬəmi	ɬəmi	to anchor, to moor, to tie up boat	EW
f.	ƛ̓aː	ƛ̓iƛ̓aː	black bear	EW, HS, BC
g.	$k^w x^w a$	$k^w ik^w x^w a$	to suck the skin (as when hurt)	EW, HS
e.	spa	sispa	to flash, reflect, beam out, echo, reach (said of light or sound)	EW

The treatment of Oowekyala laryngeals as [+sonorant] is consistent with Chomsky & Halle's (1968:303) conception of this feature (see also Halle & Clements 1983),[19] but is contrary to Hyman's (1975:45) suggestion that laryngeals are always [-sonorant] (see also Lass 1984:83, Lombardi 1997, Gussenhoven & Jacobs 1998). As Trask (1996:327) reports, "many [analysts] now prefer to regard [h] and [ʔ] as [+obstruent]" (i.e. [-sonorant]). To be sure, laryngeals are classified as [-sonorant] in many languages, e.g. Nuxalk (Nater 1984:6), Dakota (Shaw 1980:26-7), Odawa (Piggott 1980), Yowlumne (Archangeli 1988), Athapaskan in general (Rice 1995[20]), Oromo (Lloret 1995), and Hawaiian (Elbert & Pukui 1979), but this assumption does not appear to be critical in any of the relevant phonological analyses.

Kean (1980:29) argues that there is an implicational relation between the two major class features (⊃ means 'implies').

(30) [-consonantal] ⊃ [+sonorant]

Whether this implication is ever violated is an interesting empirical question. If violable, (30) may be viewed as an OT-type constraint, i.e. a well-formedness condition that can be outranked on a language-particular basis by other constraints that conspire to give laryngeals an obstruent analysis (e.g., [glottal]⊃[-sonorant]). While the general issue cannot be resolved here, the strong position will be adopted (on the basis of the Oowekyala evidence) that laryngeals are always [+sonorant].

Oowekyala laryngeals are discussed again in section 2.4.6.3 on p. 74 as well as in chapter 3. The next section focuses on continuancy contrasts in the Oowekyala inventory (22).

2.2.2. Continuancy

Oowekyala phonology presents no evidence for [±continuant] specification in sonorants. Suggestive phenomena such as intervocalic spirantisation, postnasal occlusivisation, debuccalisation of stops to [ʔ] and/or of fricatives to [h], etc., are absent in this language. Among obstruents, however, the phonological feature [±continuant] supplies a basic contrast between stops and affricates on the one hand, and fricatives on the other. This contrast is illustrated by the following pairs.

---

[19] Other languages in which laryngeals are classified as [+sonorant] include Klamath (Blevins 1993:238-9), Sƛ̓át̓imcets Salish (van Eijk 1997), and Dutch (Trommelen & Zonnefeld 1983).

[20] Rice treats [sonorant] as a privative feature which is absent from laryngeals.

(31) Some [±continuant] contrasts in Oowekyala

a.	cixa	to run, flow, flood (water)	HS, EW
	sixa	to peel (fruits, sprouts, etc.)	EW
b.	ƛiqa	to beat time	HS, EW
	ɬix̌a	fringe	EW
c.	kata	to be somewhere (said of sth. long, e.g. log), to use a long thing or put it somewhere	HS, EW
	xata	to peek, to stretch the head out	EW
d.	kʷisa	to spit	HS, EW
	xʷi̓sa	to whip, to make a whipping movement	EW
e.	qusa	bent, crooked	HS, EW
	x̌usa	to sprinkle, to splash	EW
f.	qʷlqʷa	to sprain, wrench	EW
	x̌ʷlqʷa	to sharpen with a file	HS

The status of affricates /c, ʣ, c̓, ƛ, λ, ƛ̓/ in Oowekyala calls for special comment. In all these segments, the tongue tip or blade and the alveolar ridge first come together for a 'stop' and then separate slightly so that a homorganic 'fricative' is made —except perhaps in λ, where a homorganic approximant [l] appears to be made (rather than a homorganic voiced fricative [ɮ]).[21] In spite of their phonetics, there are strong indications that affricates are single segments in Oowekyala phonology.

(32)	c	[tsʰ]	vs.	t s	[tʰs]
	ƛ	[tɬʰ]	vs.	t ɬ	[tʰɬ]

First, in spite of their phonetic compositionality, affricates are audibly distinguished from corresponding stop+fricative sequences. In the case of laryngeally unmarked (voiceless nonglottalised) affricates, the frication noise associated with the release is strong, giving the impression of post-aspiration (Lincoln and Rath 1980:6-8). In contrast, corresponding stop+fricative sequences are separated by an easily detected aspirated release of the stop prior to the fricative articulation (ibid.).

(33)	c̓	[ts̓]	vs.	t̓ s	[t̓s]
	ƛ̓	[tɬ̓]	vs.	t̓ ɬ	[t̓ɬ]

In the case of glottalised affricates, the fricative release and the ejective release appear to be simultaneous, while in the corresponding glottalised stop+fricative sequence, the stop's ejective release is realised before the fricative.

(34) ʣ [dz] vs. d *z

In the case of voiced ʣ, the 'fricative' component has no independent status in Oowekyala. That is, the sound [z] does not occur independently of [ʣ] (cf. inventory (22) on p. 21; also section 2.3 below). This provides a robust argument in favour of the affricate ʣ being a single segment.

(35) λ [dl] vs. d l [dəl]

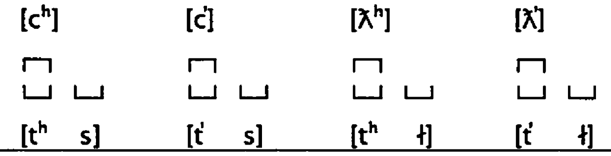
In the case of λ, the 'sonorant' component [l] immediately follows the stop release. By contrast, the corresponding

[21] In the Northwest Coast linguistic area, /λ/ is found only in North Wakashan. Sherzer (1976:67) reports /λ/ in Nadene and in Penutian, but in these linguistic groupings the sound is actually /ƛ/, the plain counterpart of phonologically aspirated /ƛʰ/ and glottalised /ƛ̓/ (Campbell & Mithun 1979, Blevins 1993). Sherzer's claim that /λ/ developed in North Wakashan "due to contact with neighboring Nadene languages" (ibid.) also lacks evidence (see Jacobsen 1979).

d+l sequence is always separated by schwa (in compliance with the Sonority Sequencing Principle and with the Syllable Contact Law; see also section 1.1.4, p. 9ff).

Note, too, that impressionistically affricates appear to be significantly shorter in duration than their corresponding stop+fricative sequences. Actual differences in duration have not yet been measured instrumentally, though.

(36) Idealisation of segmental duration (no overlap)



The phonetic differences just described, combined with the relatively permissive phonotactics of Oowekyala, allow lexical contrasts between affricates and matching stop-fricative sequences, as the following pairs illustrate:

(37) Word-initial contrasts between affricate vs. stop+fricative sequence

a.	cəla	to cut through water	EW
	tsəla	pushing	HS, EW
b.	c̓aː	flow of water, creek flowing	DS55
	t̓sa	to hit sth. with a rock, to bang rocks together, to chip pieces from rocks (as by banging the rocks together)	EW
c.	ccila[22]	to do what somebody else does or did	EW
	tstsa	push repeatedly	WL

(38) Word-final contrast between affricate vs. stop+fricative sequence

w̓ac̓	dog	JSS3
q̓ʷat̓s	crowded together on the field	EW

Plural reduplication also gives evidence that affricates are single segments in Oowekyala.[23] Recall from section 2.2.1 above that the plural normally consists of a one-syllable reduplicative prefix, frequently with a fixed vowel [i]. Crucially, affricates may occur in the onset of the prefix syllable, while no stop+fricative sequence may occur in this position, as illustrated in (39) and (40). The reduplication of forms with unambiguous clusters, e.g. /Red-sp-a/→[sispa] 'plural of: to flash', make it clear that reduplication copies only one segment, so that copied affricates must be interpreted as single segments.

[22] A sequence like cc is doubly released ([tsʰtsʰ]). The only singly-sequenced long consonants in Oowekyala, i.e. true geminate consonants, are [mː, nː, lː]. These consonants are a peculiarity of Oowekyala (Lincoln & Rath 1980:10). Examples include: c̓mː 'index finger'; smːs 'mouth'; t̓nːx 'hard knot of wood'; ɬnːx̌ 'wild crabapple'; t̓lːs 'high bush cranberries'. These double length sonorants contrast with normal length ones, e.g. t̓mc̓ 'bunchberries'; ƛ̓mq̓ 'yew tree'; kʷnq 'wet, damp'; glt 'long, tall'.

[23] The significance of plural reduplication for the status of affricates in Oowekyala is noted by Hilton and Rath (1982:31).

(39) Plural reduplication with stop+fricative sequence vs. affricate

/Red$_{PL}$-t s – a/	/Red$_{PL}$-c a i n a/	/Red$_{PL}$-s p – a /
[t i t s a]	[c i c a i n a]	[s i s p a]
plural of: ‘to push’	plural of: ‘Chinese’	plural of: ‘to flash’

(40) Plural form with word-medial contrasts between affricate vs. stop+fricative

a.	c̱ic̱aina	plural of: chinese	HS
b.	ṯiṯs̱a	plural of: to push	HS, hr
c.	c̱̓ic̱̓m:	plural of: index finger	HS
d.	ṯiṯł̱a	plural of: to bait	EW
e.	ṯ̓aṯ̓ł̱a	plural of: to slice fish parallel to the backbone	EW, JSS3
f.	ƛ̱̓iƛ̱̓a:	plural of: black bear	HS
g.	ṯ̓iṯ̓ł̱a	plural of: to soak dried fish	EW

The same point can be made with other types of prosodic morphology in Oowekyala. For example, the lexical suffix -axsala ‘aimlessly’ regularly triggers the emplacement of a long vowel [a:] in otherwise vowelless roots, e.g.:

(41) -axsala ‘aimlessly’

a.	x̌ʷa:taxsala	cut any way, carelessly	HS
	x̌ʷta	to cut with a knife	EW
b.	ga:laxsala	to crawl aimlessly	WL
	gəla	to crawl, to go on all fours	EW
c.	ya:x̌ʷaxsala	dance any way with no order/pattern	HS
	yəx̌ʷa	to dance, to make dancing movements	EW

Crucially, the ‘stop’ and ‘fricative’ components of affricates such as /c̓/ do not get separated (*[t̓a:s...]) by the morphologically-inserted long vowel, e.g. (42a,b), whereas stop+fricative sequences such as /ts/ do get separated, e.g. (42).

(42) -axsala ‘aimlessly’

a.	c̓a:maxsalagliɫ	to point around indoors	HS
	c̓əma	to point	HS
b.	c̓a:naxsala	to proceed all over the place	HS
	c̓əna	to walk in a group, go in the same direction as others, to move in a procession, to march, to parade	EW
c.	ta:saxsala	push here and there	HS
	tsa	to push, press against	EW

The advent of nonlinear phonology (Goldsmith 1976) made possible a conception of affricates as contoured segments. For example, according to Sagey (1986) each affricate is characterised by both values of continuancy: [-continuant] and [+continuant]. This conception persists even in current phonological theory, e.g., Roca (1994), Steriade (1993, 1994), Schafer (1995), van de Weijer (1996), Gussenhoven & Jacobs (1998:195-6), Zoll (1998:95), Elzinga (1999:46-7), Morelli (1999:108-110). As Clements (to appear, p.2) observes, "the current literature continues to treat these sounds [i.e. affricates] as contour or complex segments".[24]

It is doubtful that the affricates /c, ʣ, c̓, ƛ, λ, ƛ̓/ in Oowekyala are [[-cont][+cont]], since affricates never pattern with fricatives as a natural class with respect to [+continuant] in this language (or in any language, according to LaCharité 1995). For instance, fricatives shun laryngeal contrasts, but affricates (like obstruent stops) do not (see inventory (22) on p. 21; also section 2.3 below). Moreover, as will be discussed in Chapter 3, fricatives are permitted syllable-finally but affricates like other obstruent stops are avoided in this position.

It is also significant that the feature [+continuant] is not necessary or sufficient to characterise affricates in Oowekyala since they are distinguishable from nonaffricated stops (esp. /t, d, t̓/) in terms of two independently-needed features: [+strident] and [+lateral]. As will be discussed in section 2.4 below (see also (22) on p. 21), Oowekyala has three distinct series of coronal segments: an unmarked series /t, d, t̓, n, n̓/, a series specified [+strident] /c, ʣ, c̓, s/, and a series specified [+lateral] /ƛ, λ, ƛ̓, ɬ, l, l̓/. Crucially, affricates /c, ʣ, c̓, ƛ, λ, ƛ̓/ are properly included in the [+strident] and [+lateral] series, so that the 'fricatives' associated with the release of affricates can be understood as phonetic implementations of these features, not of [+continuant]. The conclusion is that, phonologically, affricates are just stops (Shaw 1989, 1991b). Here is Clements (to appear, p. 2):

> The fact that affricates consist of stop + fricative sequences phonetically is best accounted for at the phonetic level, where phonological feature combinations such as [-continuant, +strident] are spelled out sequentially as a succession of acoustic events.

Having resolved the status of affricates as [-continuant] in Oowekyala, consider again the pairs listed in (31) on p. 30. In OT these can be analysed as indicating that faithfulness to lexical values of continuancy (43) dominates context-free structural markedness contraints against instances of the phonological feature [continuant], such as (44).

(43) Faith-IO[continuant] (McCarthy & Prince 1995, 1999)

Every input feature [αcontinuant] is realised in the output; every output feature [αcontinuant] is realised in the input.

(44) $*\begin{bmatrix}-\text{son}\\+\text{cont}\end{bmatrix}$ The feature [+continuant] is prohibited on obstruents.

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[24] Note that this conception is not dependent on binary-valued continuancy: affricates are complex segments specified both [stop] and [continuant] according to Hualde (1988, 1991) and Lombardi (1990). And Steriade (1993, 1994) argues that each affricate is a sequence of phonological aperture nodes A_0, A_{fr} representing the stop and fricative components respectively.

(45) Contrast between stop/affricates and fricatives in Oowekyala

$$\text{Faith-IO[cont]} \gg *\begin{bmatrix}-\text{son}\\+\text{cont}\end{bmatrix}$$

Fricatives indeed appear to be more marked than stops (Chomsky & Halle 1968:406; Roca & Johnson 1999:585). While all languages have stops, there are languages with no fricatives at all. Maddieson (1984) reports 18 such languages in his sample of 317 languages; Lass (1984:151) reports 21 such languages. Also suggestive is the fact that among normal children "[s]egments specified [–continuant] are acquired earlier than those specified as [+continuant]" (Ueda 1996:17 on Child Japanese; see also Beers 1996 on Child Dutch; Halle & Clements (1983) illustrate the substitution of stops for fricatives in Child English) (see also Morelli 1999:186).

2.3. Laryngeal features

The Larynx feature [glottal] is assumed to be an articulator feature, in the sense of Halle, Vaux & Wolfe (2000). As such, [glottal] will be discussed in section 2.4 below, along with the other articulator features ([labial], [coronal], etc.). But glottal activity such as voicing and glottalisation in segments should not, perhaps, be considered a 'secondary articulation', since such activity actually provides the 'source wave' which is 'filtered' by the articulators of the vocal tract (Fant 1960). Laryngeal features are therefore treated here in a separate section.

As previewed in the Oowekyala inventory (22) on p. 21, obstruent stops and affricates participate in a three-way laryngeal contrast (unmarked, voiced, and glottalised), while fricatives do not. There are also two laryngeally-differentiated series of sonorants (unmarked and glottalised).

2.3.1. Laryngeal features in stops and affricates

The following words illustrate the three-way laryngeal contrast of obstruent stops and affricates in Oowekyala.

(46) Laryngeal contrasts in Oowekyala obstruent stops and affricates

a.	pəw̓is	[pʰʊˀwis]		hungry	DS126
	bəwikʷ	[bʊwikˣʷ]	~	pregnant	EW
		[pʊwikˣʷ]			
	p̓əwi	[p̓ʊwi]		halibut	WL, JSS3
b.	tmqa	[tʰmqˣa]		to snap, crack (wood or ice)	EW
	dmx̌a	[dmx̌a] ~ [tmx̌a]		to drone	EW
	t̓mqa	[t̓mqˣa]		to lace or pin together	EW
c.	cix̌a	[ʦʰix̌a]		to melt tallow	EW
	ʣiqa	[ʣiqˣa] ~ [ʦiqˣa]		to stop vocal noise (speaking, singing, crying)	EW
	c̓iqa	[ʦ̓iqˣa]		to walk across a narrow rock or edge	EW

d.	ƛaqʷa	[tɬʰaqˣʷa]	to pat	EW
	λax̌ʷa	[dlax̌ʷa] ~ [tɬax̌ʷa]	to stand	DS64
	ƛ̓axʷa	[t̓ɬaxʷa]	to mark (with paint or by frequent rubbing)	EW
e.	kisa	[kˣisa]	to strike (match)	EW
	gisa	[gisa] ~ [kisa]	to make love to one's sister-in-law	EW
	k̓ita	[k̓itʰa]	to catch herrings with a rake	EW
f.	kʷasa	[kˣʷasa]	to trample, stamp the feet, push with the feet	EW
	gʷasa	[gʷasa] ~ [kʷasa]	to fray, chafe, rub	EW
	k̓ʷaːs	[k̓ʷaːs]	mussel	EW
g.	qapa	[qˣapa]	to rise and come towards one (said of steam, haze, smell), steam, smell, air	EW
	ǧaƛa	[ǧatɬʰa] ~ [qatɬʰa]	to gaff, to hook, to crochet	EW, HS
	q̓apa	[q̓apa]	to hit a target, to be to the point (words), follow a route	EW
h.	qʷiɬa	[qˣʷiɬa]	to untie, to loosen (a rope)	EW
	ǧʷisa	[ǧʷisa] ~ [qʷisa]	dried salmon that has not been soaked yet, to eat (cook?) unsoaked dried salmon	EW
	q̓ʷiɬa.	[q̓ʷiɬa]	to break, crumble, grind up, crush, shatter, mince	EW

The three laryngeal types of stops and affricates in Oowekyala have previously been characterised as plain (unaspirated nonglottalised), aspirated, and glottalised (Lincoln & Rath 1980, Hilton & Rath 1982). Lincoln and Rath (1980:6-8) describe each type as follows:

> The plain plosives ... are pronounced as lenis stops and affricates with occasionally a slight degree of voicing[25] ... The aspiration of the aspirated plosives is very strong and in the case of /ƛ, k, kʷ, q, qʷ/ is realised as harsh affrication... The glottalised plosives give the phonetic impression of lenis stops and affricates pronounced with accompanying closure of the glottis. The glottal release is lenis.

Notwithstanding these phonetic descriptions (which seem valid impressionistically but have yet to be verified instrumentally), there is compelling evidence that the 'aspirated' stops of Oowekyala are phonologically unmarked, while the phonetically 'plain' stops are phonologically voiced. Thus those obstruents which Lincoln & Rath (1980) and Hilton & Rath (1982) regard as 'aspirated' and 'plain' are here treated instead as 'unmarked' and 'voiced', respectively. This treatment is the same as Bach's 1991, 1997 for related Haisla, in which stop voicing is phonetically more obvious. See also Howe 1998 on Heiltsuk.

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25 Similarly in Heiltsuk: "plain ... occlusives have voiced allophones, but the voiceless variants are more frequent" (Kortlandt 1975:31). See also Rath (1981).

(47) Oowekyala obstruent stops and affricates

Lincoln & Rath (1980), Hilton & Rath (1982)		This dissertation (cf. Bach 1991, 1997)
plain	⇔	voiced
aspirated	⇔	unmarked
glottalised	⇔	glottalised

Under this view of laryngeal contrasts, it is claimed that aspiration is no more than a phonetic property of stops and affricates with unmarked laryngeal specification in Oowekyala, contra Lincoln & Rath (1980) and Hilton & Rath (1982).[26] Conversely, it is claimed that the "lenis" pronunciation of unaspirated stops and affricates (both plain and glottalised), which Lincoln and Rath (1980:7-8) describe, reflects the fact that these segments are phonologically marked ([voice] or [constricted]) in Oowekyala.[27] These interpretations of the phonetics of laryngeal distinctions in Oowekyala conform with Keating's (1984) polarisation principle: languages tend to maximise differences in Voice Onset Time between contrastive series of obstruents. As Ladefoged and Maddieson (1996:46) put it: "If a language contrasts a [phonologically marked] voiced stop series with one other [phonologically unmarked] stop series, then that second series will probably be slightly aspirated".

In other words, it is claimed that [±voice] and [±constricted glottis] are distinctive and active phonological features in Oowekyala grammar, as represented here:

(48) Laryngeal specifications and realisations of Oowekyala stops and affricates

unmarked	p	t	c	ƛ	k	kʷ	q	qʷ
	[pʰ]	[tʰ]	[tsʰ]	[tɬʰ]	[kˣʸ]	[kˣʷ]	[qˣ̆]	[qˣ̆ʷ]
[+voi]	b	d	ʣ	λ	g	gʷ	ğ	ğʷ
	[p~b]	[t~d]	[ts~ʣ]	[tɬ~dl]	[kʸ~gʸ]	[kʷ~gʷ]	[q~ğ]	[qʷ~ğʷ]
[+c.g.]	p̓	t̓	c̓	ƛ̓	k̓	k̓ʷ	q̓	q̓ʷ
	[p̓]	[t̓]	[t̓s]	[t̓ɬ]	[k̓ʸ]	[k̓ʷ]	[q̓]	[q̓ʷ]

The label 'unmarked' in (48) is purposely ambiguous. On the one hand, 'unmarked' can mean that this series is specified with the more common values of laryngeal features, i.e. [-voice] and [-constricted]. On the other hand, 'unmarked' can also mean that this series is devoid of laryngeal specification, i.e. it has no [±voice] or [±constricted] features. This ambiguity is exploited below in section 3.6.4, p. 145ff.

In sections 3.6 and 4.1.4 evidence that [+voice] and [+constricted glottis] are active in the second and third series of (48) will be provided on the basis of neutralisation patterns and phonologically-conditioned allomorphy. For now, consider the distributional fact that voiced stops and affricates are found only before tautosyllabic sonorants in Oowekyala (section 3.6). By contrast, the stops and affricates which Lincoln & Rath (1980) and Hilton & Rath (1982) treat

[26] Also contra Rath (1981) and Kortlandt (1975) on Heiltsuk, and Lincoln & Rath (1986) on Kitlope-Haisla (Henaksiala).

[27] Ejectives are 'lenis' in Oowekyala, but this is not the case in all languages.

as phonologically aspirated have an unrestricted distribution. They occur not only where voiced stops occur (before tautosyllabic sonorants) but also everywhere else. In fact, 'aspirated' stops and affricates occur even in all-obstruent words, e.g.:

(49) Phonetically aspirated stops and affricates in all-obstruent words

a.	tpkʷ	[tʰpʰkˣʷ]	something squeezed	EW
b.	tx̌	[tʰx̌]	thus (interjection)	EW
c.	qʷx̌ʷ	[qˣʷx̌ʷ]	powder	EW
d.	x̌ʷtkʷ	[x̌ʷtʰkˣʷ]	(sth.) cut with a knife	HS
e.	ƛxx̌s	[ƛʰxx̌s]	canoe thwart	HS
f.	qʷsqʷs	[qˣʷsqˣʷs]	low mountain (dwarf) blueberry (Vaccinium ?caepitosum); fruits eaten	BC98

A simple explanation for the difference in distribution between voiced (and glottalised obstruents) on the one hand, and 'aspirated' obstruents on the other, is that Oowekyala avoids voiced stops and affricates because they are marked segments (Halle 1959, Chomsky and Halle 1968, etc.), and only tolerates them in a particular structural context (before a tautosyllabic sonorant; see explanation in section 3.6.3, p. 138ff.). In contrast to the limited distribution of voiced stops and affricates, aspirated stops and affricates are permitted everywhere, presumably because they are not marked in the phonology. That is, aspirated obstruent stops are in fact 'plain' (unmarked) stops which are aspirated in the phonetics. (Keating 1988 argues that a segment may remain unspecified for a feature, even at the output of the phonology.)

Strong verification that [+voice] and [+constricted glottis] are active in Oowekyala phonology also comes from the effects of what Boas (1947) called 'weakening' and 'hardening' suffixes. Some of these suffixes are listed in (50) and (51). These suffixes cause stem-final plain stops and affricates to become voiced and glottalised, respectively. (The effect of these special suffixes on stems ending in other types of segments are discussed in later sections.)

(50) Some 'weakening' suffixes

a.	-ac̓i	instrument, receptacle
b.	-ad	having
c.	-ayu	instrument, passive
d.	-is	beach
e.	-iɬ	indoors
f.	-m	nominal
g.	-n̓akʷəla	gradually
h.	-n̓u	side

(51) Some 'hardening' suffixes

a.	-a	on a rock
b.	-ax̌sm	woman of a tribe
c.	-inux̌ʷ	expert at, good at
d.	-ix̌st	to desire
e.	-ux̌ʷ	price
f.	-m	nominal
g.	-məy̓a	cheek
h.	-s	on ground

The voicing effect of 'weakening' suffixes on stem-final plain stops and affricates is illustrated in (52)–(59) with -ac̓i 'instrument, receptacle'.

(52) ...p+ac̓i → ...bac̓i

a.	cbac̓i	wooden object? (e.g. duck)	JSS3
	cpa	meaning not remembered but had something to do with cedar bark	EW
b.	c̓bac̓i	grease dipping dish, bowl where food is dipped into grease	HS
	c̓pa	to dip food (in oil, syrup, or water)	EW
c.	k̓ibac̓i	elderberry basket; home-made basket for storing things	BC90: DS
	k̓ipa	to pick elderberries	EW
d.	qʷałubac̓i	ashtray	HS
	qʷałupa	to burn to cinders	EW

(53) ...t+ac̓i → ...dac̓i

a.	Max̌ʷadac̓i	bobbing up and down; name of a mountain goat hunting place near the first narrows on Owikeno Lake	DS118
	max̌ʷata	to bob	EW
b.	łudac̓i	toboggan, slide	JSS3
	łuta	to slide	JSS3

(54) ...c+ac̓i → ...ʣac̓i

a.	ƛ̓l:ʣac̓i	container for high bush cranberries	BC91
	ƛ̓l:c	high bush cranberry (Viburnum edule) (Curtis 1970:332: tulls)	EW, HS, BC91

(55) ...ƛ+ac̓i → ...λac̓i

a.	maỷuλac̓i	womb	HS
	maỷuƛa	to give birth	EW

(56) ...k+ac̓i → ...gac̓i

a.	ʔəmagac̓i	toilet, W.C.	JSS3
	ʔəmaka	to defecate	EW
b.	smgac̓i	box for cooking oolichan grease; name of Ben Hanuse	DS143, JSS3
	smka	to extract oil from oolachens	EW, DS143
c.	k̓gac̓i	frame for stretching skins	HS
	k̓ka	to stretch skins	EW
d.	mngac̓i	anus	HS
	mənak	manure, excrement	EW

(57) ...kʷ+ac̓i → ...gʷac̓i

a.	dugʷac̓i	troller	JSS3
	dukʷa	to troll; Lyall's American stinging nettle (Urtica dioica): harmful with contact; young plants eaten; fibrous tissue for cordage, bow strings, nets[28]	EW, BC120: HS, BC
b.	baxʷbagʷac̓i	a mythical box with unlimited contents; synonymous with k̓awac̓i, a box that contains an endless supply of food, ceremonial regalia where also stored in this box	DS53
	baxʷbakʷa	to stay filled	EW
c.	ƛağmgʷac̓i	log barrier in water to keep other logs from floating away?	JSS3
	ƛağmkʷ	a log or tree that's been felled	BC506: DS
d.	t̓ənigʷac̓i	fridge	JSS3
	t̓ənikʷ	feeling cold	EW

(58) ...q+ac̓i → ...ğac̓i

a.	c̓ağac̓i	container for catching drips from a leaking roof	HS
	c̓a̓qa	to drip	EW, HS
b.	c̓aiğac̓i	house for Indian dancing, esp. for the Cannibal dancer	HS
	c̓aiqa	shaman, medicine man; Indian dancer	EW, HS
c.	kac̓ənağac̓i	spoon basket (made of red-cedar bark)	BC63
	kac̓ən̓aq	wooden spoon	HS
d.	k̓ğac̓i	log transporter; container for packing; fish packing boat	JSS3
	k̓qa	to be somewhere (said of a pile or load of things), to put, move, or deliver a pile, load, or cargo of things	EW
e.	k̓ʷğac̓i	window	HS, JSS3
	k̓ʷqa	daylight, to dawn, to become light in the morning	EW, HS
f.	l̓əğac̓i	box to make mortar in	HS
	l̓əqa	to be, to handle (said of moist materials such as putty, berry cake, bread dough, etc.); to mash and dry berries, to spread berries on a surface for drying, to putty	EW
g.	nağac̓i	cup	JSS3
	naqa	to drink, to swallow a liquid	EW, JSS2

(59) ...qʷ+ac̓i → ...ğʷac̓i

a.	xʷaxʷmalağʷac̓i	bee-hive	HS
	xʷaxʷmalaqʷ	bee	EW

The same voicing effect on stem-final plain stops and affricates is illustrated in (60)-(66) with -ił 'indoors'.

[28] An alternate form for 'stinging nettle' is duxʷa.

(60) ...p+iɬ → ...biɬ

a.	lubiɬ	unoccupied (said of a building)	HS
	lupa	contentless (as a boat, or as a person with an empty stomach)	EW
b.	t̓ibiɬ	feet on floor	WL
	t̓ipa	to step, tread onto sth.; to find fern roots or cockles by feeling with the feet	HS
c.	dzubiɬ	sth. soft (e.g. coat) thrown onto the floor	HS
	dzupa	to fill, stuff, or plug up with soft material	EW

(61) ...t+iɬ → ...diɬ

a.	cidiɬ	in listing position indoors	HS
	cita	to tilt, lean, list, to slope	EW
b.	ǧm̓x̌udiɬ	left-hand side of a house	HS
	ǧm̓x̌ut(-i)	(it's the) left-hand side	EW
c.	kadiɬ	log on the floor of the house	HS
	kata	to be somewhere (said of something long, such as a log), to use a long thing or put it somewhere	EW

(62) ...ƛ+iɬ → ...λiɬ

a.	m̓uλiɬ	heap on the floor	HS
	m̓uƛa	to have risen, to have become a lump	EW
b.	n̓əλiɬ	to lean backwards or lie on the back indoors	HS
	n̓əƛa	to lean back (as in a chair) or to lie on one's back, to lay things on the back (e.g. split fish on the side with the skin)	EW
c.	x̌λiɬ	indoors and upright (pole, stick)	HS
	x̌ƛa	to shove something with a pole	EW

(63) ...k+iɬ → ...giɬ

a.	y̓agiɬ	a dirty floor	HS
	y̓ak(-i)	(he/she/it's) bad, spoiled, evil, vicious, sick, not as it should be	EW, HS
b.	dzigiɬ	a stick sticking in the floor	HS
	dzika	to push or poke with a stick	EW, DS183
c.	t̓agiɬ	bed mat, mattress	HS
	t̓aka	to use padding, use sth. soft	EW
d.	ƛ̓giɬ	round and/or bulky thing on the floor of the house	HS
	ƛ̓ka	to put a round and/or bulky thing somewhere, e.g. to iron, to lay bricks, to roast shellfish by the side of the fire	EW, JSS3

(64) ...kʷ+iɬ → ...gʷiɬ

a.	gʷugʷiɬ	to be in a house	HS
	gʷukʷ(-i)	(that-over-there is a) house	EW, JSS3
b.	k̓ʷugʷiɬ	to set a flat thing on edge of the floor	EW
	k̓ʷukʷa	to chop with an axe	EW

c.	qlgʷił	to lie in bed (said of animate beings)	EW
	qlkʷa	to lie on sth. (said of animate beings)	HS

(65) ...q+ił → ...ğił

a.	ƛ̓ağił	stretched out, uncoiled, unbent indoors	HS
	ƛ̓aqa	to stretch out a line, go deep-sea fishing (with line and multiple hooks)	EW
b.	ʔağił	wide or spacious room	HS
	ʔaqa	to open wide (as e.g. a mouth), to widen	EW
c.	ğlğił	container placed on the floor	HS
	ğlqa	to grasp with the fingers, lift container (e.g. a pail, a pan, a coffin); to push water away with the hands (as when swimming), to paddle in the water with the hands, to crawl (as when learning how to swim)	EW

(66) ...qʷ+ił → ...ğʷił

a.	hağʷił	to lie face down in bed	HS
	haqʷla	to lie face down	EW
b.	k̓lğʷił	to urinate in bed (said of a male)	HS
	k̓lqʷa	to urinate (said of a male)	EW
c.	ləğʷił	fire on the floor of the building (e.g. the smokehouse)	HS
	ləqʷa	wood, firewood	JSS3

Note that ‘weakening’ suffixes have no audible effect on stem-final consonants that are either glottalised, e.g. (67), or underlyingly voiced, e.g. (68).

(67)

a.	ƛ̓auq̓ʷac̓i	tobacco can or any container for tobacco	BC117
	ƛ̓auq̓ʷ	tobacco (Nicotiana tabacum); also possibly western dock (Rumex occidentalis) (also possibly "wild rhubarb"): stems, leaves, sprouts and shoots eaten (?)	BC107
b.	q̓ʷat̓ił	crowded together in a house	EW
	q̓ʷat̓x̌s	overcrowded on the boat	HS

(68)

a.	ka̓budac̓i	oven, bread pan, oven pan?	JSS3
	ka̓budənugʷa	I roast(ed) sth. in the oven	HS
b.	kʷukʷay̓udac̓i	fishing boat	JSS3
	kʷukʷay̓udən	I fish(ed) with the gillnet	HS
c.	ʔuʣił	in an awkward or uncomfortable situation/position in the house	HS
	ʔuʣala	to go wrong, suffer misfortune, have trouble	EW
d.	ʔagił	all indoors	HS
	ʔagala	all together	HS

e.	y̓ugʷilac̓i	rain house; name of a small creek east of Sowick Creek, flowing into Owikeno Lake	DS1 82
	y̓ugʷa	to rain, the rain	JSS3

The glottalising effect of 'hardening' suffixes on stem-final stops and affricates is illustrated in (69)-(75) with -inux̌ʷ 'expert, good at'.

(69) ...p+inux̌ʷ → ...p̓inux̌

a.	dap̓inux̌ʷ	tow boat	JSS3
	dapa	to tow	EW, HS
b.	lip̓inux̌ʷ	gambler	HS
	lipa	to roll dice	EW

(70) ...t+inux̌ʷ → ...t̓inux̌

a.	w̓ut̓inux̌ʷ	person good at piercing	HS
	w̓uta	to prick, pierce, pin, perforate	EW, HS
b.	mat̓inux̌ʷ	flyer, pilot	HS
	mata	to fly	JSS3
c.	kʷaʔaut̓inux̌ʷ	musician	HS
	kʷaʔauta	to play a musical instrument	EW
d.	q̓nt̓inux̌ʷ	person good at shooting with the gun, a good shot, good marksman, good hunter with the gun	HS
	q̓nta	to use a firearm, to shoot	EW, HS

(71) ...c+inux̌ʷ → ...c̓inux̌

a.	q̓lc̓inux̌ʷ	grease monkey, person who greases the engines	HS
	q̓lca	oil, gas, to oil, grease, to lubricate	EW

(72) ...ƛ+inux̌ʷ → ...ƛ̓inux̌

a.	ǧaƛ̓inux̌ʷ	s.o. good at hooking	WL
	ǧaƛa	to gaff, to hook, to crochet	EW, HS

(73) ...k+inux̌ʷ → ...k̓inux̌

a.	sk̓inux̌ʷ	person who is always spearing	HS
	ska	to spear, to harpoon	EW
b.	hailik̓inux̌ʷ	healer, expert in taking out "bad medicine"	HS
	hailika	to cure s.o. (esp. by taking out "bad medicine")	HS
c.	w̓əwik̓inux̌ʷ	person from Rivers Inlet	JSS3
d.	m̓anik̓inux̌ʷ[29]	name of a lineage of Oowekeeno, a man from Bella Bella married into the Manik̓inux̌ʷ lineage	DS121

29 m̓anik- is posited here, though I have not recorded it independently.

(74) ...kʷ+inux̌ʷ → ...k̓ʷinux̌

a.	m̓əkʷ̓inux̌ʷ	blacksmith	HS
	m̓əkʷa	to hammer	EW
b.	qitk̓ʷinux̌ʷ	person always wearing a hat or cap	HS
	qitkʷ	person that has put on a cap or hat	HS

(75) ...qʷ+inux̌ʷ → ...q̓ʷinux̌

a.	tmq̓ʷinux̌ʷ	good plunger	HS
	tmqʷa	to kick with the feet when swimming, to plunge into the water to chase the fish back into the net	EW

The same glottalising effect on stem-final plain stops and affricates is illustrated in (76)-(82) with -s 'on ground'.

(76) ...p+s → ...p̓s

a.	ɬnp̓s	soft ground	HS
	ɬnpa	saggy, loose, soft, wrinkled	EW
b.	ɬup̓s	muddy ground	HS
	ɬupa	mud	HS
c.	nəp̓s	something that has collapsed on the ground outside (e.g. a house)	EW
	nəpa	to hammer; to break through a surface (e.g. wall, a deadfall); to collapse or cave in (as a roof)	EW
d.	t̓ip̓s	one's feet touching the ground (as when feeling for fern roots)	WL
	t̓ipa	to step, tread onto sth.; to find fern roots or cockles with the feet	HS

(77) ...t+s → ...t̓s

a.	cit̓s	leaning over, tilted, or in listing position on the ground outdoors	HS
	cita	to tilt, lean, list, to slope	EW
b.	kat̓s	long thing lying on the ground outdoors	HS
	kata	to be somewhere (said of something long, such as a log), to use a long thing or put it somewhere	EW
c.	xʷlt̓s	fire outdoors on the ground	WL
	xʷlta	to burn (said of a fire, coals, offerings)	EW

(78) ...ƛ+s → ...ƛ̓s

a.	m̓uƛ̓s	lump on the ground outside; small hill	HS
	m̓uƛəla	heaping full	EW
b.	n̓əƛ̓s	to lean backwards or lie on one's back on the ground outdoors, to lay things on the back on the ground outdoors	HS
	n̓əƛa	to lean back (as in a chair) or to lie on one's back, to lay things on the back (e.g. split fish on the side with the skin)	EW
c.	p̓aƛ̓s	something strung out on the ground (e.g. a root)	EW
	p̓aƛuyala	sth. hanging out of sth. (as a shirt tail out of pants)	HS

(79) ...k+s → ...k̓s

a.	ʣik̓s	(sth.) stuck into the ground	HS
	ʣika	to push or poke with a stick	EW, DS183

(80) ...kʷ+s → ...k̓ʷs

a.	gʷuk̓ʷs	house on the ground	HS
	gʷukʷ(-i)	(that-over-there is a) house	EW, JSS3
b.	k̓ʷuk̓ʷs	to stand a board on its edge on the ground outside	HS
	k̓ʷukʷa	to chop with an axe	EW
c.	lu̓x̌ʷk̓ʷs	rocky ground strewn with boulders	EW
	lu̓x̌ʷkʷəla	boulders; place with boulders	HS
d.	qlk̓ʷs	to lie on the ground outside (said of animate beings)	HS
	qlkʷa	to lie on sth. (said of animate beings)	HS

(81) ...q+s → ...q̓s

a.	ɬaq̓sa	to build a tent, shed, or shelter on the ground outdoors	HS
	ɬaqa	to build a shelter (shed, tent, etc.)	EW
b.	m̓nc̓q̓s	one cylindrical th. on ground	WL
	m̓nc̓q	one long thing (e.g. cigarette, log, tree, bottle)	HS
c.	paq̓s	sth. flat on the ground	HS
	paqa	flat, to be flat, to put a flat object somewhere (e.g. to lay shingles on a roof)	EW
d.	ƛ̓aq̓s	to have one's legs stretched out on the ground outside	EW
	ƛ̓aqa	to stretch out a line, go deep-sea fishing (with line and multiple hooks)	EW

(82) ...qʷ+s → ...q̓ʷs

a.	haq̓ʷs	to lie face down on the ground outdoors	EW
	haqʷəla	to lie face down	EW
b.	ləq̓ʷsa	to build a fire on the ground outdoors	HS
	ləqʷa	wood, firewood	JSS3
c.	tlq̓ʷsa	to lay down branches or moss in order to make a soft spot, to soften a place on the ground	HS
	tlqʷa	to soften, make soft as a pillow	DS146
d.	t̓uq̓ʷs	trail, valley, or lot of ground that is narrow	HS
	t̓uqʷ	narrow gap, small opening, narrow, slim	EW

After Howe (1996) it is assumed that 'weakening' and 'hardening' suffixes carry floating laryngeal features: [+voice] and [+constricted glottis], respectively. Upon affixation, these floating features dock onto stem-final plain obstruent stops/affricates, causing either voicing or glottalisation.

(83) m̓əkʷa 'to hammer'

m̓əkʷ – ayu 'hammer'   m̓əkʷ – inux̌ʷ 'blacksmith'

Lar   Lar

[+voi]   [+c.g.]

Such linking of autosegmental [+voice] or [+constricted glottis] is driven by a well-formedness condition recognised since Goldsmith (1976) and which can be adapted to OT with the correspondence constraint Max (Pulleyblank 1998a; cf. Akinlabi's 1996 family of constraints against floating features: Parse).

(84) a. Max-IO[voice]
Every input feature [voice] must be realised in the output.
b. Max-IO[cg]
Every input feature [cg] must be realised in the output.

The crucial point here is that [+voice] and [+constricted glottis] are phonologically active in Oowekyala, while there is no phonological evidence for the feature [+spread glottis] being active in obstruent stops and affricates (contra Lincoln & Rath 1980, Hilton & Rath 1982). In particular, there is no (vowel-initial) suffix which causes a stem-final "plain" stop or affricate to become "aspirated".

2.3.2. Laryngeal features and fricatives

Oowekyala fricatives are repeated here, from (22) above.

(85) Oowekyala fricatives

alveol. strident	alveolar lateral	velar	labio-velar	uvular	labio-uvular
s	ɬ	x	xʷ	x̌	x̌ʷ

There are no voiced fricatives in Oowekyala, i.e. one never finds *[z, ɮ, ɣ/ʝ, ɣʷ, ʁ, ʁʷ], nor are there any glottalised fricatives [s̓, ɬ̓, x̓, x̓ʷ, x̌̓, x̌̓ʷ]. These gaps reflect universal tendencies for fricatives not to support contrasts in voicing or glottalisation. The second tendency is especially strong among the world's languages, likely because glottal constriction impedes the high pressure airflow needed for frication.

(86) $*\begin{bmatrix} -\text{sonorant} \\ +\text{continuant} \\ \alpha\text{voice} \end{bmatrix}$ VOI/FRIC No voicing contrasts in fricatives.

$$*\begin{bmatrix}-\text{sonorant}\\+\text{continuant}\\\alpha\text{constricted}\end{bmatrix}$$ CG/FRIC No glottalisation contrasts in fricatives.

Note that these constraints express an incompatibility of fricatives with voicing and glottalisation contrasts, so that, e.g. fricatives are incompatible not only with [+voice] but also with [-voice] (cf. Steriade's 1997 context-sensitive constraints on voicing contrasts, e.g. *[αvoice][-sonorant]). This interpretation of the constraints in (86) will be important in later analyses, esp. section 3.6.4, p. 145ff.

Regarding voicing contrasts in fricatives, Lass (1984:154) remarks that crosslinguistically "[t]he number of voiceless fricatives is likely to be greater than that of voiced; and there is likely to be an implicational relation between a voiced fricative and its voiceless cognate". Importantly, Lass notes that the latter implicational relation is "truer for fricatives than for stops" (ibid.). As Ohala (1983) explains, voicing occurs preferentially with low air pressure while frication occurs preferentially with high air pressure. Elzinga (1999:52) concludes that "voicing in fricatives is antagonistic to the production of noisy airflow which make fricatives perceptually salient."

That Oowekyala lacks glottalised fricatives [s̓, ɬ̓, x̓, x̓ʷ, x̌̓, x̌̓ʷ] is even less surprising given the highly marked status of these segments (see, e.g., Maddieson 1984, Ladefoged & Maddieson 1996). The crosslinguistic rarity of glottalised fricatives almost certainly results from the articulatory antagonism between the glottal constriction required for glottalisation and the glottal aperture favourable to frication. As Vaux (1998) discusses, voiceless fricatives are normally produced with a glottal width comparable to that of voiceless aspirated stops.

Specifically, then, it is assumed that the markedness constraints in (86) are undominated in Oowekyala grammar. From this perspective, it is interesting to consider what happens to stem-final fricatives when they are adjoined by the voicing and glottalising suffixes that were introduced in the preceding section. As shown in (87), the effects of voicing and glottalising suffixes vary depending on the type of stem-final fricative involved.

(87) Effects of voicing and glottalising suffixes on stem-final fricatives

Stem-final fricative	....before voicing suffix	...before glottalising suffix
/s/	[y] or [dz]	[y̓] or [c̓]
/ɬ/	[l]	[l̓]
/x/	[n]	[n̓]
/xʷ/	[w]	[w̓]
/x̌ʷ/	[w]	[w̓]
/x̌/	[x̌]	[x̌ʔ]

These effects are first illustrated in (88)-(94) with the voicing suffix -ac̓i 'instrument' (see examples with stops in preceding section).

(88) ...s+ac̓i → ...yac̓i

a.	cayac̓i	funnel	HS
	casa	to pour water on, throw out water	EW, JSS2
b.	t̓up̓yac̓i (-̓s 'outdoors')	flea	EW
	t̓upa	to give s.o. a black spot (as when playing blackjack)	HS
c.	x̌myac̓i	box for smoke-dried salmon	HS
	x̌ms-x̌asa	to eat dried salmon	EW

(89) ...s+ac̓i → ...dzac̓i

a.	kʷidzac̓i	spittoon, cuspidor	HS
	kʷisa	to spit	EW
b.	gadzac̓i	container for gas	JSS3
	gas	gas	HS
c.	hmdzac̓i	dishes, plates, bowls	JSS3
	hmsa	to eat	EW
d.	kʷukʷidzac̓i	cookie jar (from English 'cookie')	JSS3
	kʷukʷis	cookies	
e.	tndzac̓i	the ceremonial house of the cannibal dancers	EW, DS145
	tanis	term used to refer to the Hamac̓a Dancer during the dance; also used for those who have already reached the rank of Hamac̓a Dancer	EW, DS145

(90) ...ł+ac̓i → ...lac̓i

a.	ʔmlac̓i	game house?	JSS3
	ʔamła	to play	EW, HS
b.	c̓ik̓alac̓i	warship	HS
	c̓ik̓ałla.	war, fighting	EW
c.	gʷulayu	salmon trap in the creek	HS
	gʷuła	to gather and preserve food staples (meat, berries, and especially salmon), to prepare food for later, make travelling provisions, to will something to somebody	EW
d.	k̓lac̓i	dustpan	JSS3
	k̓ła	to move (brush, sweep, shake) particles from a surface	EW
e.	lǧʷilac̓i	stove	JSS3
	lǧʷił	fire on the floor of the of the building (e.g. the smokehouse)	HS
f.	t̓ilac̓i	box for soaking smoked salmon	HS
	t̓iła	to soak dried fish	EW
g.	ƛ̓ilac̓i	banquet hall, community hall	HS
	ƛ̓iła	to invite to a feast	EW, DS150

(91) ...x+aci̓ → ...naci̓

a.	cinaci̓	water main, water pipe, gutter	HS
	cixəla	running, flowing, flooding (water); brook, stream	EW
b.	minaci̓	porcupine house	EW
	mixt	porcupine	EW, HS, BC
c.	mənaci̓	drum (of any kind)	JSS3
	mxa	punch, strike with the fist, knock (on the door), beat (a drum)	EW

(92) ...xʷ+aci̓ → ...waci̓

a.	ʔaliwaci̓	seal hunter's canoe	HS
	ʔalixʷa	to hunt for sea mammals	EW
b.	cawaci̓	container for catching drips from a leaking roof	HS
	caxʷa	to leak, drip	EW
c.	c̓əwaci̓	sifter? ("tamis")	JSS3
	c̓xʷa	to stab, stick into	EW
d.	dənəwaci̓	palette of a painter	EW
	cf. Kw dnxʷaɫa	standing in a row	LR92

(93) ...x̌ʷ+aci̓ → ...waci̓

a.	ywaci̓	dance hall? (for ceremonies)	JSS3
	yx̌ʷa	to dance, to make dancing movements	EW

(94) ...x̌+aci̓ → ...x̌aci̓

a.	w̓ax̌aci̓	chimney, smoke pipe of a stove, pipe for smoking tobacco	JSS3
	w̓ax̌a	to impregnate with smoke	EW
b.	ğʷix̌aci̓	flour container?	JSS3
	ğʷix̌ila	to bake bread	HS
c.	hnx̌aci̓	mirror?	JSS3
	hnx̌a	to look at one's reflection (in water or mirror)	EW
d.	ɫn:x̌aci̓	crabapple box	BC109: DS
	ɫn:x̌	wild crabapple (Malus fusca) fruit (Curtis 1970:332 hlinnh)	EW, HS; BC
e.	tix̌aci̓	bile bag (as of a fish)	EW
	tix̌a	to suffer from indigestion	HS
f.	ƛ̓ix̌aci̓	chiton (a large Chinese slipper)	WL

The same effects are illustrated in (95)-(100) with the voicing suffix -iɫ 'indoors' (already illustrated for stops in the preceding section).

(95) ...s+iɫ → ...dziɫ

a.	ʔik̓adziɫ	upper room	HS
	ʔik̓as	place that is high; ground that is high	HS

b.	hamdził	to eat in a restaurant	HS
	hmsa	to eat	EW
c.	Mu:dził	name of Ada Hanuse-Clegg	DS120
	mus-	destroy	LR

(96) ...ł+ił → ...lił

a.	k̓alił	to take a nap indoors	HS
	k̓ała	to sleep, to dream	EW, DS
b.	ƛiliła	to invite a person into the house	HS
	ƛiła	to invite to a feast	EW, DS150
c.	y̓əlił	spread out indoors	HS
	y̓əła	to spread apart (canoe, jaws of a spring trap, legs)	EW
d.	hulił	hump on the floor of the house or room	HS
	huła	to heap up, rise, uprising, riot (a wave)	EW, HS

(97) ...x+ił → ...nił

a.	p̓ənił	pit in the floor of the house (as e.g. the fireplace of the longhouse)	HS
	p̓xəla	dented, grooved	EW
b.	t̓inił	to lie or lean back in the house	WL
	t̓ixa	to lie on one's back, to lean back on something	EW

(98) ...xʷ+ił → ...wił

a.	c̓xc̓əwił	inside totem poles, indoor houseposts [reduplicated form]	EW; BC63
	c̓xʷa	to stab, stick into	EW

(99) ...x̌ʷ+ił → ...wił

a.	λawił	to stand on the floor of the house, in the room (said of animate beings)	WL
	λax̌ʷa	to stand	DS64
b.	qʷawiła	to bring out in the open in the house or room; to make easy to see, reach, or grab in the house or room	EW
	qʷax̌ʷa	to take or bring out goods that have been stored for a long time	HS

(100) ...x̌+ił → ...x̌ił

a.	la:x̌ił	to go downstairs	HS
	la:x̌a	down, to go down, to be down, to change to down position, to move downwards	EW
b.	q̓ʷax̌ił	stairway, something on a slope	EW
	q̓ʷax̌a	to grow, to grow up	EW, DS138
c.	w̓ax̌ił	smoke in the house	HS
	w̓ax̌a	to impregnate with smoke	EW

The changes in (87) are illustrated in (108)-(112) with the glottalising suffix -'a 'try to (get)', which also triggers Ca-reduplication.

(101) ...s+'a → ...y̓a

a.	kakuy̓a	to try to shave or scrape	HS
	kusa	to shave, scrape off with a knife (skin, fur, fish scales)	EW, HS
b.	y̓ay̓iday̓a	to try to get oarlock	HS
	y̓idas	oarlock	HS

(102) ...s+'a → ...c̓a

a.	lalac̓a	to try to plant	HS
	lasa	to plant	HS
b.	yayim̓ac̓a	to try to get a chief	HS
	yim̓as	chief	EW, HS

(103) ...ł+'a → ...l̓a

a.	ǧʷaǧʷal̓a	to try to end or finish sth.	HS
	ǧʷał	finished, completed, ready; to stop, end, quit, finish doing sth.	EW, HS
b.	wawul̓a	to try to heap up	HS
	wuła	to heap up, rise, uprising, riot (a wave)	EW, HS
c.	yahiǧml̓a	to try to get masks	HS
	yiǧmł	mask	EW, HS, JSS3

(104) ...x+'a → ...n̓a

a.	maman̓a	to try to punch	HS
	mxa	punch, strike with the fist, knock (on the door), beat (a drum)	EW

(105) ...xʷ+'a → ...w̓a

a.	dzadzaw̓a	to get oolichans, to try to catch oolichans	HS
	dzaxʷn	oolichan (candlefish)	EW, DS183

(106) ...x̌ʷ+'a → ...w̓a

a.	yayaw̓a	to try to dance, to have a penchant for dancing	HS
	yx̌ʷa	to dance, to make dancing movements	EW

(107) ...x̌+'a → ...x̌ʔa

a.	gagix̌ʔa	to get ready for grinding or filing, to be about to grind, to try to grind	HS
	gix̌a	to grind, to file, to sharpen	EW

b.	naniх̌ʔa	to try to pull s.o. or sth.	HS
	nix̌a	to pull (hair)	EW

The changes in (87) are also illustrated in (108)–(112) with the glottalising suffix -'inux̌ʷ 'expert'.

(108) ...s+'inux̌ʷ → ...y̓inux̌ʷ

a.	hauy̓inux̌ʷ	tallyman	HS
	hausa	to count, to tally	EW
b.	ʔay̓inux̌ʷ	person good at longlining for halibut	HS
	ʔasa	to use the longline to catch halibut	EW, HS

(109) ...s+'inux̌ʷ → ...c̓inux̌ʷ

a.	pəw̓ic̓inux̌ʷ	person who is always hungry	HS
	pəw̓is	hungry	DS126
b.	lac̓inux̌ʷ	farmer	HS
	lasa	to plant	HS

(110) ...xʷ+'inux̌ʷ → ...w̓inux̌ʷ

a.	ʔaliw̓inux̌ʷ	expert sea mammal hunter	DS
	ʔalixʷa	to hunt for sea mammals	EW

(111) ...x̌ʷ+'inux̌ʷ → ...w̓inux̌ʷ

a.	haw̓inux̌ʷ	person good at climbing trees or poles (as a "high-rigger")	HS
	hax̌ʷa	to climb (tree, rope, or steep rock)	EW
b.	k̓iw̓inux̌ʷ	professional runner, good at running	WL
	k̓ix̌ʷa	to run away, escape, flee from	EW
c.	ƛ̓əw̓inux̌ʷ	person good at pointing (e.g. playing the Lahel game)	HS
	ƛ̓x̌ʷa.	to indicate one's guess by pointing (in Lahel or other game)	EW
d.	yəw̓inux̌ʷ	person good at dancing	WL
	yəx̌ʷa	to dance, to make dancing movements	EW

(112) ...x̌+'inux̌ʷ → ...x̌ʔinux̌ʷ

a.	hlx̌ʔinux̌ʷ	killer whale, blackfish	HS, EW, BC
	Hlx̌a	"to go after killer whales"; name of Raven's wife, from the story of Raven and Dog"	DS81
b.	qlx̌ʔinux̌ʷ	barber	HS
	qlx̌a	to cut with scissors, to use scissors	EW

The various changes tabulated in (87) and illustrated in the above data can be understood as consequences of the constraints against voicing and glottalisation in fricatives; see

(86) on p. 41. Indeed, given VOI/FRIC (86a) and CG/FRIC (86b), there are various possibilities for a stem-final fricative followed by a voicing or glottalising suffix.

A first possibility is that nothing should happen, i.e. the morphologically-provided laryngeal feature might remain unrealised, in violation of Max[+voi/+cg] (84). This is the case when stem-final x̌ is followed by a voicing suffix, as illustrated in (94) and (100) above. The fact that x̌ does not change to a stop (which could acquire the floating [+voi]; see section 2.3.1) indicates that Faith-IO[continuant] (43) outranks Max-IO[voi] (84). This is illustrated in the following tableau.

(113) tix̌+ac̓i 'bile bag'

/tix̌-, $^{+voi}$ac̓i/	$*\begin{bmatrix}-\text{son}\\+\text{cont}\\\alpha\text{voi}\end{bmatrix}$	Faith-IO[cont]	Max-IO[voi]
⇒a. tix̌ac̓i			*
b. tiʁac̓i	*!		
c. tiǧac̓i		*!	

Another possibility is to fulfill Max-IO[voi/cg] (84) (and satisfy VOI/FRIC (86a) or CG/FRIC (86b) vacuously) by substituting [+sonorant] for [-sonorant], resulting in a modal or glottalised sonorant —a permissible segment type in Oowekyala (cf. inventory (22) on p. 21; also next section). This is in fact the major pattern in (87), which suggests that Max-IO[voi/cg] (84) dominates Faith-IO[sonorant] in Oowekyala grammar, as illustrated in tableaux (115) and (116). (The peculiar change of stem-final /x/ to [n, n̓] before voicing and glottalising suffixes, respectively, is discussed later in section 2.4.5, p. 70.)

(114) Faith-IO[sonorant]

Every feature [αsonorant] in the input has an identical correspondent in the output; every feature [αsonorant] in the output has an identical correspondent in the input.

(115) k̓aɬ+iɬ 'nap indoors'

/k̓aɬ-, $^{+voi}$iɬ/	$*\begin{bmatrix}-\text{son}\\+\text{cont}\\\alpha\text{voi}\end{bmatrix}$	Faith-IO[cont]	Max-IO[voi]	Faith-IO[son]
a. k̓aɬiɬ			*!	
k̓aɮiɬ	*!			
b. k̓aλiɬ		*!		
⇒c. k̓aliɬ[30]				*

30 Both /ɬ, l/ are assumed to be [+cont] here, so there is no violation of Max-IO[cont].

(116) ʔalixʷ+ˈinux̌ʷ 'seal hunting expert'

/ʔalixʷ-, $^{+cg}$inux̌ʷ/	*[−son, +cont, αcg]	Faith-IO[cont]	Max-IO[cg]	Faith-IO[son]
a. ʔalixʷinux̌ʷ			*!	
b. ʔaliɣʷinux̌ʷ	*!			
c. ʔalik̓ʷinux̌ʷ		*!		
⇒d. ʔaliw̓inux̌ʷ				*

Next, consider that the floating feature [+cg] of a glottalising suffix can also be realised as [ʔ] if it is provided with a segmental root node (cf. Kim 1999). This indeed occurs when stem-final /x̌/ is adjoined by a glottalising suffix, which suggests that Max-IO[cg] (84b) outranks Dep-IO[root].

(117) Dep-IO[root]

Each segmental root in the output has a correspondent in the input.

The fact that this change occurs only after /x̌/, which has no sonorant counterpart[31], suggests that Dep-IO[root] outranks Faith-IO[son]. The complete ranking is illustrated in the following tableau.

(118) qlx̌+ˈinux̌ʷ 'barber'

/qlx̌-, $^{+cg}$inux̌ʷ/	*[−son, +cont, αcg]	Faith-IO[cont]	Max-IO[cg]	Dep-IO[rt]	Faith-IO[son]
a. qlx̌inux̌ʷ			*!		
b. qlɣ̌inux̌ʷ	*!				
c. qlq̓inux̌ʷ		*!			
⇒d. qlx̌ʔinux̌ʷ				*	

Technically the floating [+voice] of voicing suffixes might also be provided a segmental root after /x̌/, yielding perhaps [...x̌ɦ...]. But in Oowekyala (and in other Wakashan languages) h is generally permitted only at the beginning of words. Assume the following constraint:

(119) *Xh

Nothing may precede h. (h must be word-initial)[32]

The effect of this undominated constraint is shown in the following tableau. As shown, it is more important to avoid a word-internal h than it is to satisfy Max-IO[voi] (84a).

---

[31] A possible sonorant counterpart for /x̌/ might be [+son] ʕ but this would be ruled out by high-ranking *[radical] (or *[pharyngeal]).

[32] An alternative equally effective constraint might be Align-Left(h, Word): "h must be word-initial".

(120) tix̌+ac̓i 'bile bag'

/tix̌-, $^{+voi}$ac̓i/	*Xh	$*\begin{bmatrix}-\text{son}\\+\text{cont}\\\alpha\text{voi}\end{bmatrix}$	Faith-IO [cont]	Max-IO [voi]	Dep-IO [rt]	Faith-IO [son]
⇒a. tix̌ac̓i				*		
b. tiγac̓i		*!				
c. tiǧac̓i			*!			
d. tix̌ɦac̓i	*!				*	

There are two remaining problems. First, whereas some stem-final /s/'s follow the general pattern of changing sonorancy (i.e., s ~ y, y̓), there is the fact that other stem-final /s/'s change in continuancy in order to fulfill Max-IO[voi/cg] (84) (i.e. s ~ ʣ, c̓). This is unexpected because Faith-IO[cont] outranks not only Max-IO[voi/cg] (84) but also Faith-IO[son] (which is violated in the change to affricates). This problem will be dealt with later in the section on coronals (section 2.4.3, p. 60ff.). Second, the peculiar change of stem-final /x/ to [n, n̓] before voicing and glottalising suffixes (respectively) is also discussed later in section 4.3.1, p. 174ff. (see also section 2.4.5, p. 70ff.).

2.3.3. Laryngeal contrasts in sonorants

Laryngeal contrasts in Oowekyala sonorants are shown word-initially in the following pairs.

(121) Laryngeal contrasts in Oowekyala resonants

a.	muqʷa	to hid something, keep something secret	EW, DS119
	m̓uqʷa	white, discoloured, bland, stale	EW
b.	nikʷəla	to travel by night	HS
	n̓ikʷəla	carrying on the shoulder	EW
c.	ləqʷa	wood, firewood	JSS3
	l̓əqa	to be, to handle (said of moist materials such as putty, berry cake, bread dough, etc.); to mash and dry berries, to spread berries on a surface for drying, to putty	EW
d.	yəx̌ʷa	to dance, to make dancing movements	EW
	y̓əx̌ʷa	to rise to a certain level (as the tide)	HS
e.	wina	to make war, war, a warrior, etc.; name of an Oowekeeno man, Paul Wina, his father's name was Waawalis	EW, DS168, 170
	w̓əna	to hide, to sneak about	EW
f.	hlx̌a	to go after killer whales; name of Raven's wife, from the story of Raven and Dog	DS81
	ʔlx̌a	to kill, murder; to beat up	EW, HS

An important first issue to address is whether modal (nonglottalised) resonants in Oowekyala are specified [+voice]. Several studies suggest that unmarked material, such as voicing in plain resonants, is underspecified in (lexical) phonological systems (e.g., Kiparsky 1982, Pulleyblank 1986, Shaw 1991b). On the other hand, Prince & Smolensky (1993:188) propose that OT 'abandon underspecification in favor of markedness theory'. There are at least two good reasons to believe that sonorants are not underspecified for [+voice] in Oowekyala phonology. First, as described in the preceding section, sonorants result from stem-final fricatives being targeted by a morphologically-provided floating [+voice]. Second, a number of suffixes show a pattern of allomorphy suggesting that sonorants have laryngeal specification. This pattern is discussed in the next chapter, in section 3.6.4.3, p. 149ff.

Turning to sonorant glottalisation, recall from section 2.2.1 on p. 22 that the plural involves not only CV-reduplication —typically with [i] as a fixed vowel in the reduplicant— but also glottalisation of root-initial modal sonorants, as shown here (repeated from (27)).

(122) Sonorant glottalisation in Oowekyala plural forms

	singular	*plural*		
a.	mam	mim̓am	blanket, bedding, bedcover	EW, HS, JSS3
b.	nusa	nin̓usa	to tell stories, legends, myths	EW, DS112
c.	lanca	lil̓anca	to go underwater	HS
d.	wi:kʷ	wiw̓i:kʷ	eagle	EW, HS, BC, JSS3
e.	ylx̌a	yiy̓lx̌a	to rub, smear (body part)	EW, HS
f.	husa	hiʔusa	to count, to tally	EW
g.	həxc̓as	hiʔəxc̓as	singing for the dancers	JSS3
h.	hm̓gila	hiʔmgila[33]	to cook	JSS2, JSS3

The following examples illustrate that root-initial obstruents are unaffected by the process of glottalisation, in spite of the fact that they are (i) glottalisable segments in Oowekyala in general (123a-e), and (ii) glottalisable segments in the plurals where the source of glottalisation is a lexical specification on the root (123f-g), not the affix.

(123) No glottalisation of obstruents in plural forms

	singular	*plural*		
a.	pais	pipais	flounder	EW
b.	təwa	titəwa	to walk	EW, DS146
c.	qsu	qiqsu	it is you	EW
d.	ɬiɬəmi	ɬəmi	to anchor, to moor, to tie up boat	EW
e.	spa	sispa	to flash, reflect, beam out, echo, reach (said of light or sound)	EW

[33] Glottalisation is lost on syllabic sonorants in the second syllable. See section 2.3.4, p. 53 below.

f.	ƛ̓a:	ƛ̓iƛ̓a:	black bear	EW, HS, BC
g.	kʷxʷa	kʷikʷxʷa	to suck the skin (as when hurt)	EW, HS

Now recall that glottalisation is also triggered by some lexical suffixes. These suffixes cause stem-final obstruent stops and affricates to become ejective (section 2.3.1), and stem-final fricatives to become glottalised sonorants or (in the case of some stem-final /s/'s) ejective affricates (section 2.3.2). Stem-final resonants are predictably glottalised before such glottalising suffixes, as exemplified here:

(124) -ʼinux̌ʷ

a.	təw̓inux̌ʷ	good at walking	WL
	təwa	to walk	EW, DS146
b.	x̌awəy̓inux̌ʷ	mythological name of loon	HS
	x̌awi	loon	EW, HS, BC

(125) -ʼa 'to try'

a.	c̓ac̓əm̓a	to try to point	HS
	c̓əma	to point, to poke with the finger	EW
b.	dadən̓a	to try to pull or haul	HS
	dəna	to pull, haul, drag something with a rope	EW

Because there are two different patterns of glottalisation it is apparent that the constraint against floating [+cg] (84b) must be relativised to morphemes. In particular, it is assumed that the floating [+cg] of lexical suffixes is conditioned by Max-IO[cg]$_{\text{LEX}}$, whereas the floating [+cg] of the plural prefix is conditioned by Max-IO[cg]$_{\text{PL}}$ (see Akinlabi 1996).

(126) a. Max-IO[cg]$_{\text{LEX}}$

A lexical-suffix feature [constricted glottis] in the input must be realised in the output.

b. Max-IO[cg]$_{\text{PL}}$

A plural-prefix feature [constricted glottis] in the input must be realised in the output.

To explain the fact that only sonorants are targeted by the [+cg] feature of the plural, it is claimed that faithfulness to cg-specification in sonorants ranks lower than Max-IO[cg]$_{\text{PL}}$ while faithfulness to cg-specification in obstruents ranks higher than this constraint. The effect of the ranking {Dep-IO(obs, +cg) $\gg$ Max-IO[voi]$_{\text{PL}}$ $\gg$ Dep-IO(son, +cg)} is illustrated in the following two tableaux. As shown, only root-initial sonorants are targeted by the floating glottalisation feature (since the plural is a prefix).

(127) wiw̓i:k^{w} 'plural of: eagle'

/Red$_{PL}$$^{+cg}$-wi:k^{w}/	Dep-IO(obs, +cg)	Max-IO[cg]$_{PL}$	Dep-IO(son, +cg)
a. wiwi:k^{w}		*!	
⇒b. wiw̓i:k^{w}			*

(128) pipais 'plural of: flounder'

/Red$_{PL}$$^{+cg}$-pais/	Dep-IO(obs, +cg)	Max-IO[cg]$_{PL}$	Dep-IO(son, +cg)
⇒a. pipais		*	
b. pip̓ais	*!		

Finally, to explain the fact that both sonorants and obstruents are targeted by the [+cg] feature of the lexical suffixes, it is claimed that Max-IO[cg]$_{LEX}$ outranks both types of faithfulness to cg-specification. The effect of this ranking, i.e. {Max-IO[voi]$_{LEX}$ ≫ Dep-IO(obs, +cg) ≫ Dep-IO(son, +cg)} is illustrated in the following two tableaux. As shown, stem-final sonorants as well as stem-final obstruents are targeted by the floating glottalisation feature.

(129) təw̓inux̌^{w} 'expert at walking'

/tw-$^{+cg}$inux̌^{w}/	Max-IO[cg]$_{LEX}$	Dep-IO(obs, +cg)	Dep-IO(son, +cg)
a. təwinux̌^{w}	*!		
⇒b. təw̓inux̌^{w}			*

(130) mat̓inux̌^{w} 'pilot'

/mat-$^{+cg}$inux̌^{w}/	Max-IO[cg]$_{LEX}$	Dep-IO(obs, +cg)	Dep-IO(son, +cg)
a. matinux̌^{w}	*!		
⇒b. mat̓inux̌^{w}		*	

By transitivity, we have Max-IO[cg]$_{LEX}$ ≫ Max-IO[cg]$_{PL}$. This relative ranking may reflect a more general asymmetry between prefixes (like the plural) and lexical 'suffixes' which often display root-like phonological properties (cf. Blake 2000 on lexical suffixes in Salish). That is, by treating lexical 'suffixes' as root-like morphemes, the ranking just given is in accord with McCarthy & Prince's (1995) proposed metaconstraint Faith$_{ROOT}$ ≫ Faith$_{AFFIX}$.

2.3.4. Laryngeal contrasts in vowels

Oowekyala is the only Wakashan language with overt glottalised vowels. Their distribution is extremely restricted, as they appear only as the first syllabic sonorant in a word. Some words with /a̓, i̓, u̓/ are listed here.

(131) Glottalised [a̓]

a.	c̓a̓qa	to drip	EW, HS
b.	ca̓caus	church-building	HS
c.	da̓ɬəla	to laugh	EW

d.	gʷa̓st	to come down (tears)	EW
e.	ǧa̓glsəla	to go out early in the morning	EW
f.	ǧa̓xsala	to carry fish by hooking one finger in the gill	EW
g.	ka̓budac̓i	oven, bread pan, oven pan?	JSS3
h.	k̓a̓sa	to pinch with the fingernails	EW
i.	ma̓łəla	two people working together	EW
j.	na̓xʷ	vulva; unidentified flounder-like fish	EW
h.	q̓a̓sa	to eat any kind of meat	HS
i.	q̓ʷa̓ła	to pick sprouts (e.g. of salmonberry thimbleberry)	BC114
j.	ƛa̓sa	to slap	EW
k.	ƛ̓a̓s	animal fat, oil, grease, blubber	EW
l.	w̓a̓q̓ʷa	sibling of the opposite sex	EW
m.	w̓a̓x̌ʷəla	colleague, fellow-worker	EW
n.	xʷa̓sa	to sway, shake	EW
o.	x̌a̓pkʷ	young; child	SW77,80

(132) Glottalised [i̓]

a.	xʷi̓sa	to whip, to make a whipping movement	EW
b.	xi̓səla	to show the teeth, to grin	EW
c.	ƛi̓sa	to slap (a ball), to strike at something with a flicking movement, to flip	EW
d.	q̓ʷi̓sa	to squeeze with the hand	EW
e.	qi̓sa	to wipe a dish out with the finger	EW
f.	li̓x̌	red cedar	EW

(133) Glottalised [u̓]

a.	ƛ̓u̓xʷala	pain, ache, sickness; to be sick, to ache (said of a body part)	EW
b.	n̓u̓si	moon, month	EW
c.	gʷu̓si	Irish white potato (Solanum tuberosum): introduced food, tubers eaten (possibly from English "good seed"?)	HS; BC119: DS
d.	gʷu̓xʷbaƛəla	factory?	JSS3
e.	c̓u̓sai	boil, pimple	EW, HS
	c̓u̓saiǧm	to have a boil on the face	HS
f.	bu̓x̌ʷbuq̓ʷa	unidentified sea anemone	EW
g.	ƛu̓la	(to do) again	HS

Glottalisation in the examples just given is lexical, in the sense that it is not predictable, hence pairs like ma̓łəla 'two people working together' vs. małəla 'swimming'; ƛ̓a̓s 'animal fat, oil, grease, blubber' vs. ƛ̓as 'far out at sea or seaward'; xʷi̓sa 'to whip, to make a whipping movement' vs. xʷita 'to stick out, to raise (log, head)'. In a large number of cases, however, glottalisation in the vowel is nonlexical. For example, the glottalising suffix -̓s 'on the ground outside' (previously illustrated in section 2.3.1) is responsible for vowel glottalisation in the following words:

(134) Derived from lexical suffix [+cg]

a.	bi̓s	rarely used camping place, old abandoned village	EW
b.	gi̓s	to be on the ground outside	EW
c.	kʷa̓s	to sit on the ground outdoors	HS
d.	na̓s	snow on the ground outside	JSS3
e.	q̓u̓s	pond, pool, puddle, lake	EW
f.	w̓u̓s	surface of the ground, soil	JSS3

The fact that Oowekyala admits both underlying and derived glottalised vowels suggests that Max-IO[cg] outranks *v̓, the markedness constraint against glottalised vowels, as illustrated in the following tableau.

(135) kʷa̓səla 'to be sitting on the ground outside'

	/kʷa- +cg s-la/	Max-IO[cg]	*v̓
⇒a.	kʷa̓səla		*
b.	kʷasəla	*!	

To account for the distribution of glottalised vowels in Oowekyala, we can adopt Zoll's (1998:96) proposal that highly marked structure is aligned with the left edge of the word. In our case, glottalised vowels must be leftmost in the word.

(136) Align-Left(v̓, Wd)

A glottalised vowel must be at the left edge of the word.

This analysis is illustrated in the following tableau (with an imaginary input). As shown, glottalisation is eliminated from all vowels but the first.

(137) ka̓budac̓i 'oven'

	/ka̓bu̓da̓c̓i̓/	Align-Left(v̓, Wd)	Max-IO[cg]	*v̓
a.	ka̓bu̓da̓c̓i̓	***		****
b.	ka̓bu̓da̓c̓i	**	*	***
c.	ka̓bu̓dac̓i	*	**	**
⇒d.	ka̓budac̓i		***	*
e.	kabudac̓i		****!	

2.4. Articulatory features

2.4.1. Introduction

Some consensus exists among phonologists and phoneticians that there are just six articulators involved in the sounds of the world's languages (e.g., Pulleyblank 1988a, 1995; Halle 1992, 1995; Clements and Hume 1995; Ladefoged and Maddieson 1996:44, 371; Halle, Vaux & Wolfe 2000). These articulators and their related features are listed in (138) and discussed with regard to Oowekyala in the sections that follow.

(138) Articulators and related features

a.	Lips:	[labial], [±round]
b.	Tongue Blade:	[coronal], [±anterior], [±distributed], [±strident], [±lateral]
c.	Tongue Body:	[dorsal], [±high], [±low], [±back]
d.	Tongue Root:	[±ATR]
e.	Soft Palate:	[±nasal]
f.	Larynx:	[glottal], [±constricted], [±spread], [±voice]

Note that the unary features in (138) designate major articulations, i.e. the articulators that realise the stricture features [±cons], [±son], and [±cont] (section 2.2 above). Halle, Vaux & Wolfe (2000) propose to treat each such articulator feature as terminal, thereby replacing the pointing arrow of Sagey (1986) and Halle (1992, 1995).

2.4.2. Lips

Two features depend on the Lips: [labial] and [±round].

2.4.2.1. [labial]

Oowekyala consonants with [labial] as their major Place articulator feature are /p, b, p̓, m, m̓/.

(139)

a.	baƛa	to fathom, measure by using the extended arms or fingers	EW, HS
b.	paƛa	to flatten	EW, HS
c.	p̓aƛ̓s	sth. strung out on the ground	EW
d.	maƛa	to shake hands, take by the hand	EW
e.	m̓iƛa	to miss a shot, to dodge, avoid, or escape from sth., dislike contact	EW

Observe that labial fricatives are absent (cf. section 2.2.2 above on continuancy). This gap in Oowekyala is not haphazard but rather reflects a universal markedness constraint on the feature combination [labial, +continuant].

(140) $*\begin{bmatrix}\text{labial}\\ +\text{cont}\end{bmatrix}$ The features [labial] and [+continuant] must not cooccur within a segment.

Note that [labial] here is a terminal articulator feature à la Halle, Vaux & Wolfe (2000) which is crucially absent from segments where labialisation (i.e. [+round]) is only secondary. Thus segments may not be specified both [labial] and [+continuant], while segments can be specified both [+round] and [+continuant], as in /xʷ, x̌ʷ/ (discussed in next section).[34]

That (140) is markedness-based is evident typologically. For instance, consider the marking implication in (141), which Sherzer (1976:258) gives on the basis of a large survey of North American Indian languages. Here, X → Y signifies that "if a language has X, then that same language also has Y and that it is the case that X is marked with respect to Y" (Sherzer 1976:256).

(141) A marking implicational (Sherzer 1976:258, 1.3.1)

f, v, ɸ, β → p

There is also acquisitional evidence that labial fricatives are relatively complex. For example, Beers (1996:36-7) reports that Dutch children acquire labial fricatives (f) 3 to 8 months later than they acquire coronal fricatives (s) and velar fricatives (x).

In OT, a plausible analysis is that faithfulness to input values of continuancy —Faith-IO[continuant] (43), p. 29— outranks the markedness constraint (140) in languages like (adult) Dutch or English. By contrast, the opposite ranking holds in Oowekyala. Recall from section 2.2.2 that Faith-IO[continuant] outranks the markedness constraint against fricatives. The Oowekyala ranking is therefore the following.

(142) No labial fricatives in Oowekyala

$$*\begin{bmatrix}\text{labial}\\ +\text{cont}\end{bmatrix} \gg \text{Faith-IO[cont]} \gg *\begin{bmatrix}-\text{son}\\ +\text{cont}\end{bmatrix}$$

To illustrate the effect of this ranking in Oowekyala grammar, consider the adaptation of English labial fricatives into Oowekyala, as illustrated by the words in (143).[35]

(143) Loan adaptations of labial fricatives in Oowekyala

	Oowekyala	English	
a.	pəlawas	flawə(ɹ)z	'flowers'
b.	kʷabi	kɔfi/kɑfi	'coffee'
b.	sdup	stov	'stove'
c.	bankʷuba	væŋkuvə(ɹ)	'Vancouver'

[34] Alternatively, Shaw (p.c.) suggests having [+round] dependent on the Tongue Body.

[35] It is a supposition that these English words were adapted directly into Oowekyala. In fact, some words might have been borrowed via Chinook Jargon. The general point remains valid nonetheless, as Chinook Jargon also lacked labial fricatives.

The initial adaptation of Vancouver > bankʷuba is illustrated in the following constraint tableau. The labial fricatives of the English input[36] are optimally changed into homorganic stops, in compliance with higher-ranked *[lab, +cont] and in violation of lower-ranked Faith-IO[cont].

(144) Vancouver > bankʷuba

	Eng: væŋkuvə(ɹ)	$*\begin{bmatrix}\text{labial}\\+\text{cont}\end{bmatrix}$	Faith-IO[cont]	$*\begin{bmatrix}-\text{son}\\+\text{cont}\end{bmatrix}$
a.	Oo: vankʷuva	*!*		**
⇒b.	Oo: bankʷuba		**	

2.4.2.2. [±round]

Oowekyala has a large number of labialised segments, i.e. segments specified with the Lips-dependent feature [+round]. These include the back vowels /u, u̓, uː/, the back glides /w, w̓/, and the back obstruents /kʷ, gʷ, k̓ʷ, xʷ, qʷ, ǧʷ, q̓ʷ, x̌ʷ/. The latter are vividly exemplified in the following words.

(145) Oowekyala labiovelars and labiouvulars

a.	qʷx̌ʷ	powder	EW
b.	x̌ʷtkʷ	(sth.) cut with a knife	HS
c.	kʷxʷa	hot	HS
d.	kʷx̌ʷbis	noiseless fart, cushion creeper	HS
e.	k̓ʷkʷx̌ʷsy̓akʷ	sth. chopped up, kindling	HS
f.	q̓ʷiqʷxʷsm	powdery blueberry (Vaccinum ovalifolium)	BC99
g.	k̓lq̓ʷx̌ʷƛa	incessantly urinating (said of a male)	HS
h.	xʷmǧʷac̓i	bee-hive	EW
i.	Ǧʷax̌ʷǧʷalan̓usiwa	Raven-at-the-North-End-of-the-World	DS78
j.	ǧʷiqʷx̌ʷǧʷax̌a	plural of: to eat bread	HS

The fact that [+round] combines only with back consonants, not with labials (e.g., *pʷ) or coronals (e.g., *tʷ), is a recurrent state of affairs crosslinguistically. In fact, there appears to exist a synergistic relation (cf. Stevens, Keyser, & Kawasaki 1986) between backness and rounding. As Ladefoged and Maddieson (1996:356) remark, "[labialisation] is especially common with velar obstruents and, relative to their frequency, with uvulars." Likewise, the fact that [+round] occurs only with back nonconsonantal segments, not with front vowels (*ü) or glides (*ɥ), represents an unmarked state of affairs.

Archangeli and Pulleyblank (1994) argue that sympathetic relations between features, such as that holding between [+round] and [+back], are encoded in the phonological module of grammar as positive implicational statements. The sympathetic condition in (146) captures the 'enhancement' relation between rounding and backness (Archangeli & Pulleyblank 1994:78;

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[36] The input væŋkuvə(ɹ) is chosen to illustrate the initial (historical) nativisation process. It is assumed that the input for present-day Oowekyala [bankʷuba] is actually /bankʷuba/.

447, n. 93; 458, n. 89).[37] The basic effect of this condition in Oowekyala is that only back segments may be labialised.

(146) A sympathetic grounding condition
[+round]⊃[+back]

(146) applies to both consonantal segments (k^w, g^w, $k̓^w$, x^w, q^w, $ǧ^w$, $q̓^w$, $x̌^w$) and nonconsonantal segments (u, u̓, uː, w, w̓). Of course, the status of [+round] differs in consonantal versus nonconsonantal segments. Rounding is marked in the former class, hence the following constraint from Roca and Johnson (1999:585).

(147) $*\begin{bmatrix}\text{+consonantal}\\ \text{+round}\end{bmatrix}$ The features [+consonantal] and [+round] must not cooccur within a segment.

By contrast, in the nonconsonantal class of segments, rounding is predictable from the backness and height features of the Tongue Dorsum (see section 2.4.4 below on [±back] and [±low]). Indeed, crosslinguistically the feature [+round] tends to accompany (nonlow) back (semi-)vowels while this feature tends to be absent from other (semi-)vowels.[38] As Ladefoged and Maddieson (1996:292-3) state:

> The great majority of the world's languages have a predictable relationship between the phonetic Backness and Rounding dimensions. Front vowels are usually unrounded and back vowels are usually rounded. ... Rounding and Height are also related in that higher vowels are usually more rounded than lower vowels.

These robust tendencies can be summed up as a 'sympathetic' condition, in the sense of Archangeli & Pulleyblank (1994). The condition in (148) (cf. Chomsky & Halle 1968, chap. 9; Kean 1980; Calabrese 1995:383, fn. 12; Roca & Johnson 1999:585) requires that back (semi)vowels be rounded. Thus any glide that is not one of /y, w/ (or /y̓, w̓/) will fatally violate it.

(148) $\begin{bmatrix}\text{- cons}\\ \text{+ back}\end{bmatrix} \supset [\text{+ round}]$ Back (semi-)vowels must be rounded.

In Oowekyala grammar (148) is presumably dominated by an antagonistically grounded constraint against the cooccurrence of [+round] and [+low] (see above statement by Ladefoged and Maddieson), so that [ɒ] is excluded.

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[37] Cf. Archangeli & Pulleyblank (1994:170): LAB/DOR "If [labial] then [dorsal]".
[38] In particular, the primary Cardinal nonlow back vowels /u, o, ɔ/ are [+round], while the other primary Cardinal vowels /i, e, ɛ, a, ɑ/ are [-round]. Nonback vowels that are [+round] (e.g. /y, ø/) and nonlow back vowels that are [-round] (e.g. /ɯ, ɤ/) are relatively infrequent in the world's languages.

(149) $*\begin{bmatrix} +\text{low} \\ +\text{round} \end{bmatrix}$ The features [+low] and [+round] must not cooccur within a segment.

2.4.3. Tongue Blade

Consonants whose major articulator is the Tongue Blade are /t, d, t̓, n, n̓, c, dz, c̓, s, ƛ, λ, ƛ̓, ɬ, l, l̓, y, y̓/. Several classes can be distinguished among these. The first, consisting of /t, d, t̓, n, n̓/, may be simply specified [coronal]. As such, this class is relatively unmarked.[39]

(150) [coronal]

a.	tix̌a	green, yellow; any type of green algae (Chlorophyta), like Sea Hair (Enteromorpha intestinalis) or Sea lettuce (Ulva lactuca)	BC45: BC
b.	diqʷkʷ	peg(s), pole(s), or pile(s) driven into sth.; deadfall	HS
c.	t̓ipx̌s	set foot into canoe	WL
d.	nix̌a	to pull (hair)	WL, EW
e.	n̓ik	to say, to tell	EW

A second class, consisting of /ƛ, λ, ƛ̓, ɬ, l, l̓/, is crucially specified with the marked feature [+lateral][40], in addition to being [coronal].[41] Roca & Johnson (1999:585) give the markedness prohibition *[+lateral], which obviously ranks low in Oowekyala grammar. Lateral obstruents appear to be more highly marked than lateral sonorants (Maddieson 1984, Ladefoged & Maddieson 1996), suggesting a markedness constraint against the combination [-sonorant, +lateral]. If such a constraint existed, it too would be lowly ranked in Oowekyala.[42]

(151) [coronal, +lateral]

a.	ƛamu	ocean perch, shiner	EW
b.	λa:	to wedge, to split with a wedge	EW
c.	ƛ̓a:	black bear	EW, HS, BC
d.	ɬağis	a tent	JSS3
e.	lasa	to plant	HS
f.	l̓apa	to spread apart with the thumbs	EW

[39] It is widely agreed that coronals are universally less marked than labials (Paradis & Prunet 1991), a fact that Prince & Smolensky (1993) formalise through a universal markedness hierarchy: *[labial] ≫ *[coronal].
[40] [lateral] is an "articulator-free feature that is appended as a modifier to the feature [+consonantal]... For a consonant that is [+lateral], the airstream is directed around one or both sides of the tongue blade" (Stevens 1994:244).
[41] The feature [lateral] is normally implemented by the Tongue Blade, but it is independent of this articulator in feature geometry; see Sagey (1986), Shaw (1991b), Kenstowicz (1994:156), Clements and Hume (1995:293), Hall (1997). For a different view, see McCarthy (1988), Blevins (1994) and Grijzenhout (1995).
[42] Oowekyala-related Nuuchahnulth constitutes a blatant counterexample to putative *[-son, +lat]. This South Wakashan language has a full set of lateral obstruents (ƛ, ƛ̓, ɬ) but no lateral sonorants (l, l̓).

A third class of [coronal] segments is crucially specified with the marked feature [+strident][43]: /c, ʣ, c̓, s/. This feature is assumed to be geometrically dependent on the Tongue Blade, as argued by Shaw (1991b) (see also Archangeli & Pulleyblank 1994; contra e.g. Halle 1992, 1995, Halle, Vaux & Wolfe 2000).

(152) [coronal, +strident]

a.	cuqʷa	to beg, to go and ask for something	EW
b.	ʣuxʷm	sapling, young tree	EW, BC507: BC
c.	c̓uɬtu	coloured black; black colour	HS, SW48
d.	Sumx̌uɬ	name of the Shumahalt River, spelled Sheemahant on the map, an important village site	DS144, JSS3

The glides /y, y̓/ define the last class of [coronal] segments; they are specified with the marked feature [-anterior] (e.g. Halle, Vaux & Wolfe 2000:433), unlike the other coronal segments which are either specified [+anterior] or else unspecified for [anterior] (it is suggested below that Oowekyala has both types of segments).

(153) [coronal, -anterior]

a.	yudukʷ	three	EW, HS, BC
b.	y̓ugʷa	to rain, the rain	JSS3

As Chomsky and Halle (1968:406, 407) observe, [-anterior] is more highly marked than [+anterior] (see also Morelli 1999:128-9; Roca & Johnson 1999:585; Lombardi 2000). The universal markedness hierarchy is therefore *[-anterior] ≫ *[+anterior]. The fact that Oowekyala normally excludes consonants that are specified [-anterior] (e.g., š, č, ǰ, ɲ, ʎ) indicates that *[-anterior] ranks higher than Faith-IO[anterior] in Oowekyala phonology. The fact that /y, y̓/ are nonetheless [-anterior] in Oowekyala can be explained through a hypothesised higher ranked universal constraint:

(154) $*\begin{bmatrix} -\text{consonantal} \\ +\text{anterior} \end{bmatrix}$ A vowel or glide must not be [+anterior].

In sum, Oowekyala has the ranking: *[-cons, +ant] ≫ *[-ant] ≫ Faith-IO[ant], *[+ant]. This ranking still allows for two possible interactions between the lower ranked member of the universal markedness hierarchy, i.e., *[+anterior] and Faith-IO[anterior]. On the one hand, *[+anterior] may outrank Faith-IO[anterior], as in *[-cons, +ant] ≫ *[-ant] ≫ *[+ant] ≫ Faith-IO[ant]. According to this ranking, segments in Oowekyala cannot be lexically specified either [+anterior] or [-anterior], i.e. segments must be lexically unspecified for [anterior]. On the other hand, Faith-IO[anterior] may outrank *[+anterior], as in *[-anterior] ≫ Faith-IO[anterior] ≫

[43] [+strident] is standardly assumed to be an acoustic feature, defined through higher intensity noise, but it can also be defined articulatorily as "rough-edge articulation" (Hyman 1975:39).

*[+anterior]. According to this ranking, Oowekyala segments cannot be specified *[-anterior] (155), but they may be specified [+anterior] (156) or else be unspecified for [anterior] (157).

(155) [-anterior] segments disallowed

/č/ $\begin{bmatrix}\text{cor}\\ -\text{ant}\end{bmatrix}$	$*\begin{bmatrix}-\text{consonantal}\\ +\text{anterior}\end{bmatrix}$	*[-anterior]	Faith-IO[anterior]	*[+anterior]
a. t $\begin{bmatrix}\text{cor}\\ +\text{ant}\end{bmatrix}$			*	*!
b. č $\begin{bmatrix}\text{cor}\\ -\text{ant}\end{bmatrix}$		*!		
⇒c. t [cor]			*	

(156) [+anterior] segments allowed

/t/ $\begin{bmatrix}\text{cor}\\ +\text{ant}\end{bmatrix}$	$*\begin{bmatrix}-\text{consonantal}\\ +\text{anterior}\end{bmatrix}$	*[-anterior]	Faith-IO[anterior]	*[+anterior]
⇒a. t $\begin{bmatrix}\text{cor}\\ +\text{ant}\end{bmatrix}$				*
b. č $\begin{bmatrix}\text{cor}\\ -\text{ant}\end{bmatrix}$		*!	*	
c. t [cor]			*!	

(157) Segments unspecified for [anterior]

/t/ | [cor]	$*\begin{bmatrix}-\text{consonantal}\\+\text{anterior}\end{bmatrix}$	*[-anterior]	Faith-IO[anterior]	*[+anterior]
a. t | $\begin{bmatrix}\text{cor}\\+\text{ant}\end{bmatrix}$			*!	*!
b. č | $\begin{bmatrix}\text{cor}\\-\text{ant}\end{bmatrix}$		*!	*	
⇒c. t | [cor]				

In other words, even with *[-anterior] excluded, a two-way distinction in terms of [anterior] remains possible: a segment may be lexically specified [+anterior] or else be lexically unspecified for [anterior] (cf. Archangeli & Pulleyblank's 1994 analyses of Barrow Inupiaq and Ainu). The possibility of such a distinction seems important in at least one area of Oowekyala phonology.

Recall from section 2.3.2 that the voicing and glottalising suffixes of Oowekyala cause mostly predictable changes in fricatives. The effects on stem-final /s/'s are unpredictable, however. Some stem-final /s/'s change to [y, ỷ] before weakening and hardening suffixes, respectively. But other stem-final /s/'s change to [ʣ, c̓] before weakening and hardening suffixes, respectively. For example, from hausa 'to tally' we get hauyayu 'tallying machine' (-ayu 'instrument') and hauỷinux̌ʷ 'tallyman' (-'inux̌ʷ 'expert'), whereas from hmsa 'to eat' we find hmʣayu 'utensil' and hmc̓imas 'leftover food' (-'imas 'leftovers').

It is proposed that those /s/'s which change to [y, ỷ] are unspecified for [anterior], as in (157), while those /s/'s that change to [ʣ, c̓] are specified [+anterior], as in (156). The fact that stems ending in this second type of /s/, that specified [+anterior], do not show the change to [y, ỷ] before voicing and glottalising suffixes, is presumably related to the fact that such a change necessarily involves a violation of Faith-IO[anterior]; cf. (154). Specifically, then, it is assumed that Faith-IO[ant] ranks above Faith-IO[cont]. The result is illustrated in the following two tableaux.

In general it is better to fulfill Max-IO[voi/cg] by changing a fricative into a sonorant rather than by changing a fricative into a stop/affricate (i.e. Faith-IO[cont] ≫ Faith-IO[son]). Thus a stem that ends in the first type of /s/, which is unspecified for [anterior], shows the regular fricative-to-sonorant change. (As suggested above, both [+cons] /s/ and [-cons] [y, ỷ] can be unspecified for [anterior].)

(158) hauyayu 'tallying machine' (-ayu 'instrument')

/haus-, $^{+voi}$ayu/	$*\begin{bmatrix}-son\\+cont\\\alpha voi\end{bmatrix}$	Faith-IO[ant]	Max-IO[voi]	Faith-IO[cont]	Faith-IO[son]
a. hausayu			*!		
b. hauzayu	*!				
c. haudzayu				*!	
⇒d. hauyayu					*

But when the stem ends in /s/ specified [+anterior], high-ranking Faith-IO[ant] blocks the change to nonanterior [y, ỷ] (cf. (154)), so that [dz, c̓] surface instead.

(159) hmdzayu 'utensil' (-ayu 'instrument')

/hms-, $^{+voi}$ayu/ +ant	$*\begin{bmatrix}-son\\+cont\\\alpha voi\end{bmatrix}$	Faith-IO[ant]	Max-IO[voi]	Faith-IO[cont]	Faith-IO[son]
a. hmsayu +ant			*!		
b. hmzayu +ant	*!				
⇒c. hmdzayu +ant				*	
d. hmyayu		*!			*

With regard to a possible historical origin of the two types of /s/ in Oowekyala, it is worth mentioning Swadesh's (1953) proposal that Salish, Chimakuan and Wakashan derive from a common ancestor, termed Mosan. Crucially, Swadesh reconstructs Mosan as having a [±anterior] contrast in its obstruent series. Tentatively, then, those stem-final /s/'s that are specified [+anterior] in present-day Wakashan may be said to derive historically from Mosan */s/, while those stem-final /s/'s that are unspecified for [anterior] may be said to derive from Mosan */š/. In fact, however, the hypothesised contrast is not dependent on Mosan (which has gained little support among historical linguists). It is possible that proto-Wakashan simply had this contrast.

2.4.4. Tongue Body

The Tongue Body feature [dorsal] is the most important articulator feature in Oowekyala. It defines the major articulation of vowels /a, i, u, etc./, of velar glides /w, w̓/, of velar obstruents /k, g, k̓, x, kʷ, gʷ, k̓ʷ, xʷ/ and of uvular obstruents /q, ğ, q̓, x̌, qʷ, ğʷ, q̓ʷ, x̌ʷ/.

2.4.4.1. Vowels

A basic linguistic function of the tongue dorsum is to define vowels. The standard features associated with dorsal gestures, along with their values for Oowekyala vowels, are listed in (160).[44] (The status of schwa in Oowekyala is discussed later in this section.)

(160) Basic vowel features

	i, í, iː	a, á, aː	u, ú, uː
[high]	+	-	+
[low]	-	+	-
[back]	-	+	+

Focussing first on the height dimension, the distinction between [+low] /a/ and [+high] /i, u/ is essential in Oowekyala, as illustrated in (161).

(161) Height contrast in Oowekyala vowels

a.	k̓ʷata	movement of pulling towards oneself with a stick, to strike a match	EW
	k̓ʷita	to pry open or loose, to lever up	EW
	k̓ʷuta	to nail	EW
b.	kasa	to have a strong bend (as a tree or some people's chin)	EW
	k̓isa	to drain water off	EW
	k̓usa	to bend (finger or body)	EW
c.	maqʷəla	dusk	EW
	miqʷəla	dirty, muddy (said of water); to darken, when they sky becomes dark	EW, DS119
	muqʷəla	to hide sth. (as in one's clothes)	HS

The lack of mid-vowels (e, o) in Oowekyala arguably reflects a markedness constraint against the combination [-high, -low] (Kean 1980; Calabrese 1995:383, fn. 12; Roca & Johnson 1999:585).[45]

(162) $*\begin{bmatrix}-\text{high}\\-\text{low}\end{bmatrix}$ The features [-high] and [-low] must not cooccur within a segment.

That some constraint like (162) dominates Faith-IO[high] in Oowekyala phonology is evident from adjustments that only appear in loanwords. English words with mid vowels such as

[44] The spreading of the lips with /i/ and their rounding with /u/ were addressed in section 2.4.2.

[45] This widely-adopted constraint is not obviously grounded in Archangeli & Pulleyblank's (1994) sense. The effects of this constraint may in fact derive from more basic grounded constraints. For example, Archangeli and Pulleyblank argue that [-low] favours [+ATR] while [-high] favours [-ATR]. In this respect, the specification [-high, -low] favours a contradictory specification in terms of [ATR].

table [tebl], cherries [čɛɹiz], stove [stov] and soda [sodə] are adapted into Oowekyala with high vowels: tibl (HS), cilis (BC, HS), sdup (HS), and suda (WL), respectively.[46] That (162) blocks the surfacing of English non-high vowels in Oowekyala is illustrated in the following tableaux. (English forms are here treated as inputs only to illustrate the initial nativisation process. It is assumed that once English words are adapted into Oowekyala, underlying representations with high vowels are selected.)

(163) cherries → cilis

/čɛɹiz/	$*\begin{bmatrix}-\text{high}\\-\text{low}\end{bmatrix}$	Faith-IO[high]
a. celis	*!	
⇒b. cilis		*

(164) stove → sdup

/stov/	$*\begin{bmatrix}-\text{high}\\-\text{low}\end{bmatrix}$	Faith-IO[high]
a. sdop	*!	
⇒b. sdup		*

Concentrating now on the backness dimension, the pairs in (165) show that the [±back] distinction is contrastive in Oowekyala high vowels.

(165) Backness contrast in Oowekyala vowels

a.	m̓iƛa	to miss, dodge, avoid, escape, dislike contact	EW
	m̓uƛa	to have risen, to have become a lump	EW
b.	cikʷa	to shovel	EW
	cukʷa	to crumble or break to pieces (said of sth. brittle such as corn flakes)	EW
c.	ƛ̓ipa	to roll up, turn inside out	EW
	ƛ̓upa	to roast, barbecue	EW
d.	k̓isa	to drain water off	EW
	k̓usa	to bend (finger or body)	EW
e.	q̓ʷita	to embrace	EW
	q̓ʷuta	to eat berry cake or berries boiled until a jam-like consistency is obtained	EW

Backness is not contrastive in low vowels, i.e. Oowekyala makes no distinctions such as [ba] vs. [bæ].[47] This indicates that the markedness constraint responsible for backness in low

[46] See fn. 35.

[47] [æ] occurs noncontrastively after the front glides /y, ỷ/ and also after the velar obstruents /k, g, k̓, x/ which are palatalised in Oowekyala phonetics (see next section).

a. k[æ]sa (*k[a]sa) to have a strong bend (as a tree or some people's chin) EW vowels (Chomsky & Halle 1968, chap. 9; Calabrese 1995:383, fn. 12; Roca & Johnson 1999:585) ranks high in Oowekyala grammar.

(166) $*\begin{bmatrix}+\text{low}\\-\text{back}\end{bmatrix}$ Low vowels are back.

The status of schwa (ə) in Oowekyala phonology calls for special comment. Schwa is articulatorily unmarked as a vowel in Oowekyala: it is the neutral vowel as it requires no special movement of the tongue dorsum. More formally, ə avoids all structural markedness breaches associated with place features (*[+back], *[+low], *[+high], etc.), since it is not specified for any of these features (Borowsky 198?, Kager 1990, Shaw 1996b). It is remarkable that in spite of its unmarked status, ə is excluded from contexts in which other vowels appear freely, e.g. *λ̓əpa, *cəkʷa, *kʷatə, etc.; cf. (161), (165). This exclusion is especially striking in Oowekyala, where ə is otherwise the default epenthetic segment in syllabification, as discussed in the introduction (ə is used to break up obstruent+sonorant sequences that violate the Sonority Sequencing Principle, and sonorant+obstruent sequences that violate the Syllable Contact Law). In other words, there is independent evidence that ə is unmarked in Oowekyala (assuming that epenthetic segments are typically unmarked; see Archangeli 1988, Pulleyblank 1988a,b, Steriade 1995, Shaw 1991b, 1996b, Alderete et al. 1999), yet ə is not a contrastive vowel in this language.

It is proposed that ə is avoided because of a general requirement that syllables be properly headed.

(167) Syllable Headedness (*ə)

The head (nucleus) of a syllable must be a segment specified with Place-features.

This constraint is inspired by van Oostendorp's (2000:3) Headedness hypothesis:

> The structure of a syllable can be determined by the feature structure of its head, and the structure of a head segment in a syllable can be determined by the structure of the syllable.

The ranking of Syll-Headedness over Max-IO[root] ensures that schwa would not always be realised in Oowekyala. The following tableau illustrates the deletion effect with a possible (but not actual) input for t̓gʷn 'funeral canoe'. Schwa deletion is also illustrated in the adaptation of English 'Japan' [ǰəpæn] into Oowekyala as [cpan].

---

b.	plqg[æ] (*plqg[a])	flat dish	EW, JSS3
c.	qk̓[æ]la (*qk̓[a]la)	to speak (said of a woman)	EW, HS
d.	kʷax[æ] (*kʷax[a])	scum, slime, saliva, mucus	EW
e.	Qʷuy[æ]t (*Qʷuy[a]t)	channel between Elizabeth Lagoon with Fish Egg Inlet	DS137
f.	tatay̓[æ] (*tatay̓[a])	to try, to be ready to push sth.	WL

(168) Avoidance of ə in Oowekyala

/t̓əgʷn/	Syll-Headedness	Max-IO[root]
a. t̓ə.gʷn	*!	
⇒b. t̓.gʷn		*

On the other hand, the fact that ə appears in Oowekyala outputs for phonotactic reasons indicates that well-formedness constraints on syllabification and syllable contact (for present purposes abbreviated as Syll-Mark) outrank Syll-Headedness. This can be illustrated with the word pəlawas 'flower', from English.

(169) Necessary ə in Oowekyala

	Syll-Mark	Syll-Headedness
⇒a. pə.la.was		*
b. p.la.was	*!	
c. pla.was	*!	

The choice of ə in epenthesis is predicted by the markedness approach adopted here. Indeed, ə lacks an input counterpart (because it is inserted), so it is not subject to featural faithfulness constraints, e.g. Faith-IO[high], Faith-IO[back], Faith-IO[low]. As such, ə is fully compliant with markedness constraints against the occurrence of place features, e.g. *[+high], *[+back], *[+low]. As Kager (1999:124) remarks, "[e]penthetic segments tend to be 'minimally marked' qua feature composition."

2.4.4.2. Dorsal contrasts: consonants

In Oowekyala velar obstruents /k, g, k̓, x/ are strongly palatalised [kʸ, gʸ, k̓ʸ, xʸ~ç].

(170)

a.	kusa	[kˣʸusa]	to shave, scrape with knife	EW, HS
b.	guy̓ala	[gʸuy̓æla ~ kʸuy̓æla]	to be careful	EW
c.	k̓udis	[k̓ʸudis ~ k̓ʸutis]	any kind of log, lying down	BC506: DS
d.	xusa	[xʸusa ~ çusa]	tired	HS

Of special interest is the fact that independent of Oowekyala, palatalised velars are more marked than plain velars. Plain velars occur in approximately 99.4% of the world's languages (Maddieson 1984) and relatively few languages have both plain velars and palatalised velars (examples include Russian, Chaha, and Japanese mimetics). As Gussenhoven and Jacobs (1998:30) explain: "The articulation of [k] allows organs of speech other than the back of the tongue to take the line of least resistance, requiring no accompanying action ... of the front of the tongue (palatalisation)." Why is it, then, that Oowekyala seems to have the more marked segments k^y, g^y, k̓^{y}, x^y but not the lesser marked ones k, g, k̓, x? The same question arises with respect to neighbouring Kwakwala (Grubb 1977), Heiltsuk (Rath 1981), Nuxalk (Nater 1984), Nisga'a (Tarpent 1987), Coast Tsimshian (Dunn 1995), Comox (Blake 1992), and Haisla (Lincoln & Rath 1986, Bach 1999), i.e. velar palatalisation is an areal feature.

The answer probably lies in the fact that in all these languages velars contrast with uvulars (which are discussed in the next section).[48] This can be illustrated with some minimal pairs.

(171) Oowekyala (palato)velars vs. uvulars

a.	kapəla	lifting a lid, blanket, etc.	EW
	qapəla	rising and coming towards one (said of steam, haze, smell), steam, smell, air	EW
b.	kix̌a	to use a saw	EW, JSS2, JSS3
	qix̌a	to fade (colour)	EW
c.	gənala	getting more (money), adding to what one already has	EW
	ǧənala	carrying on the arm; a game, like tug-of-war played on the fourth night of the ƛəw̓əlax̌a Dances	EW, DS73
d.	k̓ɬa	to move (brush, sweep, shake) particles from a surface	EW
	q̓ɬa	to lift, pick up, hold, carry a person (esp. a baby)	EW

Specifically, it is likely that velar fronting is a property of the (language-particular) phonetics, serving to enhance the phonetic distance between (unrounded) velars and (unrounded) uvulars (cf. Keating's 'polarisation' principle mentioned in section 2.3.1). (Note that rounding blocks fronting.)

Note, finally, that velar fronting in Oowekyala is probably an ancient property of Wakashan, since it may have contributed to the alleged historical change of Proto-Wakashan velars to palatoalveolars in South Wakashan languages. Some Oowekyala-Nuuchahnulth correspondences are listed here:[49]

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[48] Ladefoged and Maddieson (1996:35, 45) erroneously report that these languages contrast palatovelars with 'back' velars. In the case of Kwakwala, Ladefoged and Maddieson (1996:35, 45, 79) were misled by Grubb's (1977) terminology and by his orthographic use of underlined /k̲, g̲, k̲̓, x̲/ for uvulars. Ironically, they later correctly use Kwakwala examples (also from Grubb 1977) to illustrate "contrasting plain velar and uvular consonants" (Table 10.9, p. 356). Even in these examples, they fail to recognise that Grubb's /e/ corresponds to IPA /ə/. It is also worth noting that Ladefoged and Maddieson describe Kwakwala glottalised nasals as having "creaky voice ... in the middle part of the nasal" (p. 109), not "at the beginning or the end of the nasal" (ib.), apparently because Grubb writes glottalised nasals with a straight apostrophe in the middle of the nasal. In fact, Grubb (1977:19-20) explains that he writes the glottal diacritic in the middle of the sonorant because the glottal constriction is sometimes at the beginning and sometimes at the end of the nasal. Specifically, Grubb (1977:46-7) explains that each glottalised resonant is "normally realised as preglottalized ... except in word-final position (rare) where it is postglottalized."

[49] Comparable changes have swept across Salishan languages, e.g. Lillooet, Thompson, Halkomelem, Squamish (Henry Davis, p.c.).

(172) Palatovelar-palatoalveolar correspondences in Wakashan

	Oowekyala	*Nootka-Nuuchahnulth*	
a.	tk̓i	ta:č̓a	belly
b.	ʔik̓	ʔič̓a	high
c.	k̓əya	č̓i-ʔatap	to carve, cut off
d.	n̓an̓akila	n̓an̓ačmap	to keep an eye on sth. or s.o.
e.	sk̓a	suč̓a	five

2.4.5. *Soft Palate*

The unmarked value for [nasal] is orality, i.e. [-nasal] (Chomsky & Halle 1968:405). The fact that Oowekyala has nasals shows that faithfulness to lexical nasality outranks the prohibition on the marked value [+nasal]. Interestingly, the opposite ranking holds in distantly related Ditidaht and Makah, which generally exclude the feature [+nasal] (e.g. Klokeid 1975).[50] So for example the Oowekyala root naq- 'to drink' has the cognate daq- in these other languages.

(173) Typological variation in nasality
   a. Oowekyala has nasals
      Faith-IO[nasal] ≫ *[+nasal] ≫ *[-nasal]
   b. Ditidaht & Makah lack nasals
      *[+nasal] ≫ Faith-IO[nasal], *[-nasal]

Oowekyala has no velar nasal, a fact that reflects the markedness of this segment type in comparison to alveolar/dental nasals and labial nasals. As Maddieson (1984:69) reports, the presence of /ŋ/ in a language implies the presence of both /m/ and /n/ (197/200=98.5%), but not vice versa. We can formalise this implicational relation as a universal markedness hierarchy: velar nasals are more strongly prohibited than either labial nasals or coronal nasals (174).

(174) $*\begin{bmatrix}\text{+nasal}\\ \text{dorsal}\end{bmatrix} \gg *\begin{bmatrix}\text{+nasal}\\ \text{labial}\end{bmatrix} \gg *\begin{bmatrix}\text{+nasal}\\ \text{coronal}\end{bmatrix}$

The absence of velar nasals in Oowekyala is accounted for by ranking *[+nas, dor] above faithfulness, arguably Faith-IO[Place].

(175) Faith-IO[Place] (McCarthy & Prince 1995, 1999)
   Let α be a segment in the input and β be a correspondent of α in the output. If α is Place-specified F, then β is Place-specified F.

For example, English 'king' is adapted as kin in Oowekyala (HS). This change is illustrated in the following tableau.

[50] This is an areal feature, also shared by Twana and Lushootseed.

(176) English kɪŋ → Oowekyala kin

	$*\begin{bmatrix}+\text{nasal}\\ \text{dorsal}\end{bmatrix}$	Faith-IO[Place]	$*\begin{bmatrix}+\text{nasal}\\ \text{labial}\end{bmatrix}$	$*\begin{bmatrix}+\text{nasal}\\ \text{coronal}\end{bmatrix}$
a. kiŋ	*!			
b. kim		*	*!	
⇒c. kin		*		*

Now recall from section 2.3.2 that Oowekyala has voicing and glottalising suffixes that change some stem-final fricatives to sonorants: /s/ changes to homorganic [y, y̓]; lateral /ɬ/ changes to homorganic [l, l̓]; /xʷ, x̌ʷ/ change to homorganic [w, w̓]. The fact that /x/ changes to [n, n̓] (e.g., /t̓ix-$^{+\text{voi}}$iɬ/ → [t̓iniɬ] 'to lie or lean back in the house') suggests a prior stage in Wakashan history in which /x/ changed to homorganic sonorants *[ŋ, ŋ̓]. An analysis of /x/ → [n, n̓] along these lines is proposed below in section 4.3.1.

2.4.6. Tongue Root

This section treats two types of segments as being specified [-ATR] in Oowekyala: uvulars and laryngeals. Vowels are first briefly discussed with respect to [±ATR].

2.4.6.1. Vowels

In the Oowekyala vowel system (see section 2.4.4.1 above) the low vowel /a/ is normally [-ATR] while the nonlow vowels /i, u/ (and their contextual allophones /e, o/, to be discussed below) are always [+ATR]. This reflects a universal tendency that Archangeli and Pulleyblank (1994) relate to phonetic grounding. Tongue root retraction ([-ATR]) enhances tongue dorsum lowering ([+low]), while tongue root advancement ([+ATR]) enhances tongue dorsum raising ([-low]). As Hall and Hall (1980:207) remark, "as the tongue root is retracted, the tongue body is pulled down and therefore lowered." Archangeli and Pulleyblank (1994:176) formalise this gestural antagonism as a grounding condition: "[-ATR] implies [+low], not [-low]" (see also Calabrese 1995:383, fn. 12; Roca & Johnson 1999:585).

(177) $*\begin{bmatrix}-\text{low}\\ -\text{ATR}\end{bmatrix}$ The features [-low] and [-ATR] must not cooccur in the same segment (i.e. be under the same root).

That such a markedness constraint is active in Oowekyala phonology is apparent from the nativisation of English words. As the following examples show, English vowels that are [+high, -ATR] are adapted into Oowekyala as [+high, +ATR], in accord with (177).[51]

[51] See fn. 35.

(178) English loans in Oowekyala

	English		*Oowekyala*	
a.	pussy	[pʰʊsi]	busi ('cat')	JSS3, WL
b.	book	[bʊk]	bugʷ-i, bukʷ	HS
c.	slippers	[slɪpə(ɹ)z]	səlibas	HS
d.	sugar	[šʊgə(ɹ)]	sugʷa	HS, pic
e.	matches	[mæčɪz]	maːdzis	pic
f.	cookies	[kʊkiz]	kʷukʷidzaċi ('cookie jar')	pic

2.4.6.2. Uvulars

Nonlabialised uvulars have already been illustrated in (171) above. The pairs in (179) illustrate the contrast between labiovelars and labiouvulars.

(179) Oowekyala labio-velars vs. labio-uvulars

a.	kʷasa	to trample, stamp the feet, push with the feet	EW
	qʷasa	to be startled	EW
b.	gʷulukʷ	snacks for trip	HS
	ǧʷuluqʷ	animal fat, suet, tallow	EW
c.	k̓ʷəla	land otter	EW, HS, BC
	q̓ʷəla	to live, be alive, survive	EW, DS138
d.	xʷasa	to get ready to do sth., to prepare for doing sth.	HS
	x̌ʷasa	maggot infested	EW

It is claimed that uvulars are specified with the Tongue Root-dependent feature [-ATR], in addition to being specified with the Dorsal features [+back], [-high] and [-low] (Chomsky and Halle 1968:305, 307; Halle, Vaux & Wolfe 2000:409). The Tongue Root-specification of uvulars follows Cole (1987), Elorrieta (1991), Pulleyblank (1995:12), etc.[52]

[52] The treatment of uvulars as involving the Tongue Root is similar to McCarthy's (1994) treatment of these segments as Dorsal-Pharyngeal, except that he defines Pharyngeal as an 'orosensory region', not an articulator. McCarthy's definition of Pharyngeal is primarily motivated by his belief that guttural laryngeals in Arabic are articulated without involvement of the tongue root. Shahin (1997) provides strong evidence against this view, however, showing for instance that Arabic laryngeals are actively involved in tongue root retraction harmony. The Tongue Root feature [-ATR], not the orosensory feature Pharyngeal, is assumed here in keeping with an articulator-based model of features.

(180) Representation of uvulars

q, ğ, q̓, x̌
Place
Body Root
dor -lo +bk -hi -ATR

qʷ, ğʷ, q̓ʷ, x̌ʷ
Place
Lips Body Root
+rd dor -lo +bk -hi -ATR

Uvulars are marked consonants, a fact that we can relate to the antagonistic relation in (177). It is apparent that *[-low, -ATR] is outranked by faithfulness to the lexical input specification for [ATR] and [low] in consonants.

(181)

/x̌/	Faith-IO (cons, ATR)	Faith-IO (cons, low)	*[-low, -ATR]
⇒a. x̌			*
b. x	*!		
c. ħ		*!	

It is interesting to note that in Oowekyala-related South Wakashan languages plain uvular stops /q, qʷ/ have remained intact (compare e.g. Oowekyala naq- 'drink' and Nootka-Nuuchahnulth naq- 'ibid.'), but ejective uvulars /q̓, q̓ʷ/ have changed to a glottalised pharyngeal approximant /ʕ'/ in both Ditidaht and Nootka-Nuuchahnulth, and uvular fricatives /x̌, x̌ʷ/ have changed to a voiceless pharyngeal fricative /ħ/ in Nootka-Nuuchahnulth but not in Ditidaht (Jacobsen 1969).

(182) Uvular-to-pharyngeal changes in South Wakashan

	Proto-South Wakashan	*Nootka-Nuuchahnulth*	*Ditidaht*	*Makah*	
a.	q̓apa:k	ʕ'apa:k	ʕ'apa:k	q̓pa:k	willing
b.	q̓ʷiča:k	ʕ'iča:k	ʕ'iča:k	q̓ʷiča:k	rotten
c.	miq̓a:t	miʕ'a:t	biʕ'a:t	biq̓a:t	sockeye salmon
d.	q̓ix̌ak	ʕiħak	ʕax̌ak	q̓ix̌ak	to cry, howl
e.	x̌amup	ħamup	x̌abup	x̌abup	knowing
f.	x̌upt-	ħupta:	x̌u:bit̓ad	x̌u:bit̓ad	snoring
g.	č'ix̌ʷat-	č'iħata	č'ix̌ʷatšƛ	č'ix̌ʷatšiƛ	to be scared

These historical changes in South Wakashan are relevant to our understanding of Oowekyala in at least two ways. First, they show that the interpretation of Oowekyala uvulars as Tongue Root-specified is independently-motivated in Wakashan. Unless uvulars are specified with the Tongue Root feature [-ATR], it is difficult to explain the change of uvulars to pharyngeals in South Wakashan, e.g., Oowekyala cix̌ʷa 'sour' vs. Nuuchahnulth ciħuk 'ibid.'; Oowekyala hux̌ʷa 'to whistle' vs. Nuuchahnulth huħa: 'ibid.'.

Second, these changes show that the antagonistic grounded condition *[-low, -ATR] (177) is independently-motivated in Wakashan. It ostensibly played a role in the loss of [dorsal] specification in uvular ejectives and uvular fricatives in South Wakashan. A possible OT explanation of these changes might run as follows. In both Ditidaht and Nootka-Nuuchahnulth, the grounded condition *[-low, -ATR] was promoted in conjunction with *[cg], a context-free markedness constraint against glottalisation, as illustrated in (183). In Nootka-Nuuchahnulth, *[-low, -ATR] was also promoted in conjunction with *[+cont], a context-free markedness constraint against fricatives, as illustrated in (184).

(183) q̓ > ʕ' in Ditidaht and Nootka-Nuuchahnulth

/q̓/	$*\begin{bmatrix}-\text{low}\\-\text{ATR}\end{bmatrix}$ & *[+cg]	Faith-IO (cons, ATR)	Faith-IO (cons, low)	$*\begin{bmatrix}-\text{low}\\-\text{ATR}\end{bmatrix}$
a. q̓	*!			*
b. k̓		*!		
⇒c. ʕ'			*	

(184) x̌ > ħ in Nootka-Nuuchahnulth

/x̌/	$*\begin{bmatrix}-\text{low}\\-\text{ATR}\end{bmatrix}$ & *[+cont]	Faith-IO (cons, ATR)	Faith-IO (cons, low)	$*\begin{bmatrix}-\text{low}\\-\text{ATR}\end{bmatrix}$
a. x̌	*!			*
b. x		*!		
⇒c. ħ			*	

2.4.6.3. Laryngeals

The laryngeals /h, ʔ/ pattern as a natural 'guttural' class with uvulars /q, ǧ, q̓, x̌/ in Oowekyala, in the following way: both cause a following vowel to become lowered. The following data illustrate the lowering of /i, u/ to [e, o] after gutturals.[53]

(185) Nonhigh vowels in Oowekyala

a.	ƛiqila	[dliqˣela]	to give a name to s.o.	HS
b.	kaːqu	[kʸæqˣo]	to collide	EW
c.	łaǧis	[łaǧes] ~ [łaqes]	a tent	JSS3
d.	taːn̓iǧu	[tʰaːn̓iǧo] ~ [tʰaːn̓iqo]	close to each other (as two people passing)	EW
e.	tq̓ila	[tʰq̓ela]	to advise	EW
f.	w̓aq̓ut	[w̓aq̓otʰ]	to feed a visitor, give a feast of welcome	EW
g.	x̌ikʷa	[x̌ekˣʷa]	to sweep, brush off	EW
h.	x̌uc̓	[x̌oc̓]	sledgehammer	EW
i.	hił	[heł]	to set right, to heal	DS85

[53] The lowering effect is strictly local, e.g. qput 'to overturn, tilt' is pronounced [qˣpʰutʰ], not [qˣpʰotʰ].

j.	huma	[homa]	to obtain information (by watching, listening, questioning)	EW
k.	ʔixp̓a	[ʔexʸp̓a]	good or sweet taste, to have a good or sweet taste	WL, JSS3
l.	ʔukʷ	[ʔokˣʷ]	to pity, to have mercy	HS

Laryngeals also cause lowering in an adjacent schwa. This effect is illustrated in the data below (repeated from (25)). Note that schwa varies between [ɑ] and [ʌ] (the latter quality being more common when a [coronal] segment is present). Crucially, the same effect on schwa occurs with uvulars, e.g. ğənm [ğɑnm ~ ğʌnm] 'woman'.

(186) Word-initial laryngeal+obstruent clusters

a.	√hp-	h[ɑ]px̌taʔi	moustache, chin-beard	EW
b.	√hɬ-	h[ɑ]ɬaqa ~ h[ʌ]ɬaqa	to pay (salary), to pay for	EW
c.	√hxʷ-	h[ɑ]xʷəwa	to howl (dog, wolf, coyote)	EW
d.	√hx̌ʷ-	h[ɑ]x̌ʷa	to climb (tree, rope, or steep rock)	EW
e.	√ʔb-	ʔ[ɑ]bukʷ	mother	EW, HS
f.	√ʔp-	ʔ[ɑ]pa	to go after abalone	EW
g.	√ʔd-	ʔ[ɑ]dai ~ ʔ[ʌ]dai	son! (term of endearment, always used in direct address and limited to males)	EW, HS
h.	√ʔʤ-	ʔ[ɑ]ʤi ~ ʔ[ʌ]ʤi	sasquatch; the child-snatching monster with the basket	EW
i	√ʔx̌ʷ-	ʔ[ɑ]x̌ʷa	when, if	EW

The parallel lowering effect on /i, u, ə/ of uvulars and laryngeals is reported for Oowekyala by Hilton & Rath (1982:15-6, 19-20); it is also reported for Heiltsuk by Lincoln & Rath (1980:15-6) and by Rath (1981:9-11), for Haisla by Lincoln & Rath (1986:17, 20-1), and for Kwakwala by Lincoln & Rath (1980:20). By contrast, this effect is completely absent from South Wakashan languages (e.g., Sapir & Swadesh 1939, Fraser & Howe 1996).

In their explanation of a similar lowering pattern elsewhere, Halle, Vaux and Wolfe (2000:406) propose that [-high] spreads from a uvular to a following vowel. Reference to [high] fails to explain lowering in Oowekyala, however, because laryngeals are not specified [-high] and yet they still cause vowel lowering. Rather, the feature responsible for this natural class behaviour of laryngeals and uvulars is [-ATR].[54] An analysis of vowel lowering relying on [-ATR] is offered in the next chapter.

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[54] In the phonological literature, the feature [-ATR] has been used to characterize not only gutturals, but also emphatic nonback segments, e.g. /ṭ, ṣ, etc./, which are found in some Semitic and Salishan languages (see e.g. van Eijk 1997, Bessell 1998; also McCarthy 1994 on [pharyngeal]). Interestingly, the option of specifying nongutturals as [-ATR] turns out to be important for Haisla, which is closely-related to Oowekyala. As Lincoln & Rath (1980:25) report: "It is a peculiarity of Ha[isla] that [some instances of] /t/ and /t̓/ ... cause a following vocalic resonant to sound like after a plain uvular, for example: tiɬa [tɛɪɬa] 'to fish with baited hook and sinker'; tlqʷi [tʌlqʷi] 'the one there is soft (cloth, etc.)'; t̓uxʷa [t̓ouxʷa] 'a wave'; t̓msdu [t̓ɑmsdu] 'stye'. Lincoln & Rath (1986:46) also suggest some possible cases of emphatic /p, p̓/. The

It is proposed that laryngeals are specified [-ATR] according to a grounding condition, in the sense of Archangeli & Pulleyblank (1994).

(187) [glottal] ⊃ [-ATR] Laryngeals are specified [-ATR]

The feature [glottal] is adopted as an articulator feature after Halle, Vaux & Wolfe (2000).

Note, finally, that there is an exception to the vowel lowering pattern described above. Vowel lowering does not occur after rounded uvulars.

(188) High vowels after labiouvulars

a.	C̓əyuqʷ[i]mux̌ʷ	name of the people at the mouth of the K'syaNwa River not far from C'yu	DS58
b.	qʷ[u]ln	beaver	EW, HS, BC
c.	tlǧʷ[i]sa	to eat beforehand (before a trip or before main course)	EW
d.	ciǧʷ[u]ɬ	boiled, curdled, coagulated blood	EW
e.	q̓ʷaxq̓ʷ[i]ɬ	barrel	EW
g.	q̓ʷ[u]dayu	spoon for eating berries (flat wooden spoon), soapberry spoon	BC94: DS
h.	ƛ̓ux̌ʷ[i]lac̓i	freezer	JSS3
i.	c̓k̓ʷx̌ʷ[u]	short neck(ed)	HS

This exception may indicate that labio-uvulars are not specified [-ATR], perhaps due to a constraint on the combination of [-ATR] and [+round]. There is in fact a probable grounded rationale for such a cooccurrence constraint. As noted above, tongue root retraction ([-ATR]) and tongue raising ([-low]) are antagonistic gestures; cf. (177). On the other hand, secondary rounding in consonants ([+round]) is normally associated with tongue raising ([-low]). As Ladefoged & Maddieson (1996:356) remark:

> In the great majority of cases where lip rounding is employed as a secondary articulation, there is an accompanying raising of the back of the tongue, i.e. a velarization gesture.

By transitivity, then, the features [-ATR] and [+round] ought to be antagonistic.

The notion that [-ATR] is absent from labialised uvulars is suspect in at least one respect. As mentioned in the previous section, historically uvular ejectives changed to pharyngeal /ʕ/ in Nuuchahnulth and Ditidaht, and uvular fricatives changed to pharyngeal /ħ/ in Nuuchahnulth. The fact that labialised uvulars /q̓ʷ, x̌ʷ/ fully participated in these historical changes (e.g., Oowekyala cix̌ʷa 'sour' vs. Nuuchahnulth ciħuk 'ibid.') suggests that uvulars are uniformly specified [-ATR]. It is concluded that all uvulars are [-ATR]. The next chapter, which focuses on

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fact that these consonants have the same effect on an adjacent vowel as uvulars and laryngeals suggests a common feature, arguably [-ATR].

the syntagmatic segmental phonology of Oowekyala, will provide an alternative explanation for the fact that labialised uvulars fail to induce lowering in a following vowel.

2.5. Intrasegmental phonology: conclusion

In classical generative phonology (Chomsky and Halle 1968, hereafter SPE), intrasegmental combinations of features were banned by 'linking' rules. For example, the combination of features for a labial fricative could be banned by (189).

(189) An SPE-style Oowekyala-particular constraint

$$[-\text{sonorant}] \rightarrow [-\text{continuant}] / \begin{bmatrix} \text{-----------} \\ -\text{coronal} \\ +\text{anterior} \end{bmatrix}$$

As Chomsky and Halle recognised, linking rules such as the one just given cannot be wholly language-specific since they normally reflect universal tendencies, i.e. markedness (see Trubetskoy 1939, Jakobson 1939, 1941 on Markedness Theory). For example, compare the rule in (189) with Sherzer's (1976:258) implicational statement (141) on p. 57. Since only languages without (189) can have labial fricatives, it is apparent that this rule contributes to making the segment inventory of Oowekyala relatively less marked cross-linguistically, at least from the perspective of the marking implication in (141).

Chomsky and Halle cautioned that while the theory of markedness is absolute (i.e. shared by all languages), its application is relative (i.e. depends on particular languages). To continue with our example: the markedness of labial fricatives remains constant, whether it is apparent in grammar, as in Oowekyala, or not, as in English. In SPE, therefore, markedness is not used to ban marked feature combinations directly. Rather, it is used to assess the 'naturalness' of language-specific rules affecting feature combinations from a system-external point of view. The rule in (189) is thus a good candidate for grammaticalisation because it results in a relatively less marked phonological system (Sherzer 1976:258). In contrast, an equally logical rule such as (190) is less likely to become grammaticalised because it would result in an increase of relative markedness (a system with labial fricatives but no labial stops).

(190) A logically possible but implausible SPE-style rule

$$[-\text{sonorant}] \rightarrow [+\text{continuant}] / \begin{bmatrix} \text{-----------} \\ -\text{coronal} \\ +\text{anterior} \end{bmatrix}$$

Suppose, then, that Oowekyala grammar includes a markedness-motivated language-particular rule like (189) above. This rule contributes to a relatively less marked inventory of segments ("no labial fricatives") in Oowekyala, but ironically it also adds to the grammar's complexity. This illustrates a basic contradiction in the SPE approach to segment inventories: the complexity (markedness) of a segment decreases only if the complexity (number of language-particular rules) of the grammar increases, and vice versa. This contradiction persists even in modern SPE-style theories where rules like (189) are reinterpreted as 'persistent' feature-changing rules (Mohanan 1991, Myers 1991, Halle, Vaux & Wolfe 2000:409): such rules render phonological segments less complex (less marked) but their host grammar becomes more complex (it has more rules).

A partial solution to this problem was offered by the markedness-based Radical Underspecification theories of the 1980's (esp. Kiparsky 1982, 1985, Pulleyblank 1986).[55] On the starting assumption that "underlying representations must reduce to some minimum the phonological information used to distinguish lexical items" (Steriade 1995:114), underspecification theories postulate redundancy rules such as (191) (cf. (189)) that simplify the segment inventory by allowing unmarked values (such as [-continuant] in labial obstruents) to be absent from underlying segments. Crucially, those redundancy rules which prove to be cross-linguistically valid (because they are based on markedness) are assumed to be part of Universal Grammar. Consequently, redundancy rules simplify segment inventories without necessarily adding to the complexity of the language-specific portion of grammars.

(191) An underspecification-theoretic redundancy rule

$$[\ \ ] \rightarrow [-\text{continuant}] / \begin{bmatrix} \text{----------} \\ -\text{sonorant} \\ -\text{coronal} \\ +\text{anterior} \end{bmatrix}$$

As Mohanan (1991) remarks, however, the redundancy rules of underspecification theories introduce some formal redundancy into phonological theory, because they exist alongside 'linking' rules that work against marked combinations of features (see Roca 1994:82 for more discussion). Indeed, redundancy rules like (191) do not simply replace SPE-style rules like (189). To see this, consider again the alleged adaptation of English labial fricatives into Oowekyala, e.g. (143). The redundacy rule (191) fills in underspecified features, but it does not require labial fricatives to change to stops. In order to account for the initial adaptation of e.g. Vancouver > bank^{w}uba in Oowekyala, one needs to posit the independent existence in Oowekyala grammar of some structure changing rule like (189) (see Mohanan 1991, Myers 1991).

To recapitulate, a basic contradiction of derivational phonology is that rules render phonological segments less complex (less marked) but their host grammar is more complex (it has more rules). This problem stems from the fact that markedness is not incorporated directly into the grammatical analysis. OT (Prince and Smolensky 1993) avoids this problem by recognising the grammatical status of markedness constraints. So for instance, prohibitions on labial fricatives are understood as the effect of a markedness constraint on the feature combination [labial, +continuant] that is literally present in every grammar (see section 2.4.2.1).

[55] Because they assumed the segment as phonological primitive, contrastive underspecification theories contributed little to our understanding of feature cooccurrence restrictions within segments (see Archangeli 1988 for some critical discussion).

The OT approach to segmental inventories differs from derivational approaches (e.g. Kiparsky 1985, Archangeli & Pulleyblank 1994) in at least two other ways. First, within derivational Lexical Phonology (e.g. Kiparsky 1985) a language's segment inventory fixes the melodic content of underlying representations but must also be stipulated as a general condition on the output of (lexical) rules —this is 'structure preservation' (Kiparsky 1985:92). Archangeli and Pulleyblank (1994) avoid this stipulation by making the claim that the conditions making up the inventory hold to the maximal extent possible, i.e. in both underived and derived lexical representations, as well as in (lexical) rules. In contrast, OT imposes no restrictions on underlying representations and instead makes the strong claim that output constraints are not only necessary but sufficient in explaining phonological patterns, including the segmental inventory of a language.

Second, to the extent that segmental inventories are discussed in derivational theory (esp. Kiparsky 1985, Archangeli & Pulleyblank 1994), they are treated as arbitrary (i.e. extra-grammatical) selections of phonological features and arbitrary selections of featural cooccurrence conditions. By contrast, in OT a language's segmental inventory is strictly determined by its constraint grammar. Specifically, each segment inventory derives from a particular interaction between 'markedness' constraints that militate against featural complexity, and 'faithfulness' constraints that aim to preserve lexical featural specifications.

3. Intersegmental phonology

3.1. Introduction

In current operational derivational phonology (e.g. Halle, Vaux & Wolfe 2000), the deterministic role of constraints in establishing segmental inventories is acknowledged, but constraint-based explanation of segmental distributional patterns is denied. Take Calabrese (1995:457):

> [M]arking statements or prohibitions or other phonotactic conditions cannot be used to account for language-particular distributional facts, but only to account for restrictions on the structure of phonological elements —that is, in the paradigmatic component of language.

OT may be seen as an attempt to extend the constraint-based approach to the syntagmatic component of phonology. This chapter applies OT to the following intersegmental patterns in Oowekyala: rounding of consonants after /u/ and after rounded consonants (section 3.2), degemination (section 3.3), patterns affecting continuancy including spirantisation/deocclusivisation (section 3.4) and dissimilation of continuancy (section 3.5), patterns of voicing neutralisation (section 3.6) and vowel lowering (section 3.7.1). An allophonic pattern of sonorant debuccalisation is described last (section 3.7.2).

3.2. Rounding in consonants

The feature [+round] is distinctive in Oowekyala consonants, e.g. c̓ik̓ʷ 'bird' vs. n̓ik̓ 'siphon, penis'; qʷuƛ̓a 'full' vs. quła 'bent'.[56] Contrastiveness results from the following ranking.

(192) $$\text{Faith-IO(C, round)} \gg {}^{*}\begin{bmatrix}+\text{cons}\\ +\text{round}\end{bmatrix}$$

The distinction between rounded and unrounded consonants can be neutralised under two circumstances: when a consonant follows /u/, and (optionally) when a consonant follows a rounded consonant. This section discusses these two neutralising contexts in turn.

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56 Oowekyala and Heiltsuk are apparently unique to their general area in allowing rounding contrasts before /u/. In the other Wakashan languages (including Haisla, Kwakwala, and Nuuchahnulth), only unrounded obstruents are permitted before /u/, while the opposite is true of Nuxalk: "Before u, unrounded postvelars and palatovelars (K) are not found." (Nater 1984:6; see also p. 4).

3.2.1. Neutralisation after /u/

3.2.1.1. Description

A (pan-Wakashan) constraint illustrated in (193) requires that velars and uvulars be rounded after /u/.

(193) Rounding of velars and uvulars after /u/

a.	dukʷ-a (*duka)	to troll; Lyall's American stinging nettle (Urtica dioica)[57]	EW, BC120: HS, BC
b.	y̓ugʷ-a (*yuga)	to rain	JSS3
c.	ƛ̓uk̓ʷ-pa (*ƛ̓uk̓pa)	to get spruce roots (for making baskets)	BC507: DS
d.	buxʷ-ls (*buxls)	illegitimately pregnant	EW
e.	cuqʷ-a (*cuqa)	to beg, to go and ask for something	EW
f.	huǧʷ-iƛ (*huǧiƛ)	to run into the house (with a group of people)	HS
g.	luq̓ʷ-as (*luq̓as)	Western or Lowland hemlock tree (Tsuga heterophylla)	EW; BC71
h.	lux̌ʷ-a (*lux̌a)	to roll (said of a round thing)	EW, HS

This constraint may be stated informally as follows.

(194) A vowel /u/ must share the feature [+round] with a following velar or uvular obstruent.

That this is not simply a morpheme structure constraint (e.g. (193)), but a more general constraint in Oowekyala, is apparent from alternations. For example, the initial segment of the inchoative suffix -xʔit, illustrated in (195), becomes rounded after u-final stems, as illustrated in (196).

(195) -xʔit 'to become, to start'

a.	ɬl̓-xʔit	to become dead	HS
	ɬl̓	dead, inactive, paralysed	EW, HS
b.	pqʷc̓-xʔit	to become sleepy or drowsy	HS
	pqʷc̓	drowsy, sleepy	EW
c.	pusq̓a-xʔit	to become very hungry, to get a very hungry feeling	EW
	pusq̓a	very hungry feeling (as when starved), to feel very hungry	HS

(196) -xʷʔit 'to become, to start'

a.	ʔlx̌ʷstu-xʷʔit	to assume the colour of blood	HS
	ʔlx̌ʷstu	colour of blood, having the colour of blood	HS

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[57] An alternate form for 'stinging nettle' is duxʷa.

b.	ƛ̓u̓xʷalasu-xʷʔit	to fall ill, to become sick	WL
	ƛ̓u̓xʷalasu	to suffer from a disease, to be ill, sick	WL
c.	tu-xʷʔit	to take a walk, to start to walk	HS
	təw-a	to walk	EW, DS146
d.	su-xʷʔit	to take, grab, pick up, grasp with the hand	HS
	səwa	to carry, get, take, hold in one's hand	EW

Similarly, the initial segment of the suffix -gila 'to make', illustrated in (197), becomes rounded after u-final stems, as illustrated in (198).

(197) -gila 'to make'

a.	ʔənm-gila-xʔit	to make a sling	HR36
	ʔənm	sling	HS
b.	ğin̓i-gila	to cook fish eggs	WL
	ğin̓i	salmon roe, salmon eggs	EW
c.	məya-gila	draw/carve a fish	WL
	məya	fish (esp. salmon)	EW

(198) -gʷila 'to make'

a.	mu:-gʷila	to get, catch, receive, obtain, acquire four items (e.g. four animals, furs, salmon)	HS
	mu:p̓nista	four round trips, to make four round trips	EW
b.	ʔamastu-gʷila	to make kindling	HS
	ʔamastu	kindling	HS
c.	Tu-gʷila	beginning of one's Indian dances; name of the younger brother of Muudana, who was Peter Chamberlain's great-uncle; term used for the second series of the Həmac̓a Dances	DS146
	təwa	to walk	EW, DS146

The initial obstruent of the suffix -k̓ala 'noise, sound', illustrated in (199), also becomes rounded after /u/, as illustrated in (200).

(199) -k̓ala 'noise, sound'

a.	nan-k̓ala	sound of a grizzly bear	HS
	nan	grizzly bear; name of Ray Johnson	EW, HS, BC
b.	waka-k̓ala	sound of barking	HS
	waka	to bark (dog), to woof	EW, HS
c.	nuł-k̓ala	sound of foolish talk	EW
	nuła	to behave in an odd, crazy, or foolish way, as if possessed	EW, DS110

(200) -k̓ʷala 'noise, sound'

a.	tu-k̓ʷala (*tuk̓ala)	sound of footsteps	HS
	təwa	to walk	EW, DS146
b.	l̓əx̌ʷu-k̓ʷala (*l̓əx̌ʷuk̓ala)	sound of coughing	HS
	l̓əx̌ʷəwa	to cough	EW

The initial segment of the suffix -ğu 'together', illustrated in (201), becomes rounded after /u/, as illustrated in (202).

(201) -ğu 'together'

a.	bn̓-ğut	to put things close together	EW
	bən̓a	close to sth.	HS
b.	la:-ğu	to go (fit) together (as e.g. the pieces of a jigsaw puzzle), to fuse together	HS
	labut	to go to the end of sth.	HS
c.	ʔak-ğu	all together (as for a meeting, a job)	HS
	ʔak	all, in full, every(thing), any(thing), each; entire(ly), complete(ly); to finish sth. up completely	EW

(202) -ğʷu 'together'

a.	mu:-ğʷəw-ala	four people walking together	HS
	mu:p̓ənax̌a	four times down	WL

Likewise, the initial segment of the suffix -x̌s 'aboard', illustrated in (203), becomes rounded after /u/, as illustrated in (204).

(203) -x̌s 'aboard'

a.	w̓n-x̌s	to stow away, to sneak onto a boat	WL
	w̓əna.	to hide, to sneak about	EW
b.	k̓ʷa̓-x̌s	to sit in a boat	HS
	k̓ʷa̓s	to sit outside	HS
c.	xʷlt-x̌s	fire (stove) on the boat	WL
	xʷlta	to burn (said of a fire, coals, offerings)	EW

(204) -x̌ʷs 'aboard'

a.	mu:-x̌ʷs	four people aboard the boat, to be four aboard	HS
	mu:p̓ənax̌a	four times down	WL
b.	q̓atu-x̌ʷs	to assemble, gather or meet together on the boat	HS
	q̓atu	meeting	HS

Finally, rounding also occurs across the prefix-root boundary. Recall that the most common form of the plural in Oowekyala is a CV-shaped reduplicative prefix. The data in below show that a root initial obstruent becomes rounded when the copied vowel in the reduplicative prefix is /u/. (Note that syncope applies within the base, such that /u/ deletes after being copied).

(205) Rounding in Oowekyala plural forms

	singular	*plural*		
a.	kusa	ku-kʷsa	to shave, scrape off with a knife (skin, fur, fish scales)	EW, HS
b.	quɬəla	qu-qʷɬəla	bend, crooked, warped	EW
c.	qux̌ʷa	qu-qʷx̌ʷa	to scrape	HS, EW
d.	ǧul'as	ǧu-ǧʷəl'as	salmonberry (Rubus spectabilis) bush	HS; BC114
e.	ǧum'a	ǧu-ǧʷəm'a	paddle; propeller	EW, HS, JSS3

3.2.1.2. Analysis

In operational terms, one might say that the feature [+round] spreads from the vowel /u/ onto a following consonant in Oowekyala. But it is problematic to state a rule of rounding assimilation involving /u/. First, the rule in question would effectively apply during morpheme concatenation, e.g. (196), (198), (200), (202), (204), (29); but in doing so, the rule would duplicate the structural conditions holding of all morphemes in Oowekyala, e.g. (193). That is, rounding assimilation —if treated by rule— typifies the Duplication Problem (Kenstowicz & Kisseberth 1977).

A second problem comes from the fact that [±round] is predictable from the backness and height features of vowels in Oowekyala (as in most languages). Steriade (1987) points out that when lip rounding is predictable (as in the Oowekyala vowel system), it serves mainly to 'enhance' the perceptual saliency of backness and height in vowels (cf. Stevens, Keyser and Kawasaki 1986). This implies that in a language like Oowekyala, backness and height are contrastive vowel features while rounding is redundant. The vowels of Oowekyala are indeed sufficiently distinguished by [high] and [back], or else by [low] and [back], as shown in (206).

(206) Oowekyala vowels specifications

	i	a	u		i	a	u
[high]	+	-	+	[low]		+	
[back]	-		+	[back]	-		+

On the assumption that only contrastive features are present in lexical representations, contrastive underspecification theories (see Steriade 1987, Clements 1988, & Mester & Itô 1989) make the strong prediction that rounding cannot be an active vowel feature in Oowekyala (lexical) rules. In fact, of course, the noncontrastive feature [+round] of /u/ is one of the most cal) rules. In fact, of course, the noncontrastive feature [+round] of /u/ is one of the most active features in the phonology of Oowekyala (and indeed of Wakashan in general); see (196), (198), (200), (202), (204), (29).

A similar failed prediction is made by Calabrese (1995) who also argues that in a language like Oowekyala, where vowels are unmarked with respect to [±round], only backness and height features are contrastive, as shown in the first three rows of (207). The contrastive feature specifications are enclosed in squares, following Calabrese (1995:436). Calabrese does not believe that noncontrastive and unmarked features, such as [±round] in (207), are underspecified in lexical representations (cf. Steriade 1987), but he claims that phonological operations are not sensitive to such features. The prediction of contrastive underspecification theories (see above) therefore remains: backness and height are active features in Oowekyala rules, but rounding is not (contrary to fact).[58]

(207) Oowekyala vowels specifications (Calabrese 1995:436)

	i	a	u
[high]	$\boxed{+}$	–	$\boxed{+}$
[low]	–	+	–
[back]	$\boxed{-}$	+	$\boxed{+}$
[round]	–	–	+

To be fair, most derivational theories accept that rules may refer to noncontrastive features in the postlexical phonology. It could be claimed, therefore, that rounding assimilation in Oowekyala is a postlexical rule. This is not the case, however. Not only is rounding assimilation structure-preserving (hence lexical-looking), but it also generally fails to apply to enclitics. As (208) and (209) illustrate, [+round] does not 'spread' from word-final /u/ to enclitic-initial consonants; e.g. compare (198b) and (208b).[59] If rounding assimilation were really a postlexical rule, we would expect it to apply after encliticisation.

(208) -ki '3rd person, gone, absent enclitic'

a.	k̓adayu-ki (*k̓adayu-k^{w}i)	a/the pen that is gone/absent	HS
b.	ʔamastu-ki (*ʔamastu-k^{w}i)	some/the kindling that is gone/absent	HS

[58] The connection between contrastivity and phonological activity has been reiterated most recently by Halle, Vaux and Wolfe (2000:398): "Unless specifically noted [meaning, in marked cases -dh], only contrastive features are visible to a phonological rule." (See also Vaux 1993.)

[59] In this regard, Oowekyala differs from Heiltsuk, where rounding assimilation applies even to enclitics, e.g. k̓adayu-k^{w}i. Even among Oowekyala speakers, there appears to be some speaker variation.

(209) -gask '3rd pers. poss. enclitic (owner & object both located near speaker)

a.	k̓adayu-gask (*k̓adayu-gʷask)	his/her pen (owner and object both located near speaker)	HS
b.	ʔamastu-gask (*ʔamastu-gʷask)	his/her kindling (owner and object both located near speaker)	HS

In sum, a rule-based account of rounding assimilation in Oowekyala (and in Wakashan in general) faces two embarrassments. First, it treats as coincidental the fact that a spreading rule creates output representations that correspond exactly to the independently-attested static phonology of Oowekyala (morpheme structure constraints): a vowel /u/ always shares the feature [+round] with a following velar or uvular obstruent. Second, the rule-based account paradoxically involves the spreading in lexical phonology of a nonlexical (i.e., noncontrastive, redundant) feature.

These problems can be overcome in an output-oriented constraint-based approach that formally recognises the connection between feature redundancy and feature underspecification. To see this, first recall the following universal implication from chapter 2.

(210) $\begin{bmatrix} -\text{cons} \\ +\text{back} \\ -\text{low} \end{bmatrix} \supset [+\text{round}]$ Nonlow back (semi-)vowels must be rounded.

This constraint[60] is part of a family of constraints that Itô, Mester and Padgett (1995:579) describe as

> ...familiar phonetic-realizational constraints (involving "grounding," in the terminology of Archangeli and Pulleyblank 1994), where representations are required to be richly specified for phonetically required or desirable properties. These include the redundant properties for each segment class; they may be physically inherent, or serve to enhance contrasts, or in other ways be favored (see Stevens, Keyser, and Kawasaki 1986). Thus, sonorants are voiced, back (nonlow) vowels are round, high vowels are [+ATR], and so on. (emphasis added)

Now, suppose we follow Itô, Mester and Padgett (1995) in assuming that Universal Grammar includes a family of featural "licensing" constraints that fit the following general schema.

[60] The formulation in (210) has the disadvantage of requiring that all nonlow back (semi-)vowels be specified [-low]. In section 2.4.2.2 this stipulation was avoided by formalising (210) as two constraints: one that favours rounding in back (semi-)vowels (148) and another that disfavours rounding in low vowels (149).

(211) Licensing Cancellation (Itô, Mester and Padgett 1995:580)

If $F \supset G$, then $\neg(F \lambda G)$

"If the specification [F] implies the specification [G], then it is not the case that [F] licenses [G]."

From (210) and (211), it follows that the feature [+round] is not licensed when it is linked to the vowel [u] (because the [+round] specification is predictable from the backness and height of this vowel). On the other hand, [+round] is licensed when linked to the consonant [kʷ], since [+round] specification is not predictable in this segment (e.g., nikʷa 'to catch salmon at night' vs. nika 'to retaliate'; ƛ̓aqʷa 'copper' vs. ƛ̓aqa 'to stretch out a line, go deep-sea fishing'). In fact, rounding in this case is undesirable, since [k] is less marked.

(212) a. Unlicensed [+round]

```
[u]
 |
+round
```

b. Licensed [+round]

```
[kʷ]
 |
+round
```

Note that Itô, Mester and Padgett's (1995) notion of licensing does not imply that the feature [+round] is incompatible with a nonlow back vowel. In fact, there is real pressure from (210) that a nonlow back vowel should be [+round]. To illustrate the relation between licensing and grounded implicational statements like (210), consider the following tableau for nusa 'tell (a story)'. The first candidate with the vowel u specified for rounding satisfies (210) but violates Licensing. By contrast, the candidate with the vowel u unspecified for rounding violates (210) but satisfies Licensing.

(213)

	License[round]	$\begin{bmatrix}-\text{consonantal}\\+\text{back}\\-\text{low}\end{bmatrix} \supset [+\text{round}]$
a. nusa (u linked to +rd)	*	
b. nusa		*

Turning now to the cases described in (193), consider the following tableau for duqʷa 'to look' (-a 'completive'). The first two candidates violate either (210) or Licensing. By contrast, the third candidate with doubly linked rounding violates neither constraint: (210) is fulfilled because the vowel u is specified [+round], and Licensing is fulfilled because this feature is linked to an obstruent.

(214)

(214)

	License[round]	$\begin{bmatrix} -\text{consonantal} \\ +\text{back} \\ -\text{low} \end{bmatrix} \supset [+\text{round}]$
a. d u q a		*!
b. d u q a | +rd	*!	
c. d u qʷ a \/ +rd		

The alternations exemplified in (196), (198), (200), (202), (204) and (205) can be similarly explained and further suggest that Faith-IO(C, round) ranks lower than Licensing and (210). This is shown for tuk̓ʷala 'sound of footsteps' in the following tableau.

(215)

t u + k̓ a l a | +rd	License[round]	$\begin{bmatrix} -\text{consonantal} \\ +\text{back} \\ -\text{low} \end{bmatrix} \supset [+\text{round}]$	Faith-IO(C, round)
a. t u k̓ a l a		*!	
b. t u k̓ a l a | +rd	*!		
c. t u k̓ʷ a l a \/ +rd			*

An issue remains: why does a vowel /u/ share the feature [+round] with a following consonant, but not with a preceding consonant? For instance, why isn't quła 'bent' pronounced *qʷuła (cf. qʷut̓a 'full')? A possible answer is that Oowekyala does not permit the feature [+round] (or perhaps any feature) to be doubly linked across the onset and the nucleus of the same syllable.

(216) No CV Linkage

C V
\/
+rd

Noske (1997:223) gives a similar constraint to explain that VC sequences share [+back], while CV sequences do not, in German. The crucial effect of No-CV-Linkage is shown in the following tableau for kusa 'to shave'.

(217)

k u s a	No-CV Link	License [round]	$\begin{bmatrix}-\text{consonantal}\\ +\text{back}\\ -\text{low}\end{bmatrix} \supset [+\text{round}]$	Faith-IO (C, round)
⇒a. k u s a			*	
b. kʷ u s a +rd			*	*!
c. k u s a +rd		*!		
d. kʷ u s a +r+r		*!		*
e. kʷ u s a +rd	*!			*

In sum, rounding assimilation in Oowekyala (and in Wakashan in general) can be understood in OT as the result of two conflicting general tendencies. On the one hand, there are grounded conditions that ensure rich featural representations such as "nonlow back vowels must be round", "nasals must be voiced", etc. (Archangeli & Pulleyblank 1994). On the other hand, there are licensing constraints against featural redundancy such as "nonlow back vowels do not license rounding", "nasals do not license voice", etc. (Itô, Mester & Padgett 1995). Consequently, optimal representations can be those in which segments are specified for a redundant feature that is shared and licensed by another segment. See Itô, Mester & Padgett (1995) for more examples and further discussion.

3.2.2. Rounding assimilation between obstruents

3.2.2.1. Description

Oowekyala also displays a variable pattern of assimilation whereby a velar or uvular obstruent becomes labialised if it immediately follows a labiovelar or a labiouvular. For example, the initial segment of the suffix -ˀx̌λa 'back', which is illustrated in (218), variably becomes rounded after rounded consonants, as shown in (219).

(218) -x̌̓λa 'back'

a.	q̓k̓x̌λala	motor boat	JSS3
	q̓ka	to bite (mosquito)	JSS3
b.	yip̓x̌λaʔaił	the binding around the bottom edge of the basket	BC65: DS
	yipa	to make a cedar bark mat (i.e. one with a special kind of weave)	HS

(219) -x̌̓ʷλa ~ -x̌̓λa 'back'

a.	k̓lq̓ʷx̌ʷλa ~ k̓lq̓ʷx̌λa	incessantly urinating (said of a male)	HS
	k̓lqʷa	to urinate (said of a male)	EW
b.	gʷuk̓ʷx̌ʷλala ~ gʷuk̓ʷx̌λala	boat with a cabin on the stern	HS
	gʷukʷ	to live in a place, reside, dwell, settle	EW, JSS3
c.	buq̓ʷx̌ʷλa ~ buq̓ʷx̌λa	person who always farts	HS
	buq̓ʷala	to fart	EW
d.	duq̓ʷ-x̌ʷλa ~ duq̓ʷ-x̌λa	to look back	sw71
	duqʷa	to look for sth.	HS

Similarly, the initial segment of the inchoative suffix -xʔit, which is illustrated in (220), variably becomes rounded after a labialised consonant, as shown in (221).

(220) -xʔit Inchoative

a.	p̓a-xʔit	begin to work	WL
	p̓a:la	working	HS, EW
b.	łl'-xʔit	to become dead	HS
	łl'	dead, inactive, paralysed	EW, HS

(221) -xʷʔit Inchoative

a.	dzaq̓ʷ-xʷʔit ~ dzaq̓ʷxʔit	to begin to blow (said of the dzaq̓ʷala wind)	HS
	dzaq̓ʷ-ala	north wind off the sea (also W, SW depending on location)	EW, DS183
b.	qak̓ʷxʷʔit ~ qak̓ʷxʔit	to begin to lose in the game	HS
	qak̓ʷa	to suffer a loss (as in a game)	EW

Likewise, the initial segment of the suffix -x̌̓u 'neck', which is illustrated in (222), variably becomes rounded after a labialised obstruent, as shown in (223).

(222) –x̌u ‘neck’

a.	tq̓lx̌u	itching throat, to have an...	HS
	tq̓ɫa	to itch	EW
b.	glt̓x̌u	long neck, having a long neck	HS
	glt	long, tall	EW

(223) –x̌ʷu ~ –x̌u ‘neck’

a.	c̓kʷx̌ʷu ~ c̓kʷx̌u	short neck(ed); name of a portage on the Sumx̌ulh, exact location unknown	HS, DS59
	c̓kʷ	short	
b.	qʷlq̓ʷx̌ʷu ~ qʷlq̓ʷx̌u	to sprain the neck	sw90
	qʷlqʷa	to sprain, wrench	EW
c.	m̓kʷx̌ʷu ~ m̓kʷx̌u	to choke on something solid	EW
	m̓kʷ-		EW

There are some exceptions to this pattern. First, rounding assimilation does not apply between obstruents across a reduplicative prefix boundary, e.g.:

(224)

a.	K̓lx̌ʷ-k̓lqʷa (*K̓lx̌ʷkʷlqʷa)	refers to a man urinating repeatedly; name of the water-falls at Wu̓x̌ʷƛaʔis or the old Rivers Inlet Cannery site	DS96
	k̓lqʷa	to urinate (said of a male)	EW
b.	k̓ix̌ʷ-k̓ix̌ʷa (*k̓ix̌ʷkʷix̌ʷa)	run, stop, run (repeatedly)	WL
	k̓ix̌ʷa	to run away, escape, flee from	EW
c.	ǧux̌ʷ-ǧux̌ʷa (*ǧux̌ʷǧʷux̌ʷa)	to scoop repeatedly	HS
	ǧux̌ʷa	to scoop up loose things (such as seed, sand, or berries) with one's hand	EW, HS
d.	q̓cxʷ-q̓ckʷa (*q̓cxʷq̓ʷckʷa)	to eat meat	WL
	q̓ckʷ	hair seal meat that has been cut up	JSS3

Second, there are lexical exceptions to rounding assimilation between obstruents, e.g.:

(225) –x̌s ‘aboard’

a.	q̓ikʷx̌s (*q̓ikʷx̌ʷs)	to lie in the boat (said of animate beings)	HS
	q̓ikʷa	to lie on sth. (said of animate beings)	HS
b.	sukʷx̌sa (*sukʷx̌ʷsa)	to pick up, lift, grab sth. in the boat	HS
	sukʷa	to take hold of with the hand; to pick up, lift, grasp, grab with the hand	HS

c.	ləqʷx̌sa (*ləqʷx̌ʷsa)	to light the stove in the boat	HS
	ləqʷa	wood, firewood	JSS3
d.	x̌ʷisiqʷx̌s (*x̌ʷisiqʷx̌ʷs)	(on) the other (or: the far) side of the boat one is in	HS
	x̌ʷisiqʷa	to travel on the other (or: the far) side of the channel	HS

(226) -qəya 'forehead'

a.	ƛ̓uqʷqya (*ƛ̓uqʷqʷya)	bald head, to be bald-headed	EW
	ƛ̓uqʷa	to make bald or bare, to cut off all hair, to remove everything from an island or a piece of land	HS
b.	ƛ̓aqʷqya (*ƛ̓aqʷqʷya)	red hair(ed)	HS
	ƛ̓aqʷa	red	EW, DS156
c.	mukʷqyaut (*mukʷqʷyaut)	to tie sth. to the top of the head	HS
	mukʷa	to tie a rope to something, to tie a knot in a rope, to hand somebody	EW
d.	buqʷqya (*buqʷqʷya)	toque	JSS3

(227) -(k)ga 'inside'

a.	c̓uc̓x̌ʷga (*c̓uc̓x̌ʷgʷa)	to wash the inside of things (e.g. of a pail), to do dishes	HS
b.	w̓ukʷga (*w̓ukʷgʷa)	inside of sth. hollow (e.g. of a boat, cup, dish)	HS

(228) -kasw̓u 'plural'

a.	bukʷkasw̓u (*bukʷkʷasw̓u)	books	JSS3
b.	c̓ik̓ʷkasw̓u (*c̓ik̓ʷkʷasw̓u)	birds	sw90

3.2.2.2. Analysis

The rounding assimilation pattern just described bears some resemblance to the pattern discussed in section 3.2.1 above. There are some important differences, however. First, obstruent rounding is obligatory after u whereas rounding assimilation between obstruents is optional. Second, post-u obstruent rounding applies across reduplicative prefix boundaries, e.g. (29), whereas rounding assimilation does not apply between obstruents across a reduplicative prefix boundary, e.g. (224). Another point of difference is that there are lexical exceptions to rounding assimilation between obstruents, whereas none appear to exist for obstruent rounding after

u. For instance, the initial obstruent of -qəya 'forehead' does not become rounded after rounded obstruents, e.g. (226), but it does so after /u/ in e.g. w̓u-q^{w}əya 'top of one's head'. Compare also (225) and (204) on p. 83.

To account for the dynamic rounding of obstruents following rounded obstruents, the following syntagmatic constraint is posited:

(229) $[+\text{round}] / \begin{bmatrix} +\text{cons} \\ +\text{round} \end{bmatrix}$ --- A segment must be [+round] if it occurs after a labialised consonant.

This constraint directly encodes the fact that rounding assimilation operates exclusively from left to right. For example, the suffix -g^{w}uɬ 'ago' does not cause rounding when it attaches to n̓ik̓ 'siphon': n̓ik̓g^{w}uɬ (*n̓ik̓^{w}g^{w}uɬ) (SW75). The nominaliser -k^w also fails to induce rounding in a preceding (labialisable) consonant, as exemplified here:

(230) -k^w 'nominaliser'

a.	t̓əmakk^w	(door) locked with a key	HS
	t̓əmaka	to lock up with a key (door, trunk, etc.); to tie shoelaces	EW
b.	ʔanqk^w	stripped from a branch with the fingers (as berries)	HS
	ʔanqa	to strip berries off the branches with the fingers	EW, HS
c.	kix̌k^w	(sth.) sawn, lumber, board	BC508: DS
	kix̌a	to use a saw	EW, JSS2, JSS3

In terms of explaining the rightward bias of rounding assimilation in Oowekyala, it is surely significant that in terms of timing, rounding is heavily skewed to the right edge of a consonant. As Ladefoged and Maddieson (1996:357) describe, in consonants rounding "is typically concentrated on the release phase of the primary articulation that it accompanies." Similarly, Watson (1999:298):

> In labialization, protrusion of the lips tends to occur on or after the hold phase of the primary articulation... As a result, the second formant of a vowel *following* a labialized consonant is lower than the second formant of a vowel *preceding* a labialized consonant.

In a phonological theory that is not constrained by phonetic factors, the positional formulation of (229) is a stipulation. In such a theory[61] it is unclear why there should exist a constraint like (229) but not one like, say, (231).

---

[61] Consider, for instance, the position of Gussenhoven and Jacobs (1998:197):

> The two place nodes in a segment with secondary articulation are not sequenced in time. Although in the IPA symbols the superscripts indicating labialization, velarization, etc. conventionally appear to the right of the consonant symbol, the two components of a secondary articulation segment are phonologically simultaneous. That is, a side-view would show a straight line.

(231) $[+\text{round}]/\text{---}\begin{bmatrix}+\text{cons}\\+\text{round}\end{bmatrix}$ A segment must be [+round] if it occurs before a labialised consonant.

But in a phonetically-constrained phonological theory (esp. Archangeli & Pulleyblank 1994) the positional formulation of (229) can be understood as appropriately reflecting the physical fact that rounded consonants are post-labialised, such that a following (labialisable) consonant is naturally rounded. That is, by (229) a representation in which a (post)rounded consonant is followed by a rounded consonant is less "complex" than a representation in which a (post)rounded consonant is followed by an unrounded consonant. (229) is thus solidly grounded; in this sense, it is a "constrained constraint" (while (231) is not).[62]

Next, to explain the fact that consonants variably resist rounding assimilation, it is assumed that (229) is crucially unranked relative to faithfulness, i.e. Faith-IO(C, round). Free ranking is interpreted as in (232), after Kager (1999:406) (see also Prince and Smolensky 1993:51, Kiparsky 1993, Reynolds 1994 and Antilla 1995).

(232) Interpretation of free ranking of constraints:

Evaluation of the candidate set is split into two subhierarchies, each of which selects an optimal output. One hierarchy has

$[+\text{round}]/\begin{bmatrix}+\text{cons}\\+\text{round}\end{bmatrix}\text{---} \gg$ Faith-IO(C, round) and the other

Faith-IO(C, round) $\gg [+\text{round}]/\begin{bmatrix}+\text{cons}\\+\text{round}\end{bmatrix}\text{---}$

The conflict between (229) and Faith-IO(C, round) is illustrated in the following two constraint tableaux. The [+round] feature of stem-final /k^w/ is optimally shared with the following suffix-initial consonant when (229) ranks higher; [+round] is not shared in this way when Faith-IO(C, round) ranks higher.

(233) Variable rounding assimilation across consonants

/c̓k^w-x̌u/	$[+\text{rd}]/\begin{bmatrix}+\text{cons}\\+\text{rd}\end{bmatrix}\text{---}$	Faith-IO(C, round)	$*\begin{bmatrix}+\text{cons}\\+\text{round}\end{bmatrix}$
⇒a. c̓k^{w}x̌^{w}u		*	**
b. c̓k^{w}x̌u	*!		*

---

[62] Archangeli & Pulleyblank (1994:166): "We are led to ask, "What are the conditions on the conditions?" ... conditions used in natural language directly reflect physical correlates of the F-elements involved. Thus, such conditions are physically grounded."

(234) Variable rounding assimilation across consonants

	/c̓k̓ʷ-x̌u/	Faith-IO(C, round)	$[+rd]/\begin{bmatrix}+cons\\+rd\end{bmatrix}$---	$*\begin{bmatrix}+cons\\+round\end{bmatrix}$
a.	c̓k̓ʷx̌ʷu	*!		**
⇒b.	c̓k̓ʷx̌u		*	*

Finally, the fact that rounding assimilation does not occur across reduplicative boundaries (224) is addressed in the next chapter. The fact that rounding assimilation fails to occur with certain suffixes, e.g. -x̌s 'aboard' (225), is taken up below in section 3.4.4 on p. 117.

3.3. Degemination

This section discusses a process of deletion that affects stem-final plain (i.e. voiceless nonglottalised) segments that are followed by identical or similar segments (cf. McCarthy 1986).

3.3.1. Introduction

A first example of the deletion pattern appears in (235). (235a) exemplifies the suffix -p̓iq 'pole, stick', which begins in a labial stop. (235b) shows this suffix in combination with a root ending in a labial stop, viz. t̓p- 'to fish...'; the root-final segment appears to delete before the suffix-initial segment.

(235) -p̓iq 'pole, stick'

a.	dn-p̓iq	crane	JSS3
	dən-a	to pull, haul, drag something with a rope	EW
b.	t̓-p̓iq	fishing rod	JSS3
	t̓p-a	to fish with baited hook and sinker	EW

Similarly, when the suffix -bala 'in passing', e.g. (236a), is combined with a root ending in a labial stop, e.g. ʔip- 'to pinch', the root-final segment apparently deletes before the suffix-initial segment, as shown in (236b). Note that this suffix causes a Ca-reduplication of the root.

(236) -bala 'in passing'

a.	q̓aq̓ixʷ-bala[63]	a liar, to be in the habit of lying	HS
	q̓ikʷ-a	to lie, to tell a lie, to deceive; to call deer with a whistle	EW
b.	ʔaʔi-bala	to pinch in passing	HS
	ʔip-a	to pinch	EW, HS
a.	qʷm̓bis	dry snow	HS
	qʷpa	powdery snow, wood that has turned into powder (as by rot)	HS

[63] The spirantisation of root-final /kʷ/ is a general process, treated in section 3.4 below.

(237) illustrates what happens when the suffix -n̓akʷəla 'gradually', e.g. (237a), is combined with a root ending in /n/, e.g. c̓ən- 'to walk in a group...'. As (237b) shows, the root-final segment is again deleted before the suffix-initial segment.

(237) -n̓akʷəla 'gradually'

a.	gl-n̓akʷla	crawling	WL
	gəl-a	to crawl, to go on all fours	EW
b.	c̓ə-n̓akʷla	to parade, to march; procession	HS
	c̓ən-a	to walk in a group, go in the same direction as others, to move in a procession, to march, to parade	EW

(238) illustrates the result of combining a suffix beginning in /gʷ/, viz. -gʷauɬ 'ago' (238a), with a stem ending in a similar stop, e.g. ʔəbukʷ 'mother'. The stem-final stop apparently deletes before the suffix-initial one, as shown in (238b).

(238) -gʷauɬ 'former'

a.	qcxʷ-gʷauɬdəya	flesh-former	sw58
	qcxʷ	flesh	sw75
b.	ʔəbu̓-gʷauɬdəya	late mother	sw77, 78
	ʔbukʷ	mother	EW, HS, JSS3

(239) shows the result of combining a suffix beginning in /g/, viz. -ganm 'perhaps' (239a), with a stem ending in a similar segment, e.g. n̓ik 'to say'. The stem-final segment apparently deletes before the suffix-initial one, as shown in (239b).

(239) -ganm 'perhaps'

a.	məya-ganm	maybe a fish	WL
	məya	fish	EW, HS
b.	n̓i-ganm	to perhaps say	SW126
	n̓ik	to say, to tell	EW

(240) and (241) illustrate the result of combining suffixes beginning in /k/, viz. -kasʔu 'plural' (240a) and -kaʔu 'big' (241a), with stems ending in the same segment. In each case, a single output /k/ corresponds to the two input segments, as shown in (240b) and (241b).

(240) -kasʔu 'plural'

a.	mayas-kasʔu	plural of: raccoon	HS
	mayas	raccoon	EW, HS, BC, JSS3
b.	c̓lc̓l-kasʔu	the feathers	hr93
	c̓lc̓lk	feathers	hr93

(241) -kaʔu 'big'

a.	q̓anas-kaʔu	a large sea prune	WL
	q̓anas	sea prune, cryptochiton	EW, WL
b.	ʔi-kaʔulisanaɬ	Weather spirit dance of the ƛəw̓ əlax̌a series of dances; making much good all over	DS
	ʔik	good, nice, well, fine, causing satisfaction	EW, HS

Likewise, (242) shows the result of combining a suffix beginning in /x̌/, viz. x̌s 'aboard' (242a), with a stem ending in /x̌/: gax̌- 'to come'. A single output segment again corresponds to the two identical input segments, as shown in (242b).

(242) -x̌s 'boat'

a.	t̓ip-x̌s	set foot into canoe	WL
	t̓ip-a	to step, tread onto sth.; to find fern roots or cockles by feeling with the feet	HS
b.	ga-x̌s	to come aboard the boat	HS
	gax̌	come!	EW

(243) illustrates the result of combining a suffix beginning in /c/, viz. -cq 'across, through' (243a), with a root ending in /c/: wnc- 'to be submerged'. Again, a single output segment corresponds to the two identical input segments, as shown in (243b).

(243) -cq 'across, through'

a.	w̓a-cq̓s	wide (said of a space) (-̓s 'outdoors')	HS
	w̓a-git	(having a) certain thickness, diameter (of tree, etc.)	EW
b.	wn-cqa	wet through, soaked (said of a person)	WL
	wnc-a	to be submerged	EW

(244) shows the result of combining a suffix beginning in /s/, viz. -sǧm 'round and/or bulky thing' (244a), with a root ending in /s/: ʔms 'thick'. Again, a single output segment corresponds to the two identical input segments, as shown in (244b).

(244) -sǧm 'round and/or bulky thing'

a.	di-sǧmt	to wipe sth. round	WL
	dəy-a	to wipe	EW, HS
b.	ʔm-sǧm	thick in shape (as a box)	HS
	ʔms	thick (box, snow, a layer of something), dense (fog, brush)	EW, HS

(245) shows the result of combining a suffix beginning in /ƛ/, viz. -ƛi 'on water' (245a), with a root ending in /ƛ/: baƛ- 'to measure by extending the arms'. A single output segment again corresponds to the two identical input segments, as shown in (245b).

(245) -ƛi 'on water'

a.	ʔaukʷa-ƛi	to stop on the water (said of a canoe)	WL
	ʔaukʷa	to stop (engine)	EW, HS
b.	ba-ƛi	fathom	HS
	baƛ-a	to measure by using the extended arms or fingers	EW

As a last example, (246) illustrates the result of combining a suffix beginning in /ƛ/, viz. -ƛəya 'on roof' (246a), with a root ending in /t/: xʷlt- 'to burn'. The root-final segment deletes before the suffix-initial one, as shown in (246b).

(246) -ƛəyas 'on roof'

a.	λax̌ʷ-ƛəyas	to stand on the roof (said of animate beings)	HS
	λax̌ʷ-a	to stand	DS64
b.	xʷl-ƛəyas	fire on the roof	WL
	xʷlt-a	to burn (said of a fire, coals, offerings)	EW

There are two classes of exceptions to the degemination pattern illustrated in (235)-(246). First, stem-final obstruents that are laryngeally specified do not delete; this fact is exemplified and discussed later in section 3.6. Second, adjacent identical segments that arise as a result of reduplication do not delete. For instance, the data in (247) illustrate a type of C-reduplication which tends to accompany the use of the suffixes -m 'face' and -stu 'eyes'.[64] This type of reduplication results in a sequence of two identical consonants, yet no deletion occurs.

(247) C-reduplication: degemination fails

a.	ƛƛx̌ʷma	to stroke the face with the flat of the hand	HS
	ƛx̌ʷa	to rub, stroke, or press with the flat of the hand	EW
b.	ttxstu	bulging eyes, to have...	HS
	txla	having the eyes open	EW
c.	ccxstwa	to wipe the eyes	HS
	cka	to rub	HS, EW

The data in (248) illustrate the result of applying plural reduplication to reduplicated forms (Ca-reduplication is here 'triggered' by the presence of the suffix: -ˈa 'to try to; to hunt'). As shown, doubly-reduplicated forms involve sequences of adjacent identical consonants that fail to undergo degemination.

[64] Some other examples of C-reduplication with -m 'face' are given here:

a.	qʷqʷɬəma	to scratch an itchy face	HS
	qʷɬa	to scratch (an itch)	EW
b.	t̓t̓kʷəma	to mark the face with scratches, to mark the face by or as if by clawing	HS
	t̓kʷa	to scrape, scratch, claw, grab with the fingers or claws	EW

(248) Double reduplication: degemination fails

a.	tattasax̌ut̓a	plural of: to try to push sth. or s.o. down from a higher level	HS
	tatasax̌ut̓a	to try to push sth. or s.o. down from a higher level	HS
b.	caccaw̓ayu	plural of: container for catching drips from a leaking roof	HS
	cacaw̓ayu	container for catching drips from a leaking roof	HS
c.	kakkadik̓ayu	plural of: unbaited deadfall	HS
	kakadik̓ayu	unbaited deadfall	HS
e.	qʷaqʷqʷl̓a	plural of: to hunt for beaver	HS
	qʷaqʷl̓a	to hunt for beaver	EW, HS
f.	qaqqml̓a	plural of: to hunt for deer	HS
	qaqml̓a	to hunt for deer	HS, WL
g.	x̌ʷax̌ʷx̌ʷat̓a	plural: on the verge of cutting; to (try to) cut?	HS
	x̌ʷax̌ʷat̓a	on the verge of cutting; to (try to) cut?	WL

3.3.2. OT analysis

The degemination pattern illustrated in (235)-(246) is assumed to be caused by a constraint against adjacent matching consonants.

(249) Antigemination

*C_iC_i A sequence of identical consonants is disallowed (where laryngeal features and laterality are irrelevant to identity).[65]

Since the consequence of Antigemination is segment deletion, it is apparent that it outranks Max-IO.

(250) Max(imality)-IO

Every segment of the input has a correspondent in the output.
('no deletion of segments')

The fact that the first, rather than the second, segment undergoes deletion arguably reflects the on-line processing of morphemes. As Pulleyblank (1998b:5) remarks:

> Frequently, indeed typically, lexical access is achieved prior to arrival at the right edge of a lexical item. As such, disruption at the left edge of a form will inhibit lexical access, whereas disruption at the right edge will in many cases have no serious effect since lexical access has already been achieved.

[65] Shaw (1980:339-341) describes a similar process of degemination that affects identical consonants across a root+reduplicant boundary in Dakota, e.g. lut+lut+a → luluta 'to be red'. Shaw gives the rule as $C_i \rightarrow \varnothing$ / ___+C_i (where i = identity). She also observes that "aspiration and glottalisation is irrelevant to the establishment of identity" (p. 340).

For relevant discussion, Pulleyblank (ibid.) recommends Cutler, Hawkins & Gilligan (1985) and Hall (1992).

Specifically, then, it is here assumed that the second segment in a sequence of segments violating (249) is protected by left-edge anchoring (McCarthy & Prince 1999, Pulleyblank 1998b):

(251) Left-Anchor(ing)-IO

Every segment at the left periphery of a morpheme in the input has a correspondent at the left periphery of that morpheme in the output.
('no deletion of segments at the left edge of a morpheme')

Altogether, then, we have the ranking {Antigemination, L-Anchor-IO ≫ Max-IO}, the degemination effect of which is illustrated in the following tableau.

(252) xʷlt-ƛəyas → xʷlƛəyas 'fire on the roof' (246b)

	/xʷlt-ƛəyas/	Antigemination	Left-Anchor-IO	Max-IO
a.	xʷltƛəyas	*!		
b.	xʷlt-∅əyas		*!	*
⇒c.	xʷl∅-ƛəyas			*

Finally, the fact that degemination fails to apply to C_iC_i sequences resulting from reduplication, e.g. (247)-(248), plausibly reflects a higher requirement that morphologically-differentiated forms be also phonologically-differentiated. Indeed, if degemination were applied to the reduplicated forms in (247)-(248), the latter would in fact be indistinguishable from non-reduplicated forms.

3.3.3. Rounding stability in degemination

The analysis just presented assumes that the stem-final consonant simply deletes in degemination. There is evidence, however, that the feature [+round] may "survive" stem-final consonant deletion. To see this, consider again the suffix -x̌s 'aboard' illustrated here:

(253) -x̌s 'on boat'

a.	xʷlt-x̌s	fire (stove) on the boat	WL
	xʷlt-a	to burn (said of a fire, coals, offerings)	EW
b.	ʔalc-x̌sa	...on a boat	HS
	ʔalc-a	to go and pick sea slugs, sea cucumber	EW, HS
c.	ğlq-x̌s	container placed aboard the boat	HS
	ğlq-a	to grasp with the fingers, lift container (e.g. a pail, a pan, a coffin)	EW
d.	ʔigis-x̌sala	loaded with sand (said of boat)	HS
	ʔigis	sand	HS, EW

Of special interest is what happens when -x̌s is added to stems ending in /x^{w}/ or /x̌^{w}/ (cf. /...x̌+x̌.../ in (242b)). In such instances, the initial /x̌/ of the suffix surfaces with the [+round] feature of the deleted stem-final segment, as illustrated here:

(254) -x̌s 'boat'

a.	/...x^{w}-x̌.../ → [...x̌^{w}...]		
	cm-x̌^{w}saɫa	flowing into the boat (said of water)	HS
	cmx^{w}-əla	to flow (water)	EW
b.	/...x̌^{w}-x̌.../ → [...x̌^{w}...]		
	c̓u-x̌^{w}sa	to wash the boat	HS
	c̓ux̌^{w}-a	to wash, launder; to give a feast "to wash off" an event	EW
c.	/...x̌^{w}-x̌.../ → [...x̌^{w}...]		
	λa-x̌^{w}s	to stand (i.e. be upright) on a boat	HS
	λax̌^{w}-a	to stand	DS64

The same phenomenon can be observed with the suffix -x̌sa 'flat object', which is exemplified in (255).

(255) -x̌sa 'flat object'

a.	haiɫux^{w}p̓n-x̌sa	to put ten things aboard the boat; ten flat things (e.g. sheets, halibuts)	HS
	haiɫux^{w}p̓ən-a	ten times; to do sth. ten times	HS
b.	ʔup̓nxstis-x̌sa	a hundred flat things (e.g. sheets, halibuts)	HS
	ʔup̓nxstis	one hundred	HS
c.	ʔaluɫ-x̌sa	new, renewed, or remodeled flat thing	HS
	ʔaluɫ	new, fresh (as a supply of sth.)	HS

When this suffix is added to stems ending in /x^{w}/ or /x̌^{w}/, its initial segment surfaces with the [+round] feature of the deleted stem-final segment, as shown in (256).

(256) -x̌sa 'flat object'

a.	/...x^{w}-x̌.../ → [...x̌^{w}...]		
	yut-x̌^{w}sa	three flat things (e.g. sheets of paper, halibuts)	HS
	yutx^{w}-p̓əna	three times, to do sth. three times	WL
b.	/...x̌^{w}-x̌.../ → [...x̌^{w}...]		
	y̓-x̌^{w}sm	reef covered by tide water (-m 'nom')	HS
	y̓x̌^{w}-a	to rise to a certain level (as the tide)	HS, ds182

Similarly, consider the case of -kaʔu 'big', illustrated in (257).

(257) -kaʔu 'big'

a.	məya-kaʔu	big fish	WL
	məya	fish	HS, EW
b.	q̓anas-kaʔu	a large sea prune	WL
	q̓anas	sea prune, cryptochiton	EW, WL
c.	Kaniɬ-kaʔu	great chief's wife; married woman; term used for new bride of the nobility, or upper class	DS92
	Kaniɬ	chief's wife; refers to holding up a bowl of food as in a ceremony; name of the sister of Galǧmkas; "belonging to the nobility"	DS91

When this suffix is added to stems ending in /kʷ/, its initial /k/ surfaces with the [+round] feature of the stem-final segment. This is illustrated in (258).

(258) -kaʔu 'big'

a.	x̌a̓p-kʷaʔu	husky young person	HS
	x̌a̓pkʷ	young; child	SW77,80
b.	məʔəlu-kʷaʔu	two big ones	hr115
	məʔəlukʷ	two, both, second	HS
c.	gʷu̓-kʷəʔu	huge house	hr121
	gʷukʷ	house	HS, EW
d.	wiː-kʷaʔwax̌ʷ	the eagle	hr89
	wiːkʷ	eagle	EW, HS
e.	ʤəwi-kʷaʔwax̌i	big pit	hr57
	ʤəwikʷ	a hole dug	HS
f.	ləkʷst̓a-kʷəʔu	kind of very strange	sw172
	ləkʷst̓akʷ	kind of different	

The appearance of [+round] on suffix-initial obstruents in e.g. (254), (256) and (258) resembles the phenomenon of tonal stability described by Goldsmith (1976:147):

> In tone languages we find that when a vowel desyllabifies or is deleted by some phonological rule, the tone it bore does not disappear; rather, it shifts its location and shows up on some other vowel.

Goldsmith (ibid.) remarked that tonal stability seems to require "a derivational constraint or conspiracy to move around the tonal specifications from vowel to vowel in order to find on the surface the underlying tone melody" (p. 147, emphasis added). At the time, Goldsmith rejected the possibility of such a "constraint" noting that it would represent "a whole new object which is global and applies anywhere in the course of a derivation, outside the set of ordered rules" (p. 149). But this kind of constraint now finds a natural expression within Correspondence Theory (McCarthy & Prince 1995, 1999):

(259) Max-IO[round]

Every input feature [round] must be realised in the output.

The effect of adding Max-IO[round] to the foregoing analysis is illustrated in the following tableau. As shown, Max-IO[round] ensures that the underlying [+round] specification of the stem-final consonant "survives" on the suffix-initial consonant.[66]

(260) cmx^w-x̌s-ala → cmx̌^{w}sala 'flowing into the boat' (254a)

	/cmx^w-x̌s-ala/	Max-IO[+rd]	Antigem.	L-Anchor-IO	Max-IO
a.	cmx^w-x̌sala		*!		
b.	cmx^w-∅sala			*!	*
c.	cm∅-x̌sala	*!			*
⇒d.	cm∅-x̌^{w}sala				*

Finally, consider briefly the possibility of explaining the appearance of [+round] on the suffix-initial segment in e.g. (254), (256) and (258) without the notion of stability. It might be claimed that [+round] is spread from the stem-final segment to the suffix-initial segment before the stem-final segment deletes.

(261)	Input:	/cmx^w-x̌s-ala/
	Round spread:	cmx^w-x̌^{w}sala
	Degemination:	cm∅-x̌^{w}sala
	Output:	[cmx̌^{w}sala]

This derivational analysis without stability seems convincing at first, since indeed rounding assimilation occurs independently between adjacent obstruents; see previous section (3.2.2). However, a derivational analysis of (254) falsely presupposes that [+round] is spread from a stem-final obstruent to the suffix-initial obstruent of -x̌s before the stem-final obstruent deletes (e.g., cmx^w-x̌s → cmx^w-x̌^{w}s → cm∅-x̌^{w}s). In fact, the initial segment of -x̌s is special in being exempt from rounding assimilation, as shown in (225) on p. 91. More generally, rounding assimilation between obstruents is variable (e.g., (219), (221), (223)) whereas the appearance of [+round] on suffix-initial obstruents in e.g. (254), (256) and (258) is regular. Overall, therefore, a stability analysis is needed. Such an analysis has traditionally been captured in derivational autosegmental phonology (e.g. Goldsmith 1976) but an OT analysis in terms of Max-IO[rd] (as encapsulated in tableau (260)) seems at least as plausible (if not improved).

[66] The easy expression of 'stability' through Correspondence is remarkable, given that this theory was developed independently of the notion of stability.

3.4. Spirantisation/deocclusivisation

3.4.1. Introduction

The contrast between stops/affricates and fricatives is not uniformly preserved in Oowekyala. The main source of neutralisation is a very general process of spirantisation that affects plain obstruent stops and affricates when they are in coda position and are followed by a heterosyllabic consonant. (The fact that laryngeally-specified stops and affricates are exempt from spirantisation is discussed below in section 3.6.) The actual changes are tabulated in (262) and are illustrated in the data that follow.

(262) Spirantisation in Oowekyala

Underlying	Derived	Examples
k	x	(263)
k^w	x^w	(264)
q	x̌	(265)
q^w	$\check{x}^w$	(266)
c	s	(267)
ƛ	ɬ	(268)

(263) k → x / __[$_\sigma$

a.	ʔixp̓a	good or sweet taste, to have a good or sweet taste	WL, JSS3
	ʔik	good, nice, well, fine, causing satisfaction	EW, HS
b.	q̓xn̓a	to keep sth. long (such as e.g. one's finger) between one's teeth	HS
	q̓kəla	holding in the mouth (dog)	EW
c.	sxʔit	to throw a spear or harpoon; to start spearing, harpooning	HS
	ska	to spear, harpoon	EW
d.	w̓anaxƛəyasa	to change the roof of the house	EW
	w̓anaka	to take over s.o.'s job (e.g. because he is tired or because one is working in shifts)	HS
e.	ləxsut	to peck a hole through stone	HS
	ləka	to play the stone throwing game	EW
f.	dzíxsut	to push through sth. with a stick	HS
	dzika	to push or poke with a stick	EW, DS183
g.	k̓xc̓əwala	a fur on a stretch board	HS
	k̓ka	to stretch skins	EW
h.	y̓axstəwala	sore, infected eye; to have ...	HS
	y̓ak	bad, spoiled, evil, vicious, sick, not as it should be	EW, HS

(264) kʷ → xʷ / __[σ

a.	x̌ix̌apxʷm̓ənix̌ʷ	little children	HR137
	x̌ix̌apkʷ	plural of: young; child	SW41,152
b.	t̓ənixʷsila (-xsila)	too cold	WL
	t̓ənikʷ	feeling cold	EW
c.	ƛ̓m̓xʷsut	to tap through sth., to tap a knot out of wood	HS
	ƛ̓mkʷa	to play pool; to tap, pound, or poke with a stick	EW
d.	ʔalxʷc̓əwa	to bleed heavily (as when a vein has been cut)	HS
	ʔalkʷa	blood, to lose blood, to bleed (as when hurt)	EW, HS
e.	baxʷc̓əwa	person who always gathers and preserves food	HS
	bakʷəla	to gather and preserve things for winter	EW
f.	ʣixʷc̓əwa	person (esp. a child) who is always in motion	EW
	ʣikʷa	to move, function, operate	EW
g.	nawalaxʷsista	"power is now present"; name of a potlatch given at the end of a feast when all the food and gifts are seemingly gone, and the hosts' ancestors arrive and do their dances	DS108
	nawalakʷ	name of the spirits from the story of Y'aakas; name is applied to items possessed with supernatural power such as the whistles of the C'aiqa Dance Series, the spirits of the ƛəw̓əlax̌a Dances; term for supernatural power	DS108
h.	ʣixʷsistalasu	bicycle	JSS3
	ʣikʷa	to push with the feet; to move, function, operate	EW
i.	c̓xʷsm	thing that is round and/or bulky and that is short: short box, short house, short hill	HS
	c̓kʷ	short	EW, HS
j.	ʔalx̓ʷsisəla	bleeding from the foot or leg	HS
	ʔalkʷa	blood, to lose blood, to bleed (as when hurt)	EW, HS
	tmxʷʔit	to start to eat cured salmon eggs	HS
	tmkʷa	to cure salmon eggs, to eat cured salmon eggs	EW

(265) q → x̌ / __[σ

a.	nax̌ps	alcoholic person	HS
	naqa	to drink, to swallow a liquid	EW, JSS2
b.	kʷnx̌p̓ala	to smell like mink	EW
	kʷnǧac̓i	den of mink	HS
c.	malix̌-sistala	to swing around	HS
	maliqa	to swing in a circle	EW
d.	xʷix̌-sistalay̓u	skipping-rope	HS
	xʷiqa	to swing a line, throw a rope	EW
e.	ƛ̓ix̌-sista	to spawn all over the area (said of herring)	HS
	ƛ̓iqa	to spawn (said of herrings)	HS

f.	p̓ax̌sta	"flat in the water" like water lillies; name of a swamp behind Zawyas or Oolichan Town	DS125
	paqa	flat, to be flat, to put a flat object somewhere (e.g. to lay shingles on a roof)	EW
g.	kmx̌sk̓ana	to jam or bruise the hand or the fingers	EW
	kmq̓s	something collapsed outside (e.g. a house)	EW
h.	kʷn̓x̌sdana	sth. caused by dampness (e.g. rheumatism)	HS
	kʷnq	wet	HS

(266) qʷ → x̌ʷ / __[σ

a.	ǧʷulux̌ʷnukʷ	to have tallow	WL
	ǧʷuluqʷ	animal fat, suet, tallow	EW
c.	k̓lx̌ʷbis	urine of a male	HS
	k̓lqʷa	to urinate (said of a male)	EW
d.	ʔsix̌ʷƛalił	(on) the other (the opposite) side of the fire in the longhouse	HS
	ʔsiqʷa	to travel on the other (the opposite) side of the channel	HS
e.	gʷasix̌ʷƛala	(on) this side of the fire	HS
	gʷasiqʷa	to travel on this side of the channel	HS
f.	x̌ʷisix̌ʷƛala	(on) the other (or: the far) side of the fire	HS
	x̌ʷisiqʷa	to travel on the other (or: the far) side of the channel	HS
g.	wənix̌ʷsiwa	to scorch through	EW
	wəniqʷa	to scorch	EW
h.	dzix̌ʷsiwa	to stick the feet through sth., to go through sth. with one's feet	HS
	dziqʷa	to push with the feet	HS
i.	wənix̌ʷsiwa	to scorch through	HS
	wəniqʷa	to scorch	EW
j.	ʔsix̌ʷc̓əwił	(on) the other (the opposite) side of the interior of the house of the room	HS
	ʔsiqʷa	to travel on the other (the opposite) side of the channel	HS
k.	tlx̌ʷc̓əwa	thing that is soft inside, sock, stocking	HS
	tlqʷ	soft	EW, HS
l.	hiłdzax̌ʷ-sistut	to translate into the native language; to translate into Heiltsuk	HS
	hiːłdzaqʷ	Heiltsuk	DS
m.	ƛax̌ʷstəwa	to cover the eyes with the hands	HS
	ƛaqʷa	to cover an object with the hand (e.g. for taking the object away unnoticed)	EW
n.	q̓ʷlx̌ʷsis.	to have a ticklish, oversensitive, touchy foot, to be afraid to touch sth. with the foot; a ticklish foot	HS
	q̓ʷlqʷa.	to tickle, to be afraid to touch, to be ticklish	EW

(267) c → s / __[σ

a.	q̓nsk̓ana	to scald the hand, to have a scalded hand; a scalded hand	HS
	q̓nca (3)	to scald	HS
b.	q̓lsn̓a	to grease a pole	HS
	q̓lca	oil, gas, to oil, grease, to lubricate	EW
c.	p̓lsp̓iga	moss on tree trunk	BC51
	p̓lca	to become covered with moss	EW
d.	t̓l:sʔit	to start to get high bush cranberries	HS
	t̓l:c	high bush cranberry (Viburnum edule) (Curtis 1970:332: tulls)	EW, HS, BC91
e.	ʔansʔit	to make a slight move, to start to move over (up) a bit; to make a move in a game of chess or checkers	HS
	ʔanca	to shove, to move towards sth. little by little; to play chess or checkers	EW, HS

(268) ƛ → ɬ / __[σ

a.	m̓iɬc̓əwa	mistake, to make a mistake; to miss (fail to get into) the container (as drips from the tap)	HS
	m̓iƛa	to miss a shot, to dodge, avoid, or escape from something, to dislike contact; name of a dance of the ƛəw̓ələx̌a Series, whistle found in the box made by M'asm̓asalanəwa; name of one of the Winter Ceremonial Dances; name of a man who travels to the moon ...	EW, DS123
b.	q̓əyuɬc̓əwa	far spent (said of the morning), late in the morning	HS
	q̓əyuƛ	to get, acquire, obtain, catch a lot	HS
c.	n̓ɬ-cista	to bend over backwards	HS
	n̓əƛa	to lean back (as in a chair) or to lie on one's back, to lay things on the back (e.g. split fish on the side with the skin)	EW
d.	p̓aɬcm	beetle; things that is round and flat (as a flat whiskey bottle)	HS
	paƛa	to flatten	EW
e.	ǧaɬp̓iq	pole for hooking	HS
	ǧaƛa	to gaff, to hook, to crochet	EW, HS

Another source of neutralisation is a process of spirantisation that affects word-final plain obstruent stops and affricates in the same way as tabulated above in (262), but only variably. This variable process is illustrated in (269)-(273).

(269) k → x / __#

a.	c̓lc̓lk ~ c̓lc̓lx	long feather	SW92,93
b.	ǧʷəlik ~ ǧʷəlix	spruce pitch, chewing gum made out of spruce pitch; used as medicine	EW, BC64: DS

c.	n̓ik ~ n̓ix	to say, to tell	EW, SW79, 187

(270) kʷ → xʷ / __#

a.	q̓ckʷ ~ q̓cxʷ	meat	WL
b.	ƛ̓upkʷ ~ ƛ̓upxʷ	(sth.) barbecued on an open fire	WL, HS
c.	ǧaƛkʷ ~ ǧaƛxʷ	sth. hooked or crocheted	WL
d.	x̌a̓pkʷ ~ x̌a̓pxʷ	young; child	SW77,80, 150

(271) q → x̌ / __#

a.	x̌aːq ~ x̌aːx̌	bone	EW, HS
	mac̓q ~ mac̓x̌	two long and cylindrical things (e.g. trees, logs, bottles, cigarettes)	WL

(272) qʷ → x̌ʷ / __#

a.	gacqʷ ~ gacx̌ʷ	this invisibie one here with me	HS
b.	ǧʷuluqʷ ~ ǧʷulux̌ʷ	animal fat, suet, tallow	EW, WL
c.	qʷǧʷuqʷ ~ qʷǧʷux̌ʷ	swan	EW, HS

(273) c → s / __#

a.	t̓lːc ~ t̓lːs	high bush cranberry (Viburnum edule) (Curtis 1970:332: tulls)	EW, HS, BC91
b.	Nuxʷnc ~ Nuxʷns	Neechanz River	JSS3, DS112

3.4.2. OT analysis

There are some principled exceptions to the changes just described which are treated in later in section 3.6 and in chapter 4. In the meantime, the trigger for the spirantisation process can be formulated as a context-sensitive markedness contraint against the occurrence of [-continuant] in coda position.

(274) *[-cont] $]_\sigma$

An obstruent stop or affricate must not occur in coda position.

It is apparent that the context-sensitive markedness contraint (274) dominates Faith-IO[cont].

(275) Neutralisation of [-cont] in Oowekyala

*[-cont] $]_\sigma \gg$ Faith-IO[cont]

The effect of this constraint ranking is illustrated in the following constraint tableau. As shown, the root-final feature [-cont] of /qʷ/ (cf. niqʷa 'dirty') is optimally delinked/deleted before syllable-initial /p̓/, in compliance with *[-cont] $]_\sigma$ but in violation of Faith-IO[cont].

(276) Regular neutralisation of [continuant] in Oowekyala

	/niqʷ-p̓a/	*[-cont]]$_\sigma$	Faith-IO[cont]
a.	niqʷp̓a	*!	
⇒b.	nix̌ʷp̓a		*

To explain the fact that plain obstruent stops and affricates variably resist spirantisation in word-final position, it is assumed that the feature [-continuant] is preserved through right-edge-anchoring (McCarthy and Prince 1995, 1999) and that this faithfulness constraint is crucially unranked relative to the markedness constraint responsible for spirantisation.

(277) Right-Anchoring-IO[cont]

Let α be a segment in the input and β be a correspondent of α at the right periphery of the word in the output. If α is [γcontinuant], then β is [γcontinuant].

Free ranking is interpreted as in (278), after Kager (1999:406). (See also Prince and Smolensky 1993:51, Kiparsky 1993, Reynolds 1994 and Antilla 1995.)

(278) Interpretation of free ranking of constraints:

Right-Anchor-IO[cont], *[-cont]]$_\sigma$

Evaluation of the candidate set is split into two subhierarchies, each of which selects an optimal output. One hierarchy has Right-Anchor-IO[cont] ≫ *[-cont]]$_\sigma$ and the other *[-cont]]$_\sigma$ ≫ Right-Anchor-IO[cont].

The conflict between Right-Anchor-IO[cont] and *[-cont]]$_\sigma$ is illustrated in the following two constraint tableaux. The [-cont] feature of word-final /qʷ/ is optimally preserved when Right-Anchor-IO[cont] ranks higher; it is optimally delinked/deleted when *[-cont]]$_\sigma$ ranks higher.

(279) Variable word-final spirantisation in Oowekyala

	/ǧʷuluqʷ/	R-Anchor-IO [cont]	*[-cont]]$_\sigma$	Faith-IO [cont]
⇒a.	ǧʷuluqʷ		*	
b.	ǧʷulux̌ʷ	*!		*

(280) Variable word-final spirantisation in Oowekyala

	/ǧʷuluqʷ/	*[-cont]]$_\sigma$	R-Anchor-IO [cont]	Faith-IO [cont]
a.	ǧʷuluqʷ	*!		
⇒b.	ǧʷulux̌ʷ		*	*

The next two tableaux show that the variable ranking of *[-cont] $]_\sigma$ and Right-Anchor-IO[cont] has no effect on the regular process of word-medial spirantisation, since Right-Anchor-IO[cont] is irrelevant in this case (cf. (276) above).

(281) Word-medial spirantisation in Oowekyala

/niq^w-p̓a/	R-Anchor-IO [cont]	*[-cont] $]_\sigma$	Faith-IO [cont]
a. niq^{w}p̓a		*!	
⇒b. nix̌^{w}p̓a			*

(282) Word-medial spirantisation in Oowekyala

/niq^w-p̓a/	*[-cont] $]_\sigma$	R-Anchor-IO [cont]	Faith-IO [cont]
a. niq^{w}p̓a	*!		
⇒b. nix̌^{w}p̓a			*

Two general properties of the analysis just given are worthy of note. First, spirantisation in Oowekyala exemplifies the notion of relative domination, whereby each lower constraint is violated in order to avoid a violation of a higher-ranking constraint. The faithfulness constraint Faith-IO[cont] is violated in order to avoid a violation of higher-ranking *[-cont]$]_\sigma$, and the latter markedness constraint is violated in order to avoid a violation of Right-Anchor-IO[cont] (when the latter ranks higher).

(283)

	constraint
Lexical contrasts of continuancy are preserved,	Faith-IO[cont]
except in coda position,	*[-cont] $]_\sigma$
except (variably) in word-final position.	Right-Anchor-IO[cont]

(284) Constraint ranking for spirantisation in Oowekyala

$$\left\{\begin{array}{l}\text{Right-Anchor-IO[cont]} \gg \text{*[-cont]}]_\sigma \\ \\ \text{*[-cont]}]_\sigma \gg \text{Right-Anchor-IO[cont]}\end{array}\right\} \gg \text{Faith-IO[cont]}$$

Another interesting aspect of this analysis is that the driving force behind spirantisation is a context-sensitive markedness constraint, viz. *[-cont] $]_\sigma$. This makes the strong prediction that no language can have a contrast [±continuant] only in coda position. That is, the current analysis predicts that the following hypothetical language should not occur (cf. Kager 1999:42):

(285) A possible language that is predicted not to occur

a. a contrast of continuancy in syllable codas
yak.li vs. yax.li, x̌aƛ.wa vs. x̌aɬ.wa, wac vs. was

b. but no contrast of continuancy elsewhere
xa: (*ka:), ya.ɬum (*ya.ƛum), su.wa (*cu.wa)

In such a language, continuancy would be regularly neutralised in onset position, so that distinct morphemes like /kaƛ/ and /xaƛ/ would be neutralised as [xaƛ]. This hypothetical state of affairs would run contrary to the widely documented fact that lexical contrasts are normally preserved in syllable onset position while they are frequently neutralised in syllable coda position (see e.g. Lombardi 1999).

To the extent that the type of language just described is not attested, the markedness-driven nature of OT is vindicated. On the other hand, the absence of such languages cannot be explained in rule-based theories that treat markedness as external to the phonological system. In particular, a rule that neutralises continuancy in onset position (i.e. [−son] → [+cont] / [$_\sigma$ __) might be judged complex from the phonology-external viewpoint of markedness, but it should nevertheless be possible (cf. (285)).

3.4.3. Special cases of spirantisation

The basic analysis presented in the preceding section is sufficient for all cases of spirantisation in which /k, kʷ, q, qʷ, c, ƛ/ change to their fricative counterparts [x, xʷ, x̌, x̌ʷ, s, ɬ], respectively; see e.g. (263)–(268) and (269)–(273) above. But what happens with obstruent stops that have no direct fricative counterparts, viz. /p/ and /t/? The actual changes are tabulated here; some examples follow.

(286) Deocclusivisation in Oowekyala

Underlying	*Derived*	*Word medial examples*	*Word final examples*
p	m	(287)	(289)
t	ɬ	(288)	(290)

(287) p → m / __[$_\sigma$

d.	nm̓sut[67]	to break through a surface (e.g. a wall)	HS
	nəpa	to hammer; to break through a surface (e.g. wall, a deadfall); to collapse or cave in (as a roof)	EW
b.	kʷəw̓mba	broken at the end (said of sth. long and horizontal, as a pole)	HS
	kʷupa	to snap, to break (said of a stick or long stick-like thing)	EW
c.	səl̓mbayu	bit (for drilling)	HS
	slpa	to twist, to turn (as in drilling)	EW
f.	ƛm̓-sista	to burst open	EW
	ƛpa	to spread out, unfold, open up, split apart	EW

[67] Some of the examples below show a concomitant process of sonorant glottalisation. This phenomenon is presumably related to the fact that /m/ is moraic in rhyme position while /p/ and /m̓/ are not moraic in this position. In other words, glottalisation arguably avoids the need to add a mora in the change from /p/ to /m/. See Zec (1995) on the status of the mora in Wakashan. This potential functional conspiracy will not be further discussed here.

e.	t̓əy̓m-sistala	riding a bicycle?	JSS2, JSS3
	t̓ipa	to step, tread onto sth.; to find fern roots or cockles by feeling with the feet	HS
g.	ǧəl̓m-sistala	to pull sth. in order to turn it; to steer a boat	HS
	ǧlpa	to grasp, hold on, pull towards oneself (esp. with a hooked finger or hand, e.g. gun)	EW
h.	səl̓m-sistala	to crank, to rotate	HS
	slpa	to twist, to turn (as in drilling)	EW
i.	km̓stut	to tuck or jam into a hole or opening, to stuff up an opening	HS
	kpa	to tuck, etc.	
j.	qʷm̓stu.	dirt in the eye; to have ...	HS
	qʷpa.	to scatter (ashes, etc.), to drop (crumbs)	EW

(288) t → ɬ / __[$_{\sigma}$

a.	dabnɬʔit	become dark	WL
	dabnt	dark (as the night)	EW
b.	c̓iqʷɬkn	baffled, stupefied by what was said	HS
	c̓iqʷt	to miss the point of what is said, to misunderstand sth.	HS
c.	galɬknmas	to make too long	HS
	glt	long, tall	EW
d.	lauɬc̓əwala	taking things out of a container; going out of a long inlet	HS
	laut	to remove sth.	HS
e.	pən̓uɬc̓əwa	to empty a container or bottle	HS
	pənut	to fill a bottle	HS
f.	məɬtu	twitching of the eye; to have a ...	HS
	məta	to twitch, to suffer from twitching	EW
g.	c̓ɬcm	to burst open (said of sth. round and/or bulky, such as a paper bag or a box)	HS
	c̓ta.	to split something, crack, burst, fissure	EW
h.	x̌ʷɬcis	a cut or knife wound in the foot or leg, to have a cut or knife wound in the foot or leg, to cut the foot or leg with a knife	WL
	x̌ʷta	to cut with a knife	EW
i.	məɬk̓ana	twitching of the hand and/or forearm, to have ...	HS
	məta	to twitch, to suffer from twitching	EW
j.	x̌ʷɬk̓ana	a cut or knife wound in the hand or forearm, to have a cut or knife wound in the hand or forearm, to cut in the hand or forearm with a knife	WL
	x̌ʷta	to cut with a knife	EW
k.	waɬ̓cis	to have cramps in the foot or leg, cramps in the foot or leg	HS
	wata	to lead by the hand, to pull	EW, HS
l.	xʷɬp̓ala	smell of fire, smell of sth. burning	HS
	xʷlta	to burn (said of a fire, coals, offerings)	EW

m.	qawał?aƛ̓la	to come to hear (after trying), to succeed in hearing	HS
	qawata	to use a hearing aid or stethoscope	HS

(289) p → m / __#

a.	p̓əl̓up ~ p̓əl̓əw̓m	sister-in-law (according to Franz Boas the precise meaning is: "husband's sister" and "woman's brother's wife")	EW
b.	ƛ̓ukʷp ~ ƛ̓ukʷm	root; licorice fern (Polypodium glycyrrhiza); "root" (rhizome) chewed, possibly for medicinal purposes	EW, SW73, BC59: LJ
c.	hap ~ ham	cry of the cannibal	EW
d.	qʷałup ~ qʷałəwm	ash	HS
e.	ǧup ~ ǧu̓m	fish scales	EW

(290) t → ł / __#

a.	nəkʷt ~ nəkʷł	salal berries (Gaultheria shallon)	BC96
b.	k̓ibat ~ k̓ibał	red elderberry (Sambucus racemosa) fruit	HS; BC90

Focusing first on the case of /p/, recall from section 2.4.2.1 on p. 56 that Oowekyala has no labial fricatives, because *[lab, +cont] is undominated. The simple change /p/ → [f] is therefore not a possible response to *[-cont] $]_\sigma$. In fact, /p/ changes to [m] in the environments of deocclusivisation, as shown in (287) and (289) above. In order to understand the insertion of [+nasal] in these environments, it is important to recognise that the feature [-continuant] may be underspecified in nasals. That is, both of the following representations of nasals are assumed to be phonetically interpretable.[68] (Keating 1988 argues that a segment may remain unspecified for a feature, even at the output of the phonology.)

(291) Two possible representations for nasals

a. Nasal specified for continuancy

```
m
|
-cont
```

b. Nasal unspecified for continuancy

```
m
```

As the following constraint tableau shows, the deocclusivisation of syllable-final /p/ as [m] (see e.g. (287) above) is optimal given two available options: that of inserting [+nasal]

[68] The highly marked status of nasal continuants motivates a universal redundancy implication, [nasal]⊃[-continuant] (cf. Pulleyblank 1997:18), which in turn motivates the underspecification of [-continuant] in nasals, given Itô, Mester and Padgett's (1995) demonstration that output segments do not license redundant features (cf. section 3.2.1.2); recall Licensing Cancellation (Itô, Mester and Padgett 1995:580): If F⊃G, then ¬(FλG) "If the specification [F] implies the specification [G], then it is not the case that [F] licenses [G]." By contrast, [continuant] cannot be underspecified in obstruents, since there is no strong implication that obstruents be [-continuant].

(*[-cont] $]_\sigma \gg$ Dep-IO[nas]), and that of underspecifying [m] for [continuant]. (Note that free-ranking Right-Anchor-IO[cont] is irrelevant in this instance.)

(292) Deocclusivisation of word-medial /p/ in Oowekyala

/ƛp-sista/ | [-cont]	*[-cont] $]_\sigma$	Dep-IO [nas]	Faith-IO [cont]
a. ƛp$]_\sigma$sista | [-cont]	*!		
b. ƛm̓$]_\sigma$sista | [-cont]	*!	*	
⇒c. ƛm̓$]_\sigma$sista		*	*

The variable deocclusivisation of word-final /p/ (see e.g. (289)) is illustrated in the next two constraint tableaux. When Right-Anchor-IO[cont] dominates *[-cont] $]_\sigma$, as in (293), word-final [-cont] must be preserved. Because deocclusivisation (293c) fails anyway, the addition of [+nasal] in (293b) is unwarranted: it unnecessarily violates Dep-IO[nas]. The optimal candidate is thus fully-faithful (293a).

(293) Preservation of word-final /p/ in Oowekyala

/ƛ̓ukʷp/ | [-cont]	R-Anchor-IO [cont]	*[-cont] $]_\sigma$	Dep-IO [nas]	Faith-IO [cont]
⇒a. ƛ̓ukʷp | [-cont]		*		
b. ƛ̓ukʷm | [-cont]		*	*!	
c. ƛ̓ukʷm	*!		*	*

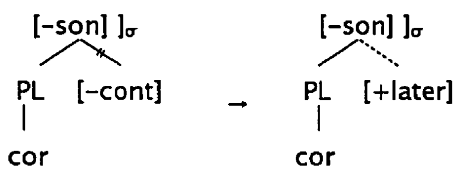
When *[-cont] $]_\sigma$ dominates Right-Anchor-IO[cont], as in (294), word-final [-cont] must be delinked/deleted. The optimal candidate is then (294c): it involves the insertion of [nasal] (*[-cont]$]_\sigma \gg$ Dep-IO[nas]), which in turn facilitates the delinking/deletion of [-cont], through underspecification.

(294) Deocclusivisation of word-final /p/ in Oowekyala

/ƛ̓ukʷp/ | [-cont]	*[-cont]]σ	R-Anchor-IO [cont]	Dep-IO [nas]	Faith-IO [cont]
a. ƛ̓ukʷp | [-cont]	*!			
b. ƛ̓ukʷm | [-cont]	*!		*	
⇒c. ƛ̓ukʷm		*	*	*

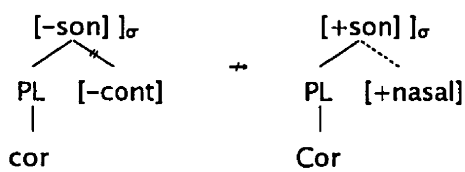
Finally, consider the case of syllable-final /t/ which changes to [ɬ]. Like the other cases of spirantisation, this change is regular word-medially, e.g. (288) above, and variable word-finally, e.g. (290) above. Of special interest here is that /t/ changes to a lateral fricative (ɬ);

(295) t → ɬ[69]



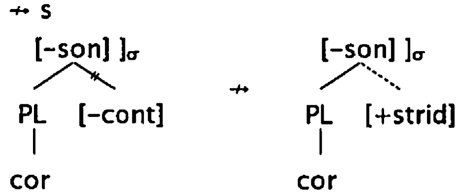
it does not change to a nasal (n) (cf. /p/→[m]),

(296) t ↛ n



nor does it change to a sibilant (s).

(297) t ↛ s



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69 It is sometimes argued that [+lateral] implies [-continuant] (e.g. Katamba 1989, Kaisse 1999), but this cannot be true here. That is, if there is a constraint [+lateral]⊃[-continuant], it must be violable. In OT: Max-IO[lateral], Max-IO[continuant] ≫ [+lateral]⊃[-continuant].

It would seem that the insertion of [+lateral] represents a less serious offence in Oowekyala grammar than either the insertion of [nasal] or the insertion of [+strident]. This state of affairs can be formalised with Dep-IO constraints as follows.

(298) Dep-IO[nasal], Dep-IO[strident] ≫ Dep-IO[lateral]

The result of adding this constraint subhierarchy to the foregoing analysis of spirantisation is illustrated in the following tableaux. (For simplicity, the constraints License[cont] and [nas]⊃[-cont] are omitted from these tableaux, and free-ranking Right-Anchor-IO[cont] is omitted from the first.)

(299) Spirantisation of word-medial /t/ in Oowekyala

/mət-k̓ana/	*[-cont] $]_\sigma$	Dep-IO [nas]	Dep-IO [strid]	Dep-IO [later]	Faith-IO [cont]
a. mətk̓ana	*!				
b. mənk̓ana		*!			*
c. məsk̓ana			*!		*
⇒d. məɬk̓ana				*	*

(300) Preservation of word-final /t/ in Oowekyala

/k̓ibat/	R-Anchor-IO [cont]	*[-cont] $]_\sigma$	Dep-IO [nas]	Dep-IO [strid]	Dep-IO [later]	Faith-IO [cont]
⇒a. k̓ibat		*				
b. k̓iban	*!		*			*
c. k̓ibas	*!			*		*
d. k̓ibaɬ	*!				*	*

(301) Spirantisation of word-final /t/ in Oowekyala

/k̓ibat/	*[-cont] $]_\sigma$	R-Anchor-IO [cont]	Dep-IO [nas]	Dep-IO [strid]	Dep-IO [later]	Faith-IO [cont]
a. k̓ibat	*!					
b. k̓iban		*	*!			*
c. k̓ibas		*		*!		*
⇒d. k̓ibaɬ		*			*	*

In sum, the two special changes treated in this section, viz. /p/→[m] and /t/→[ɬ], appear to be functionally related to the regular cases of spirantisation treated in the previous section, viz. /k/→[x], /kʷ/→[xʷ], /q/→[x̌], /qʷ/→[x̌ʷ], /c/→[s], /ƛ/→[ɬ]. The shared goal of these changes is to avoid the output configuration *[-cont] $]_\sigma$. This 'conspiracy' is easily captured in OT, because it is an output-oriented theory, and also because it formally separates the 'trigger' —the markedness constraint *[-cont] $]_\sigma$— from the actual changes —the faithfulness constraints: R-Anchor[cont], Faith[cont], Dep[nas], Dep[lateral]).

By contrast, the changes described above cannot be uniformly explained in rule-based phonology, with its input-orientation and its focus on structural change. Indeed, the diverse changes themselves, viz. ∅→[+nasal], ∅→[+lateral], and [-cont]→∅, offer no insight into the fact that they converge on avoiding a specific output configuration.

3.4.4. Exceptions to spirantisation/deocclusivisation

There are obstruent-initial suffixes that inexplicably fail to induce deocclusivisation in preceding stops and affricates. One such suffix is -x̌s 'aboard (boat)'. The data in (302) and (303) first illustrate the unremarkable use of this suffix after stems that end in sonorants and fricatives, respectively.

(302) Sonorant-final stems, -x̌s 'aboard (boat)'

a.	gncax̌s	how many on board the boat	HS
	gnca	how many?	EW
b.	ğəla:x̌s	to wait on the boat	EW
	ğəla:la	to wait for sth.	HS
c.	k̓ʷa̓x̌s	to sit in a boat	HS
	k̓ʷa̓s	to sit outside	HS
d.	kʷlx̌sala	to lie on a boat (said of animate beings)	HS
	kʷəla	to lie somewhere, to lie down (said of animate beings)	EW
e.	w̓nx̌s	to stow away, to sneak onto a boat	WL
	w̓əna.	to hide, to sneak about	EW

(303) Fricative-final stems, -x̌s 'aboard (boat)'

a.	ʔigisx̌sala	loaded with sand (said of boat)	HS
	ʔigis	sand	HS, EW
b.	k̓isx̌sala	empty boat, nothing aboard	HS
	k̓isaxʔit	to become deprived of	EW
c.	ʔaluɬx̌sa	to remodel a boat	HS
	ʔaluɬ	new, fresh (as a supply of sth.)	HS
d.	ʔik̓iqʷgʷiɬx̌s	ceiling of a boat cabin	HS
	ʔik̓iqʷgʷiɬ	ceiling of a room	HS
e.	kaxx̌sa	to lift sth. that is on the boat by hand	HS
	kaxəla	to lift, hold up, or carry on the hands and/or the forearms	EW
f.	ƛxx̌s	canoe thwart	EW
	ƛxa	to put the crosspiece on (e.g. on the canoe)	HS

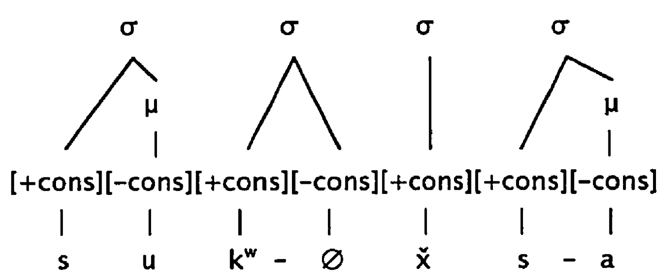
Of interest here is that when -x̌s occurs after stems ending in stops and affricates, the stem-final segments fail to undergo regular spirantisation/deocclusivisation.

(304) Stop/affricate-final stems, -x̌s 'aboard (boat)'

a.	t̓ipx̌s	set foot into canoe	WL
	t̓ipa	to step, tread onto sth.; to find fern roots or cockles by feeling with the feet	HS
b.	xʷltx̌s	fire (stove) on the boat	WL
	xʷlta	to burn (said of a fire, coals, offerings)	EW
c.	ʔalcx̌sa	to go and pick sea slugs, sea cucumber on a boat	HS
	ʔalca	to go and pick sea slugs, sea cucumber	EW, HS
d.	sukʷx̌sa	to pick up, lift, grab sth. in the boat	HS
	sukʷa	to take hold of with the hand; to pick up, lift, grasp, grab with the hand	HS
e.	q̓ikʷx̌s	to lie in the boat (said of animate beings)	HS
	q̓ikʷa	to lie on sth. (said of animate beings)	HS
f.	ǧlqx̌s	container placed aboard the boat	HS
	ǧlqa	to grasp with the fingers, lift container (e.g. a pail, a pan, a coffin)	EW
g.	x̌ʷisiqʷa	to travel on the other (or: the far) side of the channel	HS
	x̌ʷisiqʷx̌s	(on) the other (or: the far) side of the boat one is in	HS

To account for such exceptions to spirantisation/deocclusivisation, it is hypothesised that some abstract phonological structure intervenes between the suffix -x̌s and preceding stem-final segments. In particular, suppose that this suffix begins in a phonetically null vocalic root node (cf. Roberts-Kohno 1999 on the need for empty consonantal root nodes in Kikamba).[70] Positing such an empty node accounts for the fact that spirantisation/deocclusivisation fails before this suffix, in the following way: all stem-final segments are syllabified with the following empty vocalic node such that the structural description of spirantisation/deocclusivisation ($*[-\text{cont}]]_\sigma$) is never met.[71]

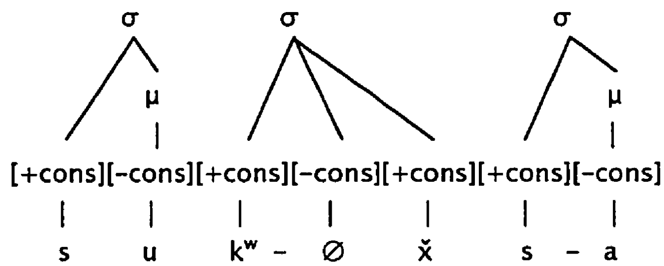
(305)



[70] Another obvious application of empty root nodes is 'h-aspiré' in French (cf. Tranel 1995). According to Roberts-Kohno (1999), languages that tolerate empty root nodes are characterised by low-ranking of *Silence, a markedness constraint against phonetically empty root nodes: *Silence "Segments may not lack phonetic content" (Roberts-Kohno 1999:292).

[71] Alternatively, if moras were permitted on obstruents in Oowekyala (contra e.g. Stonham 1994, Zec 1995), the initial fricative of -x̌s could be lexically specified with a mora. This would effectively require the preceding segment to be an onset (thanks to Doug Pulleyblank for this suggestion).

or



The hypothesis that -x̌s is preceded by a phonetically null vocalic root node receives some confirmation from the fact that its initial x̌ exceptionally fails to participate in rounding assimilation following a rounded obstruent, as already noted in section 3.2.2.1. The fact that -x̌s nonetheless participates in rounding assimilation after /u/ (e.g., /muː+∅x̌s/ → [muːx̌ʷs] 'four aboard'; see section 3.2.1.1) is expected; the vowel /u/ would presumably merge with the empty vocalic root note, as other vowel hiatus contexts are generally resolved (e.g., /ƛn+ba+ut/ → [ƛnbut] 'to bite the end off sth.'). Finally, the fact that -x̌s participates in degemination (e.g., /gax̌+∅x̌s/ → [gax̌s] 'to come aboard'; see section 3.3) is also expected; the empty vocalic root node fails to avert degemination between identical consonants precisely because it is phonetically empty.

3.5. Coronal fricative dissimilation

This section describes and analyses a process of dissimilation that concerns the feature [+continuant] in coronals.

3.5.1. Description

Oowekyala has a dissimilation process that affects adjacent coronal consonants specified [+continuant]. The effect is clearest when a suffix that begins in /s/ is added to a stem that ends in /s/ or [ɬ]: the suffix-initial segment changes to [c].

As a first example, consider the suffix -sm 'round and/or bulky object'. The initial segment of this suffix is realised simply as [s] after stems ending in non-coronal fricatives — whether these fricatives are underlying, e.g. (306), or derived from spirantisation (section 3.4.3), e.g. (307).

(306) Stems ending in underlying noncoronal fricatives, -sm 'round and/or bulky object'

a.	q̓axʷ-sm	sth. round and/or bulky that has become visible after the tide has gone out (such as e.g. a rock); to emerge from the water, reef, place that is high and dry	EW
	q̓axʷəla	becoming visible, showing itself (as e.g. a rock when the tide goes out)	HS
b.	txʷ-smt	to jump onto sth. round and/or bulky (e.g. rock)	HS
	txʷəla	jumping	HS

c.	tix̌-sm	sth. round and/or bulky (clumsy) that is green or yellow; green mountain, green rock	EW
	tix̌əla	having a green or yellow colour	HS
d.	lux̌ʷ-sm	round thing (such as a drum)	HS
	lux̌ʷa	to roll (said of a round thing)	EW, HS

(307) Stems ending in derived noncoronal fricatives, -sm 'round and/or bulky object'

a.	c̓xʷ-sm	thing that is round and/or bulky and that is short: short box, short house, short hill	HS
	c̓kʷ	short	EW, HS
b.	ta̓x̌ʷ-səmi	sheet or sheet-like thing over a round and/or bulky thing (e.g. over a box)	HS
	taqʷa	to cover (especially a sheet)	EW
c.	ƛa̓x̌ʷ-smt	to cover sth. round and/or bulky (such as a box, a rock) with the hand	HS
	ƛaqʷa	to cover an object with the hand (e.g. for taking the object away unnoticed)	EW
d.	lim-səma	to wrap or fold sth. so that it assumes a round and/or bulky shape	HS
	lipa	to roll dice	EW

In contrast, the initial segment of -sm is realised as [c] after stems ending in [ɬ], whether the latter is underlying, e.g. (308), or derived from spirantisation, e.g. (309).

(308) Stems ending in underlying /ɬ/, -sm 'round and/or bulky object'

a.	?aluɬ-cm	round and/or bulky thing (e.g. a cooking stone) that is new or that has been renewed, remodeled, renovated	HS
	?aluɬ	new, fresh (as a supply of sth.)	HS

(309) Stems ending in derived [ɬ], -sm 'round and/or bulky object'

a.	k̓ʷɬ-cmt	to stick, glue, weld, or solder sth. onto a round and/or bulky thing (such as a box)	HS
	k̓ʷta	to stick, glue, weld, or solder on	EW
b.	c̓ɬ-cm	to burst open (said of sth. round and/or bulky, such as a paper bag or a box)	HS
	c̓ta	to split something, crack, burst, fissure	EW

Similarly, the initial segment of -sm is realised as [c] after stems that end in underlying /s/. However, in such cases the dissimilation process is not surface apparent, because the stem-final segment is actually deleted by the independently-motivated process of degemination (section 3.3). This is exemplified in the following data.

(310) Stems ending in /s/, -sm 'round and/or bulky object'

a.	dəna-cm	sth. that is round and/or bulky (such as a box) and that is made of red cedar bark	BC63: DS
	dənas	inner bark of red cedar	BC63: DS
b.	p̓i-cm	thing that is round and/or bulky and that is hard	HS
	p̓isa	hard	EW
c.	q̓ika-cm	thing that is big and round and/or bulky	HS
	q̓ikas	big, large, important, considerable	HS
d.	dm̓x-cm	beetle	HS
	dm̓xs	saltwater, sea; salt	EW, JSS3

The same effects can be illustrated with the suffix -sista 'around'. The initial segment of this suffix is pronounced [s] after noncoronal fricatives, whether underlying (311) or derived from spirantisation (312).

(311) -sista 'around'

a.	cix-sistalakʷ	waterpower, hydroelectric power	HS
	cixəla	flowing of water; brook, stream	JSS3
b.	Ǧacx̌-sistalaɬ	name of the son of Waawalis	DS72
	ǧacx̌	starfish	EW, JSS3
c.	k̓ix̌ʷ-sistala	running around sth. (e.g. an island), running in a circle	WL
	k̓ix̌ʷa	to run away, escape, flee from	EW
d.	lux̌ʷ-sistala	to turn around (as a wheel), to revolve	HS
	lux̌ʷa	to roll (said of a round thing)	EW, HS
e.	qlx̌-sistala	to cut around sth. with scissors (e.g. around a pattern), to trim the hair	HS
	qlx̌a	to cut with scissors, to use scissors	EW

(312) -sista 'around'

a.	malix̌-sistala	to swing around	HS
	maliqa	to swing in a circle	EW
b.	nawalaxʷ-sista	"power is now present"; name of a potlatch given at the end of a feast when all the food and gifts are seemingly gone, and the hosts' ancestors arrive and do their dances	DS108
	nawalakʷ	name of the spirits from the story of Y'aakas; name is applied to items possessed with supernatural power such as the whistles of the C'aiqa Dance Series, the spirits of the ƛəw̓əlax̌a Dances; term for supernatural power	DS108
c.	hiɬdzax̌ʷ-sistut	to translate into the native language; to translate into Heiltsuk	HS
	hiːɬdzaqʷ	Heiltsuk	DS

d.	qlxʷ-sistiɬ	to move from a sitting to a lying position; to lie in a circle indoors	HS
	qlkʷstiɬ	to lie on the floor of the house (said of animate beings)	HS
e.	ʣixʷ-sistalasu	bicycle	JSS3
	ʣikʷa	to push with the feet; to move, function, operate	EW
f.	ƛ̓íx̌-sista	to spawn all over the area (said of herring)	HS
	ƛ̓iqa	to spawn (said of herrings)	HS

But the initial segment of -sista is pronounced [c] after stems ending in [ɬ], whether the latter segment is underlying (313) or derived from spirantisation (314).

(313) -sista 'around'

a.	ʔaʔamɬ-cistalay̓u	to jumble up s.th. (as a child playing with sth.)	HS
	ʔamɬa	to play	EW, HS
b.	c̓ik̓aɬ-cista	to riot, a riot	HS
	c̓ik̓aɬəla	war, fighting	EW
c.	hiɬ-cista	to take a turn for the better	HS
	Hiɬayu	good or right; the term for one's soul, "that thing which causes you to be alive"	DS86
d.	mamaɬ-cistala	swimming around an island	HS
	maɬəla	swimming	EW
f.	nuɬ-cista	to act the fool	EW, WL
	nuɬa	to behave in an odd, crazy, or foolish way, as if possessed	EW, DS110
g.	xʷiɬ-cista	to return, to turn back	HS
	xʷiɬa	to return, turn back, back out, to pitch fish, to wrestle	EW
h.	wəɬ-c̓istalas x̌ʷidayu	mixer?	JSS3
	wɬa	to happen by itself, to move by itself, to move without or as if without cause (as a car)	HS
i.	qʷaq̓ʷuɬ-cista	fence?	JSS3
j.	ǧl̓u̓ɬcista	to somersault	EW, DS73

(314) -sista 'around'

a.	n̓əɬ-c̓ista	to bend over backwards	HS
	n̓əƛa	to lean back (as in a chair) or to lie on one's back, to lay things on the back (e.g. split fish on the side with the skin)	EW
b.	ʔaɬ-cista	to go back around again (as e.g. for picking up people who did not show up)	HS

	ʔaƛala	landwards, towards the woods; away from the open (hence away from the centre of the house and towards the wall, away from the beach and towards the land, away from sea and towards mainland, inland, shorewards, behind the house	EW

The initial segment of -sista is also realised as [c] after stems that end in underlying /s/. As described earlier, dissimilation is less obvious in such cases due to the deletion of the stem-final /s/ (degemination). This is shown in the following examples.

(315) -sista 'around'

a.	cu-cista	drought	HS
	cusa	dried out, brittle	EW
b.	Q̓á-cistala	name of the father of Mazlx, from the story of Wren and the Grizzly Bear; name of the son of Waawalis, from the story of the adventures of Waawalis	DS130
	q̓áṡa	sea otter	EW
c.	q̓u-cistala	travelling around sth. on the water (e.g. around an island), paddling around sth.	HS
	q̓usa	to paddle, travel on water, go by boat	EW
d.	c̓í-cistala	winding rope around sth.	HS
	c̓isa	to wind up, tangle up	EW
e.	t-cistaut	to push sth. or s.o. over with the hands	HS
	tsa	to push	EW, HS

The same effects occur with the personal subject ending -su 'you' (cf. Rath (1981:83) on Heiltsuk). The initial segment of this enclitic surfaces without change after vowels (316), after stops (derived from underlyingly voiced segments so that they do not spirantise) (317), and after noncoronal fricatives (318).

(316) -su 'you'

a.	ʔaː-su	you pour(ed) grease into sth.	HS
	ʔaː	to add grease to one's cooking	EW, HS
b.	ʔíkqu-su	you reconcile, make peace	HS
	ʔíkqu	to reconcile (as a couple), to make up after quarreling, to make peace	HS

(317) -su 'you'

a.	ʔak-su	you finish(ed) sth. up completely	HS
	ʔag-nc	we (incl.) are finished	HS
	k-su	and then you...	HS
	g-nc	and then we (incl.) ...	HS
	tuxʷʔit-su	you take a walk	HS
	tuxʷʔid-i	he/she over-there takes a walk	HS

(318) -su 'you'

a.	ʔix-su	you are good	HS
	ʔik	good, nice, well, ok	EW, HS
b.	ʔəbuxʷ-su	you are a mother	HS
	ʔəbukʷ	mother	EW, HS

But the enclitic -su is pronounced [cu] after words that end in [ɬ], whether the latter is underlying (319) or derived (320).

(319) -su 'you'

ğʷaɬ-cu p̓a:la	you stop working	HS
ğʷaɬ-i p̓a:la	he/she over-there stops working	HS

(320) -su 'you'

	q̓auɬ-cu	you know	HS
	q̓auƛ	to know	HS
a.	glɬ-cu	you are tall	HS
	glt	tall	EW, HS

The enclitic is also pronounced [cu] after words that end in /s/ in their underlying representation (321). Again, note that word-final /s/ deletes before [c] in this case.

(321) -su 'you'

a.	ʔa-cu ...	you belong to ...	HS
	ʔas	to belong to him, her, it, them	EW

3.5.2. OT analysis

The fact that /s/ changes to [c] only after coronal fricatives (not after (labio)velar or (labio)uvular fricatives) implies that dissimilation of the feature [+continuant] affects only (adjacent) coronals in Oowekyala. This accords with the finding of many researchers (e.g. Padgett 1991, Selkirk 1988, 1991, 1993, Yip 1989, Pierrehumbert 1993) that featural dissimilation tends to apply only between segments that also share one or more other features.

The following constraint is held responsible for continuancy dissimilation in Oowekyala. (It may actually be a conjunction of OCP(Cor) and OCP(+cont); see Suzuki 1998.)

(322) OCP(cor, +cont)

A sequence of two segments, both Coronal and both [+continuant], is disallowed.

...violated	...not violated
* COR COR	DOR COR
| |	| |
[+cont][+cont]	[+cont][+cont]

Because it triggers a loss of [+continuant], OCP(cor, +cont) (322) must outrank Faith-IO[cont]. Recall that *[-cont] $]_\sigma$ also outranks Faith-IO[cont] (see section 3.4.2 on spirantisation). Together, then, OCP(cor, +cont) and *[-cont]$]_\sigma$ ensure that in a sequence of two coronal fricatives, the second (rather than the first) will lose its [+continuant] specification, as illustrated in the following tableau.

(323) Continuancy dissimilation in coronals

/ǧʷaɬ-su/	*Cor Cor | | [+cont][+cont]	*[-cont] $]_\sigma$	Faith-IO[cont]
a. ǧʷaɬ-su	*!		
b. ǧʷaƛ-su		*!	*
⇒c. ǧʷaɬ-cu			*

Turning now to the change ...s+s...→...c... illustrated in (310), (315) and (321), it is evidently related to the dissimilatory change ...ɬ+s...→...ɬc.... (e.g., (308), (309), (313), (314), (319), (320); cf. tableau (323)). But stem-final /s/ —while integral to the structural description of dissimilation in (310), (315) and (321)— is in fact deleted before suffix-initial [c], via a separate degemination process that elides the first consonant in a sequence of two (near) identical segments (section 3.3). This opaque interaction of processes will be discussed separately along with other comparable cases in section 4.3.

3.5.3. Interaction with spirantisation

Two constraints affecting continuancy have been postulated, one prohibiting [-cont] in a coda segment (esp. one that immediately precedes a syllable) (section 3.4), and the other prohibiting [+cont] in a coronal that immediately follows a coronal fricative. So far it has been observed that both of these constraints result in simple feature switches: in response to the constraints, a segment changes from [-cont] to [+cont], or vice versa. Because the constraints that trigger the changes are considered separate from the changes themselves, one is left wondering why other possible 'repairs' are not invoked. For instance, the sequence ...ɬ+s... violates OCP(cor, +cont) (322) and so a feature-change occurs: ...ɬ+c.... But what of other conceivable outcomes? In particular, why doesn't Oowekyala grammar resort to deletion, e.g. ...ɬ+s...→...ɬ+∅..., a move that would equally well resolve the OCP(cor, +cont) violation?

The answer is that (in Oowekyala) feature switching represents a less drastic measure than segment deletion, so all else being equal, economy dictates that a feature change is the preferred strategy. In correspondence-theoretic terms, violating Faith-IO[cont] (43) is a less serious offense than violating Max-IO:

(324) Max-IO (McCarthy & Prince 1999:225)
Every segment of the input has a correspondent in the output.

(325) Feature switch preferred to segment deletion
Max-IO ≫ Faith-IO[cont]

In other words, segment deletion is overkill, where a simple featural change otherwise fixes the problem (i.e. a violation of *[-cont] $]_\sigma$ (274) or of OCP(Cor+cont) (322)).

In this regard, the current OT analysis makes the singular prediction that segment deletion might occur when a simple feature switch is insufficient to resolve a violation of *[-cont] $]_\sigma$ (274) or of OCP(Cor+cont) (322). Remarkably, this prediction is borne out in Oowekyala, as will now be shown.

The relevant data involve suffixes that begin in -sCV..., e.g. -stu 'round hole, eye'. The basic form of this suffix is shown in the following examples.

(326) -stu 'round hole, eye' (Boas 1947)

a.	di-stut	wiping the eyes	HS
	dəya	to wipe	EW, HS
b.	λəw̓i̓-stu	to wake up and fall asleep again; to stand in for, to replace, to fill in	HS
	λəw̓əla	again, to do sth. again	HS
c.	gax̌-stu	to come towards a hole, an opening, or one's eye	HS
	gax̌	come!	EW
d.	k̓m̓-stu	to show discontent by closing eyes or turning the face away	EW
	kpa	to tuck, etc.	
e.	ʔanxʷ-stu	bruised eye, black and blue eye	HS
	ʔanxʷa	bruise, bruised	EW, HS
f.	ccx-stəwa	to wipe the eyes	HS
	cka	to rub something (excluding body parts), scrub, knead	EW, HS

The same suffix has the form -tu after stems ending in [ɬ], as shown in the following data. Note that stem-final [ɬ] may derive from /ɬ/, /ƛ/, or /t/.

(327) -tu 'round hole, eye' (Boas 1947)

a.	w̓iɬ-tu	narrow, slim (said of an opening, hole, eye, diameter of sth.)	HS
	w̓iɬ	thin (said of something tall such as a tree or person)	EW

b.	kʷɬ-tut	to stick, glue, weld, solder sth. over a hole, an opening, a wound, or one's eye	HS
	kʷta	to stick on, to be sticky	EW

Likewise, this suffix has the form -tu after stems ending in [s], as the following data illustrate.

(328) -tu 'round hole, eye' (Boas 1947)

a.	ƛ̓as-tut	to slap s.o. on the eye	HS
	ƛ̓asa	to slap	EW
b.	pus-tu	(to have a) swollen eye, to swell (said of the eye)	HS
	pusa	to swell	EW
c.	dzas-tu	dark of colour	HS
	dzasa	to have a dark skin	EW
d.	mayas-təwala	to have a stripe across the eyes (as a raccoon)	HS
	mayas	raccoon	EW, HS, BC, JSS3

As another example, consider the suffix -sta 'water', illustrated in the following data.

(329) -́(s)ta 'water'

a.	cix-stala	waterfall pouring into a lake or the sea	HS
	cixəla	running, flowing, flooding (water); brook, stream	EW
b.	kʷuxʷ-sta	warm or hot (said of water)	HS
	kʷuxʷa	warm, hot	EW
c.	gncap̓n-sta	how many times into the water?	HS
	gncap̓nista	how many round trips?	HS
d.	ga:l-stut	to be the first to set the net, to be first to put the line into the water	HS
	galxʔit	to become the first, first to, ahead	EW
e.	p̓ax̌-sta	"flat in the water" like water lillies; name of a swamp behind Zawyas or Oolichan Town	HS, DS125
	paqa	flat, to be flat, to put a flat object somewhere (e.g. to lay shingles on a roof)	HS, EW
f.	q̓ux̌ʷ-staʔais	calm, still, or placid water in the bay, lake or inlet	HS
	q̓uqʷəla	calm, free from wind (said of the weather)	EW

The initial /s/ of this suffix is dropped after stem-final [ɬ], as the following data show. (Again, [ɬ] derives from stem-final /ɬ/, /ƛ/ or /t/.)

(330) -ta 'water'

a.	kʷɬ-ta	to tumble down into the water (said of things piled up)	HS
	kʷɬa	to collapse (said of a pile of something), become separated (salmon eggs when about to be laid), disintegrate	EW

b.	qʷuɬ-ta	to fall forwards or dive head first into the water	HS
	qʷuɬa	to bend or fall forwards	EW
c.	k̓aɬ-tala	paint	HS
	k̓ata	to write, paint, draw pictures	EW

Likewise, the initial /s/ of -sta 'water' is dropped after s-final stems, e.g.:

(331) -ta 'water'

a.	ts-taut	to push sth. into the water	HS
	tsa	to push, press against	EW
b.	t̓ns-ta	cold water	HS
	t̓nsa	to go get hard knots of wood; (to chill sth., to add cold water to sth.?)	BC505

The deletion of suffix-initial [s] in these cases is a direct consequence of the OT analysis developed so far, as the following tableau illustrates. The fully-faithful candidate (332a) fulfills $*[-\text{cont}]]_\sigma$ (274) but fatally violates OCP(cor, +cont) (322). The candidates (332b,c) fulfill OCP(cor, +cont) (322) through feature switches (violations of Faith-IO[cont]) but they fatally violate $*[-\text{cont}]\,]_\sigma$ (274). Candidate (332d) overcomes this "no win" situation via deletion (violation of Max-IO).[72]

(332) Continuancy dissimilation in coronals

/w̓iɬ-stu/	*Cor Cor | | [+cont][+cont]	$*[-\text{cont}]\,]_\sigma$	Max-IO	Faith-IO[cont]
a. w̓iɬs.tu	*!			
b. w̓iƛs.tu		*!		*
c. w̓iɬc.tu		*!		*
⇒d. w̓iɬ∅.tu			*	

[72] Two possible candidates that otherwise might be selected as optimal are not considered here: w̓i.ƛs.tu and w̓iɬ.c.tu, with the "degenerate" syllables .ƛs. and .c., respectively. Although the possibility of such syllable types was recognised in section 1.1.4, more needs to be learned about their nature and distribution in Oowekyala. For instance, it may be that such syllables are excluded from word-medial positions like wi.ƛs.tu and w̓iɬ.c.tu.

3.6. Voicing neutralisation

Voicing contrasts in Oowekyala are found only in the environment of a following tautosyllabic vowel or resonant (which may be glottalised, e.g. bn̓ǧu 'close together'). This limited distribution results from an exceptionless process of neutralisation that is described and analysed in the next few subsections.

3.6.1. Description

The Oowekyala process of voicing neutralisation is especially clear in plural forms. Recall that the most common form of the plural in Oowekyala is a CV-shaped reduplicative prefix. Consider first what happens when the base of reduplication has a short vowel: the base vowel deletes upon copying. The outcome of this vowel-deletion process is that the first two consonants of the base become adjacent.

(333) Vowel deletion in the base of plural reduplication

$$/\mathrm{Red}_{PL}\text{-}C_1VC_2.../$$

$$C_1V - C_1\varnothing C_2...$$

$$[C_1VC_1C_2...]$$

The data in (29) show that voicing contrasts in C_1 are neutralised before C_2 when the latter is an obstruent.

(334) Voicing neutralisation in Oowekyala plural forms

	singular	*plural*		
a.	buxʷls	bu-pxʷls	illegitimately pregnant	EW
	puxʷa	pu-pxʷa	to inflate, blow with the mouth	EW
b.	daqa	da-tqa	to get sheets of red-cedar bark for roofing	BC63: DS
	taqʷa	ta-tqʷa	to cover (especially a sheet)	EW
c.	ʣikʷa	ʣi-ckʷa	to push with the feet	EW
	cikʷa	ci-ckʷa	to shovel	EW, JSS3
d.	λax̌ʷa	λa-ƛx̌ʷa	to stand	DS64
	ƛax̌əla	ƛa-ƛx̌əla	to produce vocal noise in order to scare people or animals, to cheer	EW
e.	gix̌a	gi-kx̌a	to grind, to file, to sharpen	EW
	kix̌a	ki-kx̌a	to use a saw	EW, JSS2, JSS3
f.	gʷuta	gʷu-kʷta	to stack, pile things up	EW
	kʷuƛa	kʷu-kʷƛa	to bend something long (e.g. a piece of wire); to break a branch	EW

g.	ǧaƛa	ǧa-qƛa	to hook, gaff, or crochet	EW, HS
	qaka	qa-qka	to cut off heads of fish, animals, or people; to behead, to decapitate	EW, DS129
h.	ǧʷux̌ʷa	ǧʷu-qʷx̌ʷa	slender, thin, lean, skinny	HS
	qʷuťa	qʷu-qʷťa	full, loaded	EW, HS

Next, consider plural reduplication when the base is shaped /C_1C_2.../, i.e. when the base has no vowel. In that case, the reduplicative prefix contains C_1 and a vowel [i].

(335) Vowel deletion in the base of plural reduplication

/Red_{PL}-C_1C_2.../

C_1 i - C_1C_2...

[$C_1iC_1C_2$...]

When C_2 is a sonorant consonant, lexical voicing in C_1 surfaces normally in both the base (before C_2) and in the reduplicant (before [i]), as shown here:[73]

(336)

	singular	*plural*		
a.	bn̓ǧut	bi-bnǧut	to put things close together	EW
b.	dlxa	di-dlxa	white eruption on skin (because of dampness)	EW
c.	ʤlx̌a	ʤi-ʤlx̌a	to crawl, to go under something while stooping	EW
d.	λnbut	λi-λnbut	to bite the end of sth.	HS
e.	glw̓a	gi-glw̓a	canoe	EW, JSS3
f.	ǧm̓x̌ut	ǧi-ǧmx̌ut	left-hand side	EW
g.	ǧʷnbut	ǧʷi-ǧʷnbut	to make a partial payment on a loan (i.e. down payment or installment payments, and in money or otherwise)	HS

In contrast, when C_2 is an obstruent, lexical voicing is neutralised in the base —where C_1 immediately precedes C_2— but not in the reduplicant —where C_1 precedes [i]. This is exemplified by the following pairs.[74]

[73] Glottalisation on syllabic sonorants is lost in the plural forms of (a) and (f); this is discussed in the next chapter.

[74] One exceptional plural form is worth mentioning here. The plural of ǧənm 'woman, girl, wife, daughter' involves a reduplicative prefix lacking a vowel: qǧənm. Note the voicing neutralisation in the copied consonant.

(337) Voicing neutralisation in Oowekyala plural forms

	singular	*plural*		
a.	pgʷanm	bi-pgʷanm	person	EW, HS
	pc̓ini	pi-pc̓ini	easy	EW
b.	ƛx̌a	λi-ƛx̌a	to shove, slide, slip sth. long (e.g. canoe); to plane	EW
	ƛx̌ʷa	ƛi-ƛx̌ʷa	to rub, stroke, or press with the flat of the hand	EW
c.	ƛgʷit	λi-ƛgʷit	thick (in girth)	EW
	ƛka	ƛi-ƛka	to maneuver the boat to another direction (as by working with the paddle)	EW
d.	qk̓ala	ǧi-qk̓ala	to speak (said of a woman)	EW, HS
	qc̓m	qi-qc̓m	knife for cutting salmon	EW

Observe how, in each case, consonants that cannot be distinguished at the beginning of the singular forms can in fact be distinguished —in voicing— at the beginning of the plural forms.

(338) Singular forms: neutralisation of voicing contrast

a. /λ x̌ - a/ → [ƛ x̌ a]

b. /ƛ x̌ʷ - a/ → [ƛ x̌ʷ a]

(339) Plural forms: preservation of voicing contrast

a. /Red$_{PL}$ -λ x̌ - a/ → [λ i ƛ x̌ a]

b. /Red$_{PL}$ -ƛ x̌ʷ - a/ → [ƛ i ƛ x̌ʷ a]

This special interaction of voicing neutralisation with prosodic morphology is also apparent in other areas of Oowekyala grammar. In all Wakashan languages certain suffixes cause modifications in the roots such as vowel insertion, vowel lengthening or reduplication. (Bach (1997) suggests that these suffix-triggered modifications of roots are the 'Case' requirements of particular suffixes.) Consider, for instance, the suffix -axsala 'aimlessly' which 'triggers' the insertion of [aː] in CC-shaped roots in Oowekyala. The forms in (340) illustrate this suffix-triggered aː-insertion effect.[75]

[75] Each citation root is listed with the completive -a or the continuative -ala; the ending of -axsala may perhaps be further analysed as -axsal-a (with completive -a), but not as *-axs-ala since the continuative meaning is lacking.

(340) -axsala ‘aimlessly’

a.	ta:saxsala	push here and there	WL
	tsa	to push, press against	EW
b.	x̌ʷa:taxsala	cut any way, carelessly	WL, HS
	x̌ʷta	to cut with a knife	EW
c.	ba:k̓ʷaxsala	to talk nonsense (as when delirious)	HS
	pk̓ʷala	to talk, to speak	HS
d.	ğa:kaxsala	to talk nonsense (said of women)	HS
	qk̓ala	to speak (said of a woman)	EW, HS
e.	λa:x̌axsala	to slide here and there	HS
	ƛx̌a	to shove, slide, slip sth. long (e.g. canoe); to plane	EW

Especially revealing are (340c, d): the insertion of [a:] in roots where C_1 is lexically voiced circumvents the voicing neutralisation process that affects unmodified roots in the stems with suffix -(k̓)ala ‘noise, sound’ (pk̓ʷala, qk̓ala).

(341) Ablaut averts voicing neutralisation

a. /bk̓ʷ-(k)’ala/ ‘to talk’ b. /bk̓ʷ-axsala/ ‘to talk nonsense’

↓↓ ↙↓

[pk̓ʷala] [ba:k̓ʷaxsala]

Next consider the suffix -’a ‘to try to’ which causes roots shaped C_1C_2... to be realised as $C_1aC_1aC_2$.... This effect is exemplified in (342).

(342) -’a ‘to try to’

a.	ta-tac̓a	to try to push	HS
	tsa	to push, press against	EW
b.	qa-qap̓a	to try to capsize	HS
	qpa	to capsize	HS, EW
c.	ğa-ğak̓a	to try to get a wife[76]	EW, HS
	qk̓ala	to speak (said of a woman)	EW, HS

As shown in (342c), the presence of [a] both in the base and in the reduplicant completely prevents voicing neutralisation.

[76] This is probably a different suffix -’a meaning ‘to try to get’. It has the same effect on the root as the suffix -’a meaning ‘to try’.

(343) Reduplication + ablaut in Oowekyala

a. /ǧk-(k)'ala/ → [q k̓ a l a]

b. /Red$_{TRY}$-ǧ k -'a/ → [ǧ a ǧ a k̓ a]

The fact that some underlying voicing contrasts are revealed only in modified roots (via reduplication, vowel insertion, vowel lengthening) gives the Oowekyala phonological system an 'outside-in' character, in the sense of Hayes (1995, 1999) and Kenstowicz (1996). The underlying representation of some individual morphemes such as /ǧk-/ 'woman' can only be learned on the basis of morphologically complex forms.

(344) Root modifications show underlying voicing contrast

/ǧk-/ 'woman'	qk̓ala	to speak (said of a woman)
	ǧiqk̓ala	plural of: to speak (said of a woman)
	ǧa:kaxsala	to talk nonsense (said of women)
	ǧaǧak̓a	to try to get a wife

The polysynthetic nature of Oowekyala makes the phonology marked in this respect, at least according to Hayes (1999:193) who argues, "phonological systems tend to organize themselves in ways that permit derived forms ... to be predicted from the base forms" (and not vice versa, as in Oowekyala).

The Oowekyala process of voicing neutralisation is further illustrated in the data below. Each of these sets exemplifies a lexically voiced segment —/g, ǧ, dz, gʷ, d/— which surfaces unchanged (a) preceding a tautosyllabic sonorant, but which becomes devoiced (b) word-finally, (c) preceding an obstruent (regardless of its laryngeal specification, e.g. (349c); also (337a,c,d), etc.), and (d) preceding a heterosyllabic sonorant. Note that unlike their lexically unmarked counterparts, devoiced stops/affricates fail to undergo regular spirantisation (section 3.4 above).

(345) /ʔag/ → [ʔak]/__{#, C} 'all, complete'

a.	ʔag-nc	we (incl.) are finished	HS
	y̓ak-nc	we (incl.) are bad	HS
b.	ʔak	all, complete	HS, EW
	y̓ak ~ y̓ax	bad, spoiled, evil, vicious, sick, not as it should be	EW, HS
c.	ʔak-su	you are finished	HS
	y̓a̓x-su	you are bad	HS
d.	ʔak-nukʷ	to have all	HS

(346) /c̓ağ/ → [c̓aq]/__{#, C} 'mountain goat'

a.	c̓ağ-i	that-over-there is a goat	HS
	c̓aq-i	that-over-there drips/dripped (as water)	HS
b.	c̓aq	mountain goat	EW, HS, BC
c.	c̓aq-ki	this-near-me is a goat	HS
d.	c̓aq-nukʷ	to have a goat	HS

(347) /waːdz/ → [waːc]/__{#, C} 'watch, clock (from English "watch")'[77]

a.	waːdz-i	that-over-there is a watch, clock	JSS3, HS
	t̓ɬːc-i	that-over-there is *high bush cranberry*	EW, HS, BC91
b.	waːc	watch, clock (from English "watch")	JSS3
	t̓ɬːc ~ t̓ɬːs	high bush cranberry (Viburnum edule)	EW, HS, BC91
c.	waːc-ki	that absent/gone thing is a watch, clock	HS
	t̓ɬːs-ki	that absent/gone thing is highbush cranberry	HS
d.	waːc-nukʷ	to have a watch	HS

(348) /bugʷ/ → [bukʷ]/__{#, C} 'book (from English)'

a.	bugʷ-i	that-over-there is a book	HS
	gʷukʷ-i	that-over-there is a house	HS
b.	bukʷ	book	HS
	gʷukʷ ~ gʷuxʷ	house	EW, HS
c.	bukʷ-ki	that-one (absent, gone) is/was a book	HS
	gʷuxʷ-ki	that-one (absent, gone) is/was a house	HS
d.	bukʷ-nukʷ	to have a book	HS

(349) /y̓ugʷ-/ → [y̓ukʷ]/__{#, C} 'to rain'

a.	y̓ugʷ-a	to rain, the rain	JSS3
	dukʷ-a	to troll	EW, BC120: HS, BC
b.	y̓ukʷ-bis	rain, rainwater	HS
	duxʷp̓iq	crane?	JSS3

(350) /...m̓id/ → [...m̓it]/__{#, C} 'to start ...'

a.	dam̓id-i	he/she over-there started towing	HS
	c̓an̓it-i	that-over-there is a fish tail	EW, HS
b.	dam̓it	to start towing	HS
	c̓an̓it	tail of a fish	EW
c.	dam̓it-ki	he/she (absent, gone) started towing	HS

[77] The fact that the stem final segment of this borrowed word is underlyingly voiced in Oowekyala is discussed below.

(351) /-ad/ → [-at]/__{#, C} 'to have'

a.	ƛ̓ukʷbad-i	that-one-over-there has roots	HS
	k̓ibat-i	that-over-there is red elderberry	HS; BC90
b.	ƛ̓ukʷbat	to have roots	HS
	k̓ibat ~ k̓ibaɬ	that-over-there is red elderberry	HS; BC90
c.	ƛ̓ukʷbat-ki	that-one (absent, gone) has/had roots	HS

A final, rather unique, example of voicing neutralisation is offered by the syntactic element g- 'and further, and then' which is always followed by personal subject enclitics. As shown in (352), the underlying voicing of g- is preserved before (tautosyllabic) sonorant-initial enclitics but it is neutralised before obstruent-initial enclitics. Note that enclitics beginning in RV (e.g., -nugʷa '1st pers. sing.) are separated from g- by an epenthetic schwa, e.g. g+nugʷa → gənugʷa 'and then I...', such that devoicing does not occur.

(352) /g-/ 'and further, and then'

a.	g-i	and then he/she/it (over there) ...	EW
b.	g-nc	and then we (incl.) ...	HS
c.	k-ki	and then he/she/it (absent, gone) ...	HS
d.	k-su	and then you ...	HS

3.6.2. Two OT analyses of voicing neutralisation

There are two approaches to voicing neutralisation in the current OT literature. In the first approach, voicing in obstruents is preserved through faithfulness (353) in spite of a universal tendency to avoid voiced obstruents. The relevant context-free markedness contraint is given in (354), after Halle (1959), Chomsky and Halle (1968:406), Kiparsky (1985), etc.

(353) Faith-IO[voice]

Every input feature [voice] has an identical correspondent in the output (Max); every output feature [voice] has an identical correspondent in the input (Dep).

(354) *[+voice, -sonorant]

An obstruent must be voiceless.

Voicing neutralisation occurs nonetheless because Faith-IO[voice] is dominated by a high ranking context-sensitive markedness constraint against voiced obstruents. The best known such constraint is given in (355) (Pulleyblank 1997, Inkelas, Orgun & Zoll 1997:408, Kager 1999:14, etc.).[78]

[78] This constraint may derive from the conjunction of two basic markedness constraints: *[-voi, +son] (354) and NoCoda. See Smolensky (1995) on constraint conjunction.

(355) *[+voice]]$_\sigma$

An obstruent must not be voiced in coda position.

This constraint accounts for all cases (exemplified in section 3.6.1) in which voicing in an obstruent is neutralised word-finally (e.g., ʔa<u>k</u>, cf. ʔag-i) and preceding a heterosyllabic sonorant (e.g., bu<u>kʷ</u>nukʷ, cf. bugʷ-i). This is illustrated in the two constraint tableaux in (356). In (356a), the optimal candidate (i) violates Faith-IO[voice] while the suboptimal candidate (ii) violates highest-ranked *[+voice]]$_\sigma$. In (356b) *[+voice]]$_\sigma$ is irrelevant. In that case, the optimal candidate (i) only violates lowest-ranked *[-sonorant, +voice].

(356) Voicing neutralisation in coda position

a. /c̓ağ-/ → [c̓aq] 'goat'

	*[+voice]]$_\sigma$	Faith-IO[voice]	*[-son, +voi]
⇒i. c̓aq		*	
ii. c̓ağ	*!		*

b. /c̓ağ-i/ 'the-one-over-there is a goat'

	*[+voice]]$_\sigma$	Faith-IO[voice]	*[-son, +voi]
⇒i. c̓aği			*
ii. c̓aqi		*!	

However, the constraint *[+voice]]$_\sigma$ apparently fails to account for some cases (presented in section (3.6.1)) in which lexical voicing becomes neutralised preceding an obstruent. Especially problematic are the cases illustrated in (352) and in (337) (cf. (340c, d), (342c)); see also fn. 74. For example, /g+su/ → ksu 'and then you...'; /bk̓ʷ-(k̓)ala/ → pk̓ʷala 'to talk'. The problem is that the word-initial consonants in ksu, pk̓ʷala, etc. are not transparently in coda position (unless they are somehow "stranded codas", but no independent evidence exists for this interpretation), yet voicing is neutralised in them (/bk̓ʷ.../→[pkʷ...], /λx̌.../→[ƛx̌...], /λgʷ.../→[ƛgʷ...], /ğk.../→[qk....], etc.).

To account for these cases of voicing neutralisation which would be exceptional under an account assuming (355), it seems necessary to recognise another context-sensitive markedness constraint against voiced obstruents, this one syllable-independent. The following is given by Steriade (1997).

(357) *[+voi] [-son]

An obstruent must be voiceless preceding an obstruent.

The effect of this constraint is illustrated in the following tableau, which parallels (356a). In (358), the optimal candidate (i) violates Faith-IO[voice] while the suboptimal candidate (ii) violates highest-ranked *[+voi] [-son].

(358) Voicing neutralisation before an obstruent

/ǧk-(k)ʼala/	*[+voi] [-son]	Faith-IO[voice]	*[-son, +voi]
⇒i. qk̓ala		*	
ii. ǧk̓ala	*!		*

Note that *[+voice] $]_\sigma$ is still needed, since *[+voi][-son] does not account for voicing neutralisation that occurs word-finally or preceding a heterosyllabic sonorant. In sum:

(359) Voicing neutralisation via context-sensitive markedness constraint
*[+voi] [-son], *[+voice] $]_\sigma$ ≫ Faith-IO[voice] ≫ *[-sonorant, +voice]

In a different approach to voicing neutralisation (e.g. Lombardi 1999, Tesar & Smolensky 2000; cf. Howe & Pulleyblank, to appear), the context-free markedness constraint against voiced obstruents (354) dominates faithfulness (353), i.e. *[-sonorant, +voice] ≫ Faith-IO[voice]. But the prohibition on voiced obstruents is itself overridden by a context-sensitive faithfulness constraint, viz. (360).

(360) *OnsFaith-IO[voice] (Lombardi 1999:270)
Consonants in the position stated in the Laryngeal Constraint (361) should be faithful to underlying laryngeal specification.

(361) The Laryngeal Constraint[79]

σ
[Root] [+son]
|
Lar

(362) Voicing neutralisation via context-sensitive faithfulness constraint
OnsFaith-IO[voice] ≫ *[-sonorant, +voice] ≫ Faith-IO[voice]

This approach to voicing neutralisation is exemplified in the two constraint tableaux in (363). In (363a), OnsFaith-IO[voice] is irrelevant to the stem-final consonant; the optimal candidate (i) violates only lowest-ranked Faith-IO[voice] while the suboptimal candidate (ii) violates higher ranked *[-sonorant, +voice]. In (363b), the optimal candidate (i) violates *[-sonorant, +voice] while the optimal candidate (ii) violates highest ranked OnsFaith-IO[voice].

[79] This formulation is Lombardi's. A non-exhaustive domination interpretation is intended, i.e. the syllable may dominate material other than that given in (361).

(363) Voicing neutralisation with context-sensitive faithfulness

a. /c̓ağ-/ → [c̓aq] 'goat'

	OnsFaith-IO[voice]	*[-son, +voi]	Faith-IO[voice]
⇒i. c̓aq			*
ii. c̓ağ		*!	

b. /c̓ağ-i/ 'the-one-over-there is a goat'

	OnsFaith-IO[voice]	*[-son, +voi]	Faith-IO[voice]
⇒i. c̓aği		*	
ii. c̓aqi	*!		*

Note that this approach also seems to account for the special cases of voicing neutralisation presented in section (3.6.1): (352), (337) (cf. (340c, d), (342c)); see also fn. 74. Though these initial consonants may be in onset position (see section 1.1.4, p. 9ff.) yet they still undergo voicing neutralisation (/bk̓ʷ-a.../→[pk̓ʷa...], /λx̌-a.../→[ƛx̌a...], /λgʷi.../→[ƛgʷi...], etc.) because they are not followed by a sonorant, as required by (361).

To summarise, each of the above analyses of voicing neutralisation relies on context-sensitivity. In the first approach (e.g. Pulleyblank 1997, Steriade 1997, etc.), context-sensitive markedness bans voiced obstruents everywhere except before a tautosyllabic sonorant. In the other approach (Lombardi 1999, Tesar and Smolensky 2000, etc.), context-sensitive faithfulness preserves voicing in obstruents only before a tautosyllabic sonorant.

3.6.3. Voicing in loan word phonology

Stops and affricates that are voiceless in English regularly become voiced when (English) words are borrowed into Oowekyala. This gives the peculiar impression that stop voicing is phonologically unmarked in loans. Some examples are listed in (364).[80] In the last few examples, the 3rd person subject enclitic /-i/ is added to the loan words in order to show that voicing has been added to stem-final obstruents that were voiceless in the source language.

(364) English loans in Oowekyala

	English		*Oowekyala*	
a.	Peter	[pʰitə(ɹ)] ~ [pʰirə(ɹ)]	bida	HS
b.	tea	[tʰiː]	diː	BC119, JSS3
c.	pussy	[pʰʊsi]	busi	JSS3, WL
d.	apple(s)	[aplz]	ʔabls	BC100: EW, HS, BC
e.	slippers	[slɪpə(ɹ)z]	səlibas	HS

[80] There are a few exceptions, e.g. cherries > cilis (BC111: LJ; JSS3), flowers > pəlawas (BC506: EW, HS, BC), coffee > kʷabi (HS, JSS3). However, note in the latter that voiceless [f] becomes voiced [b].

f.	matches	[mæčɨz]	maːdzis	JSS3
g.	stove	[stov]	sdub-i, sdup	HS
h.	boat	[bot]	bud-i, but	HS
i.	book	[bʊk]	bugʷ-i, bukʷ	HS
j.	watch	[wač]	waːdz-i, waːc	HS, pic

To explain this pattern, it is here claimed that a universal preference exists for segments to be voiced before tautosyllabic sonorants. This preference may be stated as a context-sensitive markedness constraint:

(365) [+voi]/[$_\sigma$___[+son] A segment must be voiced before a tautosyllabic sonorant.

Before considering the place of (365) in Oowekyala grammar, it is important to note that this constraint is grounded in phonetic factors. That one should find segments becoming voiced before sonorants —which are inherently voiced— is phonetically unsurprising. At the same time, (365) remains a phonological constraint because stop voicing is relativised to a strictly phonological constituent —the syllable— and because its consequences vary from language to language, i.e. it participates in individual phonological systems —construed as ranked constraints in OT.

The typological evidence in favour of (365) comes from languages in which obstruents are systematically voiced before tautosyllabic sonorants. Mohawk (Iroquoian), in which all and only prevocalic stops are voiced, is a textbook example of such a language (e.g. Halle and Clements 1983:59, 121-3). Other examples include Tsimshianic Nisga'a (Tarpent 1987) and Smałgyax (Dunn 1995). As Dunn (1995:I:5) describes:

> The letters b, d, dz, g, and g̲ generally occur between vowels and before vowels ... The letters k, k̲, p, and t generally occur at the end of words and in clusters.

Yet another example is Amele (spoken in Papua New Guinea) which Roberts (1987) describes as having only voiced stops prevocalically.[81] The fact that fricatives do not voice in the context of (365) is presumably related to their mode of production, which disfavours voicing contrasts (see discussion in previous chapter regarding the absence of voiced fricatives in Oowekyala).

Apart from the typological evidence, it is noteworthy that (365) also seems to be substantiated in developmental phonology. Young children tend to voice stops in prevocalic context.[82] The following data are from child English (Henry Davis, p.c., confirms that the prevocalic voicing of stops is common in child English).

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[81] Thanks to Laura Downing for drawing my attention to Amele. She points out that non-prevocalic stops may also be voiced word-medially in Amele, apparently through regressive voicing assimilation, i.e. VCC̬V → VC̬C̬V. Word-final stops are always voiceless, however. (Amele thus contradicts Lombardi's (1999:269) claim that languages do not exist "which devoice word-final but not word-internal syllable-final consonants.")

[82] Pulleyblank (p.c.) cautions that segments which adults categorise as voiced segments may in fact correspond to voiceless unaspirated segments in Child Phonology.

(366) Stop voicing in child English (Halle and Clements 1983:151)

a.	tent	[dɛt]
b.	sock	[gɔk]
c.	table	[bebu]
d.	spoon	[buːn]
e.	skin	[gin]
f.	play	[beː]
g.	tickle	[gigu]

Crucially, it is frequently the case that child language displays unmarked sound sequences (e.g., Jakobson 1941, Stampe 1979). As Smolensky (1996:720) remarks (not uncontroversially), "the same configurations that are marked (in the sense of disfavored) in adult languages tend also to be avoided in child language". The systematic voicing of stops exemplified in (366), if true, would therefore argue in favour of the markedness constraint (365).

Returning now to Oowekyala, it is not the case that all stops and affricates are voiced before a tautosyllabic sonorant (unlike in Iroquoian, Tsimshianic, Amele, and perhaps child English), e.g. kʷasa 'to trample, stamp the feet' vs. gʷasa 'to fray, chafe, rub'. To explain this, it is assumed that (365) ranks lower than faithfulness in Oowekyala grammar. Specifically, if the analysis in (359) is assumed, then Faith-IO[voice] outranks (365); if the analysis (362) is assumed, then Lombardi's (1999:270) OnsFaith-IO[voice] (360) outranks (365). Lombardi's approach is adopted below; it is more important to avoid changes in voicing in onset position than it is to have voiced stops/affricates before tautosyllabic sonorants.

(367) OnsFaith-IO[voice] ≫ [+voi]/[$_\sigma$___[+son]
Stop/affricates are not specified with non-lexical [+voice] when preceding tautosyllabic sonorants.

From this ranking, it follows that the context-sensitive markedness constraint (365) is satisfied only when a [+voice] feature is included in the input. This is illustrated in the following two constraint tableaux with the minimal pair gix̌a/kix̌a. Note in particular that the mapping of /kix̌-a/ as [gix̌a] is blocked by high-ranking OnsFaith-IO[voice].

(368) a. gix̌a 'to grind, to file, to sharpen'

/gix̌-a/	OnsFaith-IO[voice]	[+voi]/[$_\sigma$___[+son]
⇒i. gix̌a		*
ii. kix̌a	*!	**

b. kix̌a 'to use a saw'

/kix̌-a/	OnsFaith-IO[+voice]	[+voi]/[$_\sigma$___[+son]
i. gix̌a	*!	*
⇒ii. kix̌a		**

(The opposite ranking, i.e. [+voi]/[$_\sigma$___[+son] ≫ OnsFaith-IO[voice], presumably holds in Iroquoian, Tsimshianic, Amele, and child English, where it is more important that obstruent stops and affricates be voiced before a tautosyllabic sonorant than it is to avoid onset changes in voicing.)

Based on the fact that voiced obstruents 'emerge' in Oowekyala loan phonology, it is further assumed that the context-sensitive markedness constraint (365) outranks the context-free markedness constraint against voiced obstruents in general (354). The complete constraint hierarchy is thus as follows; cf. (362).

(369) OnsFaith-IO[voice] ≫ [+voi]/[$_\sigma$___[+son] ≫ $*\begin{bmatrix}-\text{son}\\+\text{voi}\end{bmatrix}$ ≫ Faith-IO[voice]

"Voicing in obstruents is avoided,
except before a tautosyllabic sonorant,
except if an obstruent in onset position is not lexically specified [+voice]."

This overall interaction is illustrated in the next two tableaux. As shown, the initial segment of λa:x̌axsala (370a.i) is optimally voiced, in violation of general markedness (354), but in conformity with higher-ranking contextual markedness (365). By contrast, ta:saxsala (370b.ii) optimally violates contextual markedness (365) because the initial segment of this form is not lexically-specified [+voice] and highest-ranked OnsIndent-IO[voice] prevents this feature from being inserted.

(370) a. λa:x̌axsala 'to slide here and there' (cf. ƛx̌a 'to shove, slide; to plane')

/λx̌-axsala/	OnsFaith-IO [voice]	[+voi]/[$_\sigma$___[+son]	$*\begin{bmatrix}-\text{son}\\+\text{voi}\end{bmatrix}$	Faith-IO [voice]
⇒i. λa:x̌axsala		**	*	
ii. ƛa:x̌axsala		***!		*

b. ta:saxsala 'to push here and there' (cf. tsa 'to push')

/ts-axsala/	OnsFaith-IO [voice]	[+voi]/[$_\sigma$___[+son]	$*\begin{bmatrix}-\text{son}\\+\text{voi}\end{bmatrix}$	Faith-IO [voice]
i. da:saxsala	*!	**	*	
⇒ii. ta:saxsala		***		*

Returning now to the voicing pattern illustrated in (364), note that the analysis encapsulated in (369) predicts that stop voicing (before a tautosyllabic sonorant) will occur whenever OnsFaith-IO[voice] is put 'out of control'. (Actually, this prediction holds generally of OT. To the extent that language is a conflict between markedness and faithfulness constraints, unmarked configurations emerge wherever faithfulness is silent (Kager 1999:47).) This allows us to understand the voicing process in loan adaptation as follows:

The highest-ranked constraint in (369) is OnsFaith-IO[voice]. But this input-output faithfulness constraint is not important in loan adaptation, because Oowekyala has no underlying representations for English words before these are borrowed (see Kaye 1974, 1975 for related general discussion). Moreover, because the loans are intended for use by Oowekyala speakers, not for the benefit of English speakers, there is little pressure for Oowekyala speakers to select underlying representations for loan words that will result in 'proper' English pronunciations. Rather, in choosing underlying representations for English words, Oowekyala speakers may select ones whose usage will incur the least markedness violations, taking into account the constraint hierarchy. This is 'lexicon optimisation', as recently reformulated by Tesar and Smolensky (2000) (cf. Prince & Smolensky 1993, chap. 9):

> The underlying form of a morpheme is the one, among all those that give the correct surface forms, that yields the maximum-Harmony paradigm. (Tesar and Smolensky 2000:80)

Since [+voi]/[$_{\sigma}$___[+son] (365) is the second highest-ranked constraint (after Faith-IO[voice]) in (369), it is the primary determinant in the selection of underlying representations for English loans. So, for instance, the choice of /bug^{w}/ for 'book' ensures that the stem-final stop will be voiced in suffixed and encliticised forms, e.g. bug^{w}i 'that is a book'. In contrast, if /buk^{w}/ were chosen as the underlying representation, some resulting suffixed and encliticised forms would violate [+voi]/[$_{\sigma}$___[+son] (365), e.g. *buk^{w}i. The fact that transparadigmatically /bug^{w}/ results in more harmonic forms than /buk^{w}/ —where 'harmony' is evaluated according to (369)— is illustrated in the following two tableaux.

(371) Paradigm tableau with voicing alternation

$/bug^w/ + \left\{ \begin{matrix} \varnothing \\ i \end{matrix} \right\}$	OnsFaith-IO [voice]	[+voi]/[$_{\sigma}$___[+son]	*[-son, +voi]	Faith-IO [voice]
⇒a. $\left\{ \begin{matrix} [buk^w] \\ [bug^wi] \end{matrix} \right\}$			* **	*
b. $\left\{ \begin{matrix} [bug^w] \\ [bug^wi] \end{matrix} \right\}$			**! **	
c. $\left\{ \begin{matrix} [buk^w] \\ [buk^wi] \end{matrix} \right\}$	 *!	 *	* *	* *

(372) Paradigm tableau with voicing alternation

$/buk^w/ + \left\{ \begin{matrix} \varnothing \\ i \end{matrix} \right\}$	OnsFaith-IO [voice]	[+voi]/[$_{\sigma}$___[+son]	*[-son, +voi]	Faith-IO [voice]
a. $\left\{ \begin{matrix} [buk^w] \\ [bug^wi] \end{matrix} \right\}$	 *		* **	 *
b. $\left\{ \begin{matrix} [bug^w] \\ [bug^wi] \end{matrix} \right\}$	 *		** **	* *
⇒c. $\left\{ \begin{matrix} [buk^w] \\ [buk^wi] \end{matrix} \right\}$		 *	* *	

The lexicon optimisation tableau below serves to further compare the two underlying forms for 'book', $/bug^w/$ and $/buk^w/$ (cf. Tesar & Smolensky 2000:81). Both $/bug^w/$ and $/buk^w/$ are mapped so that they surface with the correct paradigm, {[buk^w], [bug^wi]}. In the first candidate paradigm, the alternation results from deleting the underlying voice feature of the final $/g^w/$ —a violation of Faith–

IO[voice]; in the second candidate paradigm, the alternation results from adding a voice feature to the underlying $/k^w/$ —a violation of OnsFaith-IO[voice]. Since OnsFaith-IO[voice] ranks higher than Faith-IO[voice], the second candidate (b) is less harmonic than the first candidate (a). Lexicon optimisation thus picks $/bug^w/$ as the underlying form because it gives rise to the most harmonic structural description of the paradigm.

(373) Lexicon optimisation tableau for $[buk^w]$ ~ $[bug^wi]$

	OnsFaith-IO[voice]	[+voi]/[$_\sigma$___[+son]	*[-son, +voi]	Faith-IO[voice]
⇒a. $/bug^w/ + \left\{ \begin{matrix} \varnothing \\ i \end{matrix} \right\} \rightarrow \left\{ \begin{matrix} [buk^w] \\ [bug^wi] \end{matrix} \right\}$			*	*
			**	
b. $/buk^w/ + \left\{ \begin{matrix} \varnothing \\ i \end{matrix} \right\} \rightarrow \left\{ \begin{matrix} [buk^w] \\ [bug^wi] \end{matrix} \right\}$			*	
	*!		**	

To summarise, while both analyses given in section 3.6.2 ensure that voicing is preserved in obstruent stops/affricates before tautosyllabic sonorants, neither can explain the fact that voicing is systematically added to obstruent stops in this structural context in such languages as Mohawk, Smałgyax, Nisga'a, Amele, and child English. Nor can these approaches explain the fact that English voiceless stops and affricates become voiced in this context when they are borrowed into Oowekyala, e.g. (364). To account for such cases, it seems necessary to recognise a markedness constraint that favours voicing in segments in the environment of a following sonorant in the same syllable, as proposed in this section.

3.6.4. Evidence for [-voice]

The following question remains: does voicing neutralisation in Oowekyala involve a value change from [+voi] to [-voi], or does it involve feature deletion resulting in a laryngeally unspecified stop/affricate?

(374) Two interpretations of voicing neutralisation

$$\text{a.}\quad \begin{array}{ccc} \text{Input} & & \text{Output} \\ C & \rightarrow & C\,]_\sigma \\ | & & | \\ +\text{voi} & & -\text{voi} \end{array} \qquad\qquad \text{b.}\quad \begin{array}{ccc} \text{Input} & & \text{Output'} \\ C & \rightarrow & C\,]_\sigma \\ | & & \\ +\text{voi} & & \end{array}$$

This question is addressed below by considering the interaction of voicing neutralisation with spirantisation, degemination, and with phonologically-conditioned allomorphy.

3.6.4.1. Spirantisation revisited

Of immediate relevance is the (above noted) fact that devoiced obstruents fail to participate in spirantisation (section 3.4) whereas lexically unmarked (i.e. voiceless nonglottalised) obstruents regularly undergo this process. For example, the root-final lexically voiced stop of /ʔag/ 'all, every' is invariably pronounced [k] syllable-finally whereas the root-final lexically unmarked stop of /y̓ak/ 'bad' is pronounced [x] syllable-finally (word-finally, only variably so).

(375)	/ʔag/ 'all'	/y̓ak/ 'bad'	
	ʔak (*ʔax)	y̓ak ~ y̓ax	
	ʔaksta (*ʔaxsta)	y̓axsta (*y̓aksta)	-sta '(in) water'
	ʔag-nc	y̓ak-nc	-nc 'we (incl.)'

The reason for this asymmetry, it is here suggested, is that (in Oowekyala at least) voicing neutralisation does not completely remove the Laryngeal specification; it only switches the voicing value (from [+voi] to [-voi]). Specifically, it is argued that phonetically-identical obstruents may correspond to two different phonological outputs. For example, the stem-final stop of e.g. ʔak 'all' (which derives from underlying [+voi] /g/) is specified [-voi] in the output (Type A), whereas the stem final stop of e.g. y̓ak 'bad' is unspecified for [voice] (Type B).

(376) Two types of voiceless stops

$$\begin{array}{c} \text{Type A} \\ -\text{son} \\ \diagup\;\diagdown \\ -\text{cont}\quad \text{Lar} \\ \qquad\;\; | \\ \qquad\;\; -\text{voi} \end{array} \qquad\qquad \begin{array}{c} \text{Type B} \\ -\text{son} \\ | \\ -\text{cont} \end{array}$$

Crucially, Oowekyala fricatives do not license voicing contrasts, that is (by hypothesis) a fricative cannot be specified either [+voi] or [-voi] in this language (*[αvoi, -son, +cont]; see section 2.3.2 on p. 41). This entails that [-cont] can switch to [+cont] in an obstruent that is unspecified for [voice] (Type B), but not in an obstruent stop that is specified [-voi] (Type A). Altogether, then, it is claimed that obstruent stops that are voiceless as a consequence of voicing neutralisation fail to undergo spirantisation because they are specified [-voi] and this laryngeal specification cannot cooccur with [-son, +cont] in Oowekyala.

To ensure that voicing neutralisation results in [-voi], it is claimed that the change schematised in (377a) amounts to a lesser violation of faithfulness than the change schematised in (377b). Specifically, it is proposed that while both (377a) and (377b) violate Faith-IO[voice] (see (353) on p. 135), only (377b) additionally violates Max-IO[Lar].

(377) Two interpretations of voicing neutralisation

a.	Input		Output	b.	Input		Output'
	C	→	C $]_\sigma$		C	→	C $]_\sigma$
	Lar		Lar		Lar		
	+voi		-voi		+voi		

(378) Max-IO[Lar]

Every [Lar] in the input has a correspondent in the output.

Spirantisation applies normally to syllable-final stops that have no [voice] specification (e.g., /y̓ak-sta/ → y̓axsta 'dirty water'), since both *[-son, +cont, αvoi] (i.e. (86), p. 41) and Max-IO[Lar] are irrelevant in such cases. By contrast, the combined effect of *[-son, +cont, αvoi] and Max-IO[Lar] is illustrated in the following tableau for ʔaksta 'all in the water'. On the one hand, spirantisation (i.e. satisfaction of *[-cont] $]_\sigma$) is blocked by the presence of [-voi] (here derived from underlying [+voi]), because the latter specification cannot cooccur with [+cont] in Oowekyala, as shown in (379b). On the other hand, the wholesale deletion of underlying [Lar] (and [+voice]) that would facilitate spirantisation (i.e. satisfaction of *[-cont]$]_\sigma$) is blocked by Max-IO[Lar], as shown in (379c,d). In this "no win" situation, spirantisation simply fails (379a).

(379) /ʔag-sta/ → ʔaksta (*ʔaxsta) 'all in the water'

/ʔag-sta/ | Lar | +voi	$*\begin{bmatrix}-\text{sonorant}\\+\text{continuant}\\\alpha\text{voice}\end{bmatrix}$	Max-IO[Lar]	*[-cont]]$_\sigma$	Faith-IO[cont]
⇒a. ʔaksta | Lar | -voi			*	
b. ʔaxsta | Lar | -voi	*!			*
c. ʔaksta		*!	*	*
d. ʔaxsta		*!		*

Note that the analysis in (379) can supplement either of the two analyses of voicing neutralisation encapsulated in (359) and (362).

3.6.4.2. Degemination revisited

As noted in section 3.3 on p. 98, only stem-final plain (i.e. voiceless nonglottalised) consonants delete in degemination context. For example, (380) shows that glottalised stem-final consonants do not delete before a similar/identical consonant.

(380) No degemination with stem-final glottalised C

a.	qak̓ʷ-kʷn ~ qak̓ʷ-kn	to be completely beaten in the game	HS
	qak̓ʷa	to suffer a loss (as in a game)	EW
b.	ʔik̓-ky̓ala	high above the top of sth.	HS
	ʔik̓-ba	higher (in place or rank) than; to be at the end of a series; top of a vertical pole	HS

Voiceless stops/affricates that result from voicing neutralisation also fail to participate in degemination, as the following data illustrate.

(381) No degemination with stem-final devoiced C

a.	ʔakgls	all have left	HS
	ʔag-ala	all together	HS

b.	y̓ukʷ-k̓ʷala ~ y̓ukʷk̓ala	sound of the rain	HS
	y̓ugʷa	to rain, the rain	JSS 3

It is proposed that stem-final segments resulting from voicing neutralisation are specified [-voi], as in (377a), and that this specification makes them different from laryngeally-unmarked stem-final segments, which undergo degemination as described above in section 3.3. For example, the stem-final [k] of ʔak 'all' (which derives from underlying /g/) is specified [-voi] and as such, it fails to undergo deletion before -gls 'outside', hence ʔakgls (*ʔagls). By contrast, the stem-final k of /n̓ik/ 'say' is laryngeally-unmarked and as such it undergoes deletion before /-ganm/ 'perhaps': n̓i-ganm 'to perhaps say' (*n̓ikganm).

The fact that [-voi]-specified stem-final consonants resist deletion in degemination contexts may also be explained with high-ranking Max-IO[Lar] (378) (see previous section).

(382) ʔag-gls → ʔakgls 'all have left'

/ʔag-gls/ Lar Lar +v +v	Max-IO[Lar]	Left-Anchor-IO	Antigemination	Max-IO
⇒a. ʔak-gls Lar Lar -v +v			*	
b. ʔag-∅ls Lar +v	*!	*!		*
c. ʔa∅-gls Lar +v	*!			*

(383) n̓ik-ganm → n̓iganm 'to perhaps say'

/n̓ik-ganm/ | Lar | +v	Max-IO[Lar]	Left-Anchor-IO	Antigemination	Max-IO
a. n̓ik-ganm | Lar | +v			*!	
b. n̓ik-∅anm		*!		*
⇒c. n̓i∅-ganm | Lar | +v				*

3.6.4.3. Laryngeally-conditioned allomorphy

It has been argued that Oowekyala grammar differentiates between two types of 'unmarked' obstruent stops/affricates: ones that lack Laryngeal specification, and others that are specified with the unmarked value [-voice]. This section will further this argument by showing that Oowekyala actually makes lexical contrasts between obstruents on the basis of presence vs. absence of unmarked features. The evidence comes from a phonologically-conditioned pattern of allomorphy.

As a first example, consider the 'continuative' suffix -ala. This fully-productive suffix has the shape -ala after voiced obstruent stops and affricates, after glottalised stops and affricates, after (voiced) modal resonants, and after glottalised resonants.

(384) -ala after voiced obstruents

a.	k̓ix̌^{w}bud-ala	running to the end of sth. long and horizontal (e.g. a float, a wharf)	HS
	k̓ix̌^{w}but	to run to the end of sth. long and horizontal (e.g. a float, a wharf)	HS
b.	y̓ug^w-ala	to be raining	HS
	y̓uk^{w}x^{w}ʔit	to start to rain	EW
c.	ʔag-ala	all together	HS
	ʔakǧu	all together	HS, EW

(385) -ala after glottalised obstruent

a.	dzaq̓^{w}-ala	north wind off the sea (also W, SW depending on location)	EW, DS183
	dzaq̓^{w}x^{w}ʔit	to begin to blow (said of the dzaq̓^{w}ala wind)	HS
b.	q^{w}ut̓-ala	full	HS
	q^{w}ut̓a	full	EW

c.	ʔiḱala	high, something which is high up	EW
	ʔiḱ	high	EW, HS

(386) -ala after sonorants (whether glottalised or not)

a.	bəń-ala	keeping close to sth.	HS
	bńǧut	to put things close together	EW
b.	ćən-ala	to walk around in a group, marching, parading; procession	HS
	ćnxʔit	to begin marching or parading, to begin walking (said of a procession of people)	EW
c.	ẃam̓-ala	to have one's belongings with one	HS
	ẃam̓a	to move one's belongings	EW
d.	x̌cəm-ala	red-cedar storage box	BC65
	x̌cm	cedar storage box	EW
e.	hal̓-ala	unwilling or reluctant to do something because one feels that it is too difficult	EW
	hal̓ka	to stop trying, to give up	HS
f.	gəl-ala	going on all fours, crawling (as of a baby)	HS
	glxʔit	to start to go on all fours, to start crawling (as a baby)	WL

By contrast, the continuative is pronounced -əla after stems ending in voiceless nonglottalised stops and affricates, and after fricatives.

(387) -əla after 'plain' C

a.	q̓utəla (*q̓utala)	bracing, shoring up, supporting sth. with a pole	HS
	q̓uta	to make use of a pole (to shore up, support, poke, push)	EW
b.	qakəla (*qakala)	cutting off heads of fish, animals, or people; beheading, decapitating	HS
	qaka	to cut off heads of fish, animals, or people; to behead, to decapitate	EW, DS129
c.	gʷukʷəla (*gʷukʷala)	to camp, dwell, reside somewhere, a camp	EW
	gʷukʷila	to build a house	HS
d.	duqʷəla (*duqʷala)	to see, look	EW
	duqʷa	to look for sth.	HS

(388) -əla after fricatives

a.	casəla (*casala)	pouring, dumping out (said in connection with liquid)	WL
	casa	to pour water on, throw out water	EW, JSS2

b.	dlxəla (dlxala)	covered with dampness-caused white skin eruption	HS
	dlxa	white eruption on skin (because of dampness)	EW
c.	gʷuɬəla (*gʷuɬala)	gathering and preserving staple food; gathering and smoking salmon	HS
	gʷuɬa	to gather and preserve food staples (meat, berries, and especially salmon), to prepare food for later, make travelling provisions, to will something to somebody	EW
d.	kʷnxʷəla (*kʷnxʷala)	to rumble	EW
	kʷnxʷa	to vibrate, to cause rumbling	HS
e.	k̓ʷix̌əla (*k̓ʷix̌ala)	requesting, asking for help, coaxing s.o. into doing sth.	HS
	k̓ʷix̌a	to request something, ask a favour	EW, DS102
f.	məx̌ʷəla (*məx̌ʷala)	wet, damp	EW
	məx̌ʷsta	to bathe	JSS2

Next consider the 'inchoative' suffix -xʔit. Its initial consonant is realised after glottalised stops and affricates (389), after devoiced stops/affricates (390), and after sonorants (391).

(389) -xʔit after glottalised obstruent

a.	pq̓ʷc̓xʔit	to become sleepy or drowsy	HS
	pq̓ʷc̓	drowsy, sleepy	EW
b.	ʔik̓xʔit	to make higher, to raise, to heighten, to elevate	HS
	ʔik̓ba	higher (in place or rank) than; to be at the end of a series; top of a vertical pole	HS

(390) -xʔit after devoiced obstruent

a.	ʔakxʔit	to become complete	HS
	ʔagala	all together	HS
b.	gʷugʷatxʔit	to become a home owner	HS
	gʷugʷad-i	he/she owns a house	HS
c.	c̓aqxʔit	to become a goat	HS
	c̓ağ-i	it's a mountain goat	EW, HS, BC

(391) -xʔit after sonorants

a.	ɬl̓-xʔit	to become dead	HS
	ɬl̓	dead, inactive, paralysed	EW, HS
b.	ʔl̓xʷstu-xʷʔit	to assume the colour of blood	HS
	ʔl̓xʷstu	colour of blood, having the colour of blood	HS

c.	tu-xʷʔit	to take a walk, to start to walk	HS
	təw-a	to walk	EW, DS146
d.	pusq̓a-xʔit	to become very hungry, to get a very hungry feeling	EW

However, the initial /x/ of this suffix is dropped after fricatives, and also after 'plain' stops and affricates which become fricatives via regular spirantisation. This is illustrated here:

(392) -ʔit after fricatives and after 'plain' stops and affricates, which spirantise to fricatives

a.	ʔansʔit	to make a slight move, to start to move over (up) a bit; to make a *move in a game of chess or checkers*	HS
	ʔanca	to shove, to move towards sth. little by little; to play chess or checkers	EW, HS
b.	c̓mx̌ʷʔit	to swallow at once without chewing	HS
	c̓mqʷa	to bolt food, to swallow whole (e.g. pills)	EW
c.	c̓uɬʔit	to become black	HS
	c̓uɬa	black	EW
d.	tsʔit	to give a push, to start pushing with the hands	WL
	tsa	to push, press against	EW
e.	dabnɬʔit	become dark	WL
	dabnt	dark (as the night)	EW

If we assume that modal sonorants are specified [+voice] (see section 2.3.3, p. 50ff.) and that devoiced obstruents are specified [-voice] (see immediately preceding sections), these allomorphic patterns can be simply analysed: the disappearing segments (/a/ for -ala; /x/ for -xʔit) are realised after consonants with Laryngeal specification, but deleted elsewhere. Though the actual constraint(s) responsible for this alternation will not be discussed here, the pattern is compelling. Interestingly, there are a few exceptional roots and suffixes which end in 'plain' stops/affricates or fricatives, yet which pattern as if they had Laryngeal specification, in the sense that they are followed by -ala (not -əla), -xʔit (not -ʔit), etc.

(393) Some irregular stem-final 'plain' stops/affricates

a.	ƛ̓up-xʔit	to start falling, going out (said of the tide)	HS
	ƛ̓upan̓akʷəla	to fall or go out gradually (said of the tide)	EW
b.	ʔaƛ-ala	landwards, towards the woods	EW
	ʔaƛgila	to travel inland; inland-bound	HS
c.	baƛ-ala	measuring, fathoming, measuring by using the extended arms or fingers	EW
	baƛgiwala	spreading out from the front (as trolling poles from the front part of the boat)	HS
d.	ʔau̓x̌ʷƛ-xʔit	to lift sth. onto one's back and carry it	EW
	ʔau̓x̌ʷƛ-ala	carrying sth. on one's back	HS
e.	ʔanqʷ-ala	to be cloudy	HS
	ʔan̓q̓ʷnx̌	foggy season	HS

(394) Some irregular stem-final fricatives

a.	ƛ̓u̓xʷala	pain, ache, sickness; to be sick, to ache (said of a body part)	EW
	ƛ̓u̓xʷxʷʔit ~ ƛ̓u̓xʷxʔit	to develop, turn into a pain or disease	HS
b.	ƛ̓asala	situated or happening seaward	EW
	ƛ̓asxʔit	to go further seaward	HS
c.	x̌ʷisala	that direction, far, on the far side, far away	EW
	x̌ʷisxʔit	to go further away, to move the other way	HS
d.	w̓ixala	going slow, delayed, delaying	EW
	w̓ixsukʷəla	to go slowly	HS

It is proposed that unlike their regular homophonic counterparts (exemplified earlier), these irregular stem-final segments are specified with unmarked Laryngeal features: [-voice] for the stops/affricates (393), and [+spread glottis] for the fricatives (394). In the case of stops/affricates, this proposal also helps to explain why they fail to undergo spirantisation in e.g. (393a,b); see explanation above in section 3.6.4.1, p. 145ff.

3.7. Allophonic variation

This section discusses two patterns of allophony: vowel lowering, and sonorant debuccalisation.

3.7.1. Vowel lowering

Recall that mid vowels are avoided in Oowekyala, allegedly because faithfulness (Faith-IO[high]) is outranked by the (paradigmatic) markedness of their featural compositionality (Kean 1980; Calabrese 1995:383, fn. 12; Roca & Johnson 1999:585). It was remarked that English words with mid vowels such as table [tebl̩], cherries [čɛɹiz], stove [stov] and soda [sodə] are adapted into Oowekyala with high vowels: tibl (HS), cilis (BC, HS), sdup (HS), and suda (WL), respectively.

(395) $*\begin{bmatrix}-\text{high}\\ -\text{low}\end{bmatrix} \gg \text{Faith-IO[high]}$

Recall too, however, that only nonhigh vowels are permitted after (unrounded) gutturals, i.e. after /q, ǧ, q̓, x̌, h, ʔ/. The incidence of mid vowels after gutturals indicates that the grammar fragment in (395) is itself outranked by a (syntagmatic) markedness constraint that prohibits high vowels after segments specified [-ATR].

(396) $*[-\text{ATR}]\begin{bmatrix}-\text{cons}\\ +\text{high}\end{bmatrix}$ Vowels must not be high after [-ATR] segments.

The effect of this contextual constraint is illustrated in the following tableau. As shown, nonhigh vowels are generally avoided except after a consonant specified [-ATR].

(397) ƛiq-(g)ila 'to give a name to s.o.'

	$*[-\text{ATR}]\begin{bmatrix}-\text{cons}\\+\text{high}\end{bmatrix}$	$*\begin{bmatrix}-\text{high}\\-\text{low}\end{bmatrix}$	Faith-IO[high]
a. [dliq^{x}ila]	*!		
⇒b. [dliq^{x}ela]		*	*
c. [dleq^{x}ela]		**!	**
d. [dleq^{x}ila]	*!	*	*

Note that although (396) results in a form of assimilation it cannot be substituted by a feature-spreading operation. While the structural change involves [±high], the structural context crucially involves [-ATR]. In particular, laryngeals are not specified [-high] yet they still trigger the change of a following high vowel to [-high]. It cannot be, therefore, that [-high] is "spread" in this pattern. Nor does it appear to be the case that [-ATR] is spread, since /i, u/ are lowered to [e, o], not [ɛ, ɔ].

Finally, recall that vowel lowering is blocked after rounded uvulars. This exception to lowering may suggest that the context-sensitive markedness constraint in (396) is outranked by another context-sensitive markedness constraint, one that disfavours nonhigh vowels after rounded segments.

(398) $*[+\text{round}]\begin{bmatrix}-\text{cons}\\-\text{high}\\-\text{low}\end{bmatrix}$ Nonlow vowels must be high after rounded segments.

The effect of this last constraint is illustrated in the following tableau. As shown, nonhigh vowels are generally avoided except after a consonant specified [-ATR], except after a consonant specified [+round].

(399) ǧ^{w}ix̌ila 'to bake bread'

	$*[+\text{round}]\begin{bmatrix}-\text{cons}\\-\text{high}\\-\text{low}\end{bmatrix}$	$*[-\text{ATR}]\begin{bmatrix}-\text{cons}\\+\text{high}\end{bmatrix}$	$*\begin{bmatrix}-\text{high}\\-\text{low}\end{bmatrix}$	Faith-IO [high]
a. ǧ^{w}ix̌ila		**!		
b. ǧ^{w}ex̌ila	*!	*	*	*
⇒c. ǧ^{w}ix̌ela		*	*	*
d. ǧ^{w}ex̌ela	*!		**	**

3.7.2. Derived laryngeals

This subsection briefly introduces a second type of laryngeals in Oowekyala. In contrast to the ones discussed so far, these laryngeals are evidently not specified [-ATR], since they do not trigger lowering in adjacent vowels (including schwa), e.g. [ʔita] (*[ʔeta]) 'to row'; [ɦəna] (*[ɦʌna], *[ɦɑna]) 'to sing' (Lincoln & Rath 1980:119). (Note here that [ɦ] is voiced[83], just like the /h/ which is specified [-ATR].)

Lincoln and Rath (1980) suggest that laryngeals in such words derive from underlying (nonglottal) sonorants. Specifically, starting from the observation that one never finds any phonetic sequence of homorganic sonorants, i.e. *[yi, y̓i, wu, w̓u, m(ə)m, m̓(ə)m, n(ə)n, n̓(ə)n, l(ə)l, l̓(ə)l], Lincoln and Rath (1980:10, 14, 19) propose that these sequences are simply pronounced [ɦi, ʔi, ɦu, ʔu, ɦ(ə)m, ʔ(ə)m, ɦ(ə)n, ʔ(ə)n, ɦ(ə)l, ʔ(ə)l] in Oowekyala (as well as in Heiltsuk). Illustrative examples are given in (400) and (401). Note that this analysis does not give rise to surface ambiguity, since underlying sequences of /hi, ʔi, hu, ʔu, h(ə)m, ʔ(ə)m, h(ə)n, ʔ(ə)n, h(ə)l, ʔ(ə)l/ are pronounced [ɦe, ʔe, ɦo, ʔo, ɦ(ɑ)m, ʔ(ɑ)m, ɦ(ɑ)n, ʔ(ɑ)n, ɦ(ɑ)l, ʔ(ɑ)l] (see preceding subsection; also subsection 2.4.6.3, p. 74).

(400) Sonorant dissimilation: $R_i(ə)R_i \rightarrow h(ə)R_i$

a.	/mmk-/ → [hmk-]	grouse	LR
	e.g. hmkls (*mmkls)	grouse	hr26
b.	/nn-/ → [hn-]	sing	LR
	e.g. həna (*nəna)	to sing along with	hr26
c.	/yi-/ → [hi-]		
	e.g. himas (*yim̓as)	chief	hr26
d.	/wuɬ-/ → [huɬ-]		
	e.g. huɬa (*wuɬa)	heaping full	hr26

(401) Sonorant dissimilation: $R'_i(ə)R_i \rightarrow ʔ(ə)R_i$

a.	/n̓n-/ → [ʔn-]	
	e.g. ʔəna (*n̓əna)	to use a sling
b.	/ʔit-/ → [ʔit-]	
	e.g. ʔita (*y̓ita)	to row
c.	/w̓ut-/ → [ʔut-]	
	e.g. ʔuta (*w̓uta)	to pierce

Independent evidence (not discussed by Lincoln and Rath) for this proposal comes from reduplication. Recall that the CV-reduplicant of the plural typically has a default vowel [i], especially when the root-initial segment is a sonorant. Recall too that in plural forms the initial resonant of the base becomes glottalised (if it isn't already).

[83] As in Heiltsuk; see Rath (1981:16).

(402) Default [i] in Oowekyala plural forms

	singular	*plural*		
a.	mam	mim̓am	blanket, bedding, bedcover	EW, HS, JSS3
b.	nusa	nin̓usa	to tell stories, legends, myths	EW, DS112
c.	lanca	lil̓anca	to go underwater	HS
d.	wi:kʷ	wiw̓i:kʷ	eagle	EW, HS, BC, JSS3
e.	ylx̌a	yiy̓lx̌a	to rub, smear (body part)	EW, HS
f.	m̓nca	m̓im̓nca	to measure	EW
g.	l̓uxʷʔit	l̓il̓uxʷʔit	to faint	HS
h.	ʔukʷ	ʔiʔukʷ	to pity, to have mercy	HS

This type of reduplication can serve to demonstrate the derivation of laryngeals in two ways. First, as shown in (403), the initial glide y of a singular form is realized as h in the reduplicant, as it becomes adjacent to the homorganic fixed vowel of the reduplicant (i.e., i). Similarly, the initial y̓ of a singular form is realized as ʔ in the reduplicant, as it becomes adjacent to the i-vowel.

(403) Default [i] in Oowekyala plural forms

	singular	*plural*	
a.	yapa	[hi]y̓apa	to send s.o.
b.	ylx̌a	[hi]y̓lx̌a	to rub
c.	yusa	[hi]y̓usa	to sip
d.	y̓ak	[ʔi]y̓ak	bad
e.	y̓lxa	[ʔi]y̓lxa	to pour

Second, as shown in (404), a resonant may surface as a laryngeal in the singular form and in the base of the plural form, since in both cases it is followed by a homorganic sonorant. Yet the (nonpalatal) resonant may surface unchanged in the reduplicant, where it is not followed by a homorganic sonorant.

(404) Default [i] in Oowekyala plural forms

	singular	*plural*	
a.	[hu:]x̌ʷa (/wu:x̌ʷ-/)	[wiʔu:]x̌ʷa	to hoot
b.	[ʔu]q̓ʷa (/w̓uq̓ʷ-/)	[w̓iʔu]q̓ʷa	to believe
c.	[hm]k̓ala (/mmk-/)	[miʔm]k̓ala	buzzing sound

Another type of reduplication results in a related pattern. The suffix -̓a 'to try to...' is accompanied by Ca-reduplication, as shown in (405).

(405) 'to try' reduplication

	basic form	*to try to...*	
a.	dukʷa	dadук̓ʷa	to troll
b.	c̓əma	c̓ac̓əm̓a	to point
c.	ǧʷisa	ǧʷaǧʷic̓a	dried salmon
d.	lita	lalit̓a	to uncover
e.	nix̌a	nanix̌ʔa	to pull

A resonant may surface as a laryngeal in the nonreduplicated form and in the base of the reduplicated form, since in both cases it is followed by a homorganic sonorant, as exemplified in (406). The underlying resonant may nonetheless surface in the reduplicant, because there it is not followed by a homorganic sonorant but by [a].

(406) 'to try' reduplication

	basic form	*to try to...*	
a.	[huː]x̌ʷa (/wuːx̌ʷ-/)	[wahuː]w̓a	to hoot
b.	[ʔu]q̓ʷa (/w̓uq̓ʷ-/)	[w̓aʔu]q̓ʷa	to believe
c.	[ʔən]a (/n̓n-/)	[n̓aʔən̓]a	to use a sling

The laryngeals just described are anomalous in that they are purely derivative segments and their status in Oowekyala phonology is at present not fully understood. In particular, it is unclear why they are not automatically assigned the feature [-ATR] through the following constraint (provided earlier in section 2.4.6.3).

(407) [glottal] ⊃ [-ATR] Laryngeals are specified [-ATR]

Derived laryngeals will not be discussed further here. They are compared by Howe (1999) with similar phenomena in Nisga'a (Shaw 1991a) and Totonac (MacKay 1994); see also Akinlabi (1991) on Yoruba.

4. Segmental correspondence

This chapter extends the notion of input-output faithfulness (which has played an essential role in analyses so far) to the relation between base and reduplicant, between words, and (most tentatively) between candidates.

4.1. Base-reduplicant correspondence

4.1.1. Underapplication of h deletion

Recall that, in general, the laryngeal /h/ is permitted only word-initially in Oowekyala (as in all Wakashan languages). This restriction is plausibly formalised as a markedness prohibition on the occurrence of h after any segment.

(408) *Xh h must not occur after a segment. (Domain = word)

This context-sensitive markedness constraint, which may reflect the acoustic difficulty in perceiving [h] immediately after another segment, evidently outranks Max-IO[h] in Oowekyala.

(409) Max-IO[h]

Every h in the input has an identical correspondent in the output.

(410) *Xh ≫ Max-IO[h]

But /h/ exceptionally occurs word-medially in reduplicated forms. For example, the iterative form of hausa 'to count' is haushausa, with word-medial /h/. Next, consider the lexical suffix -̓a 'to try' which is always accompanied by Ca-reduplication; recall e.g. (432), p. 165; (342), p. 132; (405)-(406), p. 157. As shown in (411), a word-medial /h/ surfaces when this suffix is attached to words that begin in /h/.

(411) Word-medial /h/ in reduplicated forms

a.	hahmba	to try to hold the end of sth. long	HS
	hmba	to hold the end of sth. long (as e.g. a pen) between one's lips	HS
b.	hahnƛ̓a	to try to shoot with bow and arrow	HS
	hnƛa	to shoot with a bow and arrow	EW, HS

This shows that Dep-BR[h] is high ranking, such that it can compell violation of *Xh (408). This is illustrated in the following simple tableau. As shown, word-medial /h/ deletion 'underapplies' because of high ranking Dep-BR[h].

(412) Dep-BR[h]

Every h in the reduplicant has an identical correspondent in the input.

(413) /RED-hnƛ-'a/ → hahnƛ'a 'to try to shoot with bow and arrow'

/RED-hnƛ-'a/	Onset	Dep-BR[h]	*Xh	Max-IO[h]
⇒i. ha-hnƛ'a			*	
ii. ha-∅nƛ'a		*!		*
iii. ∅a-∅nƛ'a	*!			

4.1.2. Exceptions to spirantisation/deocclusivisation

In section 3.4 (p. 104ff.) it was proposed that spirantisation/deocclusivisation applies regularly because the context-sensitive markedness condition that triggers this process outranks input-output faithfulness (cf. (275)).

(414) Neutralisation of [-cont] in Oowekyala

$*[-\text{cont}]\,]_\sigma \gg$ Faith-IO[cont]

Interestingly, spirantisation/deocclusivisation fails to apply to obstruent stops and affricates in coda position in reduplicated forms. This is illustrated here.

(415) Underapplication of spirantisation/deocclusivisation

a.	pupsa (*pumsa)	plural of: to swell	HS
	pusa	to swell	EW
b.	cuckʷəla (*cuskʷəla)	plural of: brittle, easy to break (as cornflakes)	HS
	cukʷəla	brittle, easy to break	EW
c.	kaktu (*kaxtu)	plural of: to meet a person	HS
	katu	to meet somebody	EW
f.	kʷikʷsa (*kʷixʷsa)	plural of: to spit	HS
	kʷisa	to spit	EW
g.	qiqx̌əla (*qix̌x̌əla)	plural of: having a forked shape	HS
	qx̌əla	having a forked shape	EW
h.	qʷuqʷt'a (*qʷux̌ʷt'a)	plural of: full, loaded	HS
	qʷut'a	full	EW

The fact that spirantisation/deocclusivisation fails in reduplicative contexts suggests an analysis in which $*[-\text{cont}]\,]_\sigma$ is dominated by high-ranking base-reduplicant faithfulness. Specifically, it appears that spirantisation/deocclusivisation is suspended by a requirement that base-reduplicant correspondents be identical in their specification for [continuant].

(416) Faith-BR[continuant]

Let α be a segment in the base and β be a correspondent of α in the reduplicant. If α is [γcontinuant], then β is [γcontinuant].

As McCarthy and Prince (1995, 1999) demonstrate (building on earlier work by Wilbur 1973 and Shaw 1980, 1987), in fact phonologies have two ways of satisfying a BR-faithfulness constraint like (416). The first is underapplication, as actualised in Oowekyala and illustrated in (415) above. A regular process —spirantisation— fails to apply in reduplicated forms even when its structural description is met, in order to avoid violating Faith-BR.

(417) Underapplication as Anchor-BR[cont]

RED BASE

Input:

/RED_{PL}-q^wut̓-a/ → q^w u q^w t̓ a

Faith-BR

The other, equally effective, response to BR-faithfulness is overapplication. In order to avoid a violation of Faith-BR, the process of spirantisation could apply twice: once in the base, where its structural description is met, and again in the reduplicant, where its structural description is not met.

(418) Overapplication as Anchor-BR[cont]

RED BASE

Input:

/RED_{PL}-q^wut̓-a/ → * $\check{x}^w$ u $\check{x}^w$ t̓ a

Faith-BR

Overapplying spirantisation is initially appealing: it would avert not only a violation of Faith-BR[cont] (like underapplication) but also a violation of *[-cont] $]_\sigma$ (unlike underapplication). However, overapplication also introduces a violation of Left-Anchoring-IO.

(419) Left-Anchoring-IO[continuant]

Let α be a segment at the left periphery of the input and β be a segment at the left periphery of the output. If α is [γcontinuant], then β is [γcontinuant].

Left-Anchor-IO[cont] violated	*Left-Anchor-IO[cont] fulfilled*
Input: Red- q^w u t̓ -a	Input: Red- q^w u t̓ -a
Output: $\check{x}^w$ u $\check{x}^w$ t̓ a	Output: q^w u q^w t̓ a

Altogether, then, the exceptional behaviour of reduplicative forms in terms of spirantisation can be attributed to two high-ranking faithfulness constraints: Faith-BR[cont] and Left-Anchor-IO[cont].

(420) Ranking for underapplication of spirantisation

Faith-BR[cont], Left-Anchor-IO[cont] ≫ *[-cont] $]_\sigma$ ≫ Faith-IO[cont]

The effect of this hierarchy is illustrated in the following constraint tableau. As shown, the base-initial feature [-cont] of /qʷ/ is optimally preserved before syllable-initial /t̓/, in accord with Faith-BR[cont] but in violation of lower-ranked *[-cont] $]_\sigma$. Faith-BR[cont] and *[-cont] $]_\sigma$ can both be satisfied by removing [-cont] from the base-initial /qʷ/ as well as from the prefix-initial /qʷ/, but that involves an unacceptable violation of Left-Anchor-IO[cont].

(421) Underapplication in Oowekyala

/Red$_{PL}$-qʷut̓-a/	Faith-BR[cont]	L-Anchor-IO[cont]	*[-cont] $]_\sigma$	Faith-IO[cont]
⇒a. qʷuqʷt̓a			*	
b. qʷux̌ʷt̓a	*!			*
c. x̌ʷux̌ʷt̓a		*!		**

4.1.3. Underapplication of rounding assimilation between obstruents

A similar case of underapplication concerns the optional pattern of rounding assimilation between obstruents discussed in section 3.2.2. As the following data (repeated from (224) on p. 91) illustrate, rounding assimilation fails to apply to obstruents across reduplicant-base boundaries.

(422)

a.	k̓ʼlx̌ʷ-k̓lqʷa (*K̓lx̌ʷk̓ʷlqʷa)	refers to a man urinating repeatedly; name of the waterfalls at Wu̓x̌ʷƛaʔis or the old Rivers Inlet Cannery site	DS96
	k̓lqʷa	to urinate (said of a male)	EW
b.	k̓ix̌ʷ-k̓ix̌ʷa (*k̓ix̌ʷk̓ʷix̌ʷa)	run, stop, run (repeatedly)	WL
	k̓ix̌ʷa	to run away, escape, flee from	EW
c.	ǧux̌ʷ-ǧux̌ʷa (*ǧux̌ʷǧʷux̌ʷa)	to scoop repeatedly	HS
	ǧux̌ʷa	to scoop up loose things (such as seed, sand, or berries) with one's hand	EW, HS
d.	q̓cxʷ-q̓ckʷa (*q̓cxʷq̓ʷckʷa)	to eat meat	WL
	q̓ckʷ	hair seal meat that has been cut up	JSS3

The fact that rounding assimilation is suspended in this reduplicative environment indicates that the constraint responsible for this pattern ([+rd]/[+cons, +rd]___; section 3.2.2) is outranked by both Faith-BR[round] and Left-Anchor-IO[round] (cf. (161)).

(423) Faith-BR[continuant]

Let α be a segment in the base and β be a correspondent of α in the reduplicant. If α is [γcontinuant], then β is [γcontinuant].

(424) Left-Anchoring-IO[round]

Let α and β be input-output correspondent segments at the left periphery of the word. If α is [γround], then β is [γround].

(425) Ranking for underapplication of rounding assimilation

$$\text{Faith-BR[rd], Left-Anchor-IO[rd]} \gg [+\text{rd}]/\begin{bmatrix}+\text{cons}\\+\text{rd}\end{bmatrix}\_\_\_ \gg \text{Faith-IO[rd]}$$

This effect of this ranking is illustrated in the following constraint tableau.

(426) Underapplication of rounding assimilation across consonants in reduplication

Red$_{ITER}$-k̓ix̌ʷa	Left-Anchor-IO[rd]	Faith-BR[rd]	$[+\text{rd}]/\begin{bmatrix}+\text{cons}\\+\text{rd}\end{bmatrix}\_\_\_$	Faith-IO[rd]
⇒a. k̓ix̌ʷ-k̓ix̌ʷa			*	
b. k̓ix̌ʷ-k̓ʷix̌ʷa		*!		*
c. k̓ʷix̌ʷ-k̓ʷix̌ʷa	*!			*

4.1.4. Deglottalisation in the reduplicant

4.1.4.1. Introduction

Glottalisation is profuse in Oowekyala, as words like q̓aq̓ap̓c̓a 'to shoot at a target' and c̓ac̓ik̓ałq̓ən̓əwa 'to butt in on a fight' make clear. Moreover, unlike their voiced counterparts (recall section 3.6), glottalised obstruent stops and affricates are largely unrestricted in distribution. They may occur word-finally, e.g. (427), before another obstruent, e.g. (428), and even in all-obstruent words, e.g. (429).

(427) Word-final glottalised stops and affricates

a.	m̓əsaqmt̓	"throwing the spirit back and forth"; name of a ceremony at the beginning of a feast, as a way of welcoming guests; term is also used to throw a curse on to someone as in witchcraft	DS121
b.	w̓ac̓	dog	JSS3
c.	ʔaƛ̓	in the forest, to be up in the woods, to do something in the woods (esp. boat-building)	EW
d.	n̓ik̓	penis	EW, HS
e.	k̓ʷuːk̓ʷ	skunk cabbage (Lysichiton americanum); used medicinally by bears; leaves used to line berry baskets and as drinking cups	EW, HS; BC76
f.	c̓ik̓ʷ	bird	EW, HS
g.	ƛ̓auqʷ	tobacco (Nicotiana tabacum); also possibly western dock (Rumex occidentalis) (also possibly "wild rhubarb"): stems, leaves, sprouts and shoots eaten (?)	BC107

(428) Glottalised stops and affricates preceding obstruents

a.	kʷup̓gał	sound of a stick breaking	WL
b.	t̓ka	to spring things away with the fingers and thumb	EW
c.	muːc̓ğais	four strands	WL, HS
d.	p̓aƛ̓sa	to string sth. out on the ground outdoors (e.g. a line)	EW
e.	ʔik̓ba	higher (in place or rank) than; to be at the end of a series; top of a vertical pole	HS
f.	ƛ̓uk̓ʷpa	to get spruce roots (for making baskets)	BC507: DS
g.	naq̓bu	thirsty	HS
h.	ƛaq̓ʷdn	shoulder blade	EW

(429) Glottalised stops and affricates in all-obstruent words

a.	k̓ʷs	light (in weight)	EW
b.	k̓ʷp̓s	loose dirt (not mud)	EW, HS
c.	p̓ƛ̓s	to bend down to the ground (as branches)	HS
d.	pq̓ʷc̓	drowsy, sleepy	EW
e.	c̓k̓ʷx̌t	short (said of a person)	HS
f.	t̓xt̓k̓ʷs	fish hawk	EW, HS
g.	ƛ̓xƛ̓p̓s	to squat on the ground outdoors	HS not sure
h.	k̓ʷx̌k̓ʷq̓s	just about daylight, early dawn (as when one begins to see one's way outdoors)	HS

The free distribution of glottalised obstruents is plausibly related to the phonetic status of these segments as ejectives. Ejectives tend to be perceptually salient by the very nature of their production, as Howe and Pulleyblank (in press) describe:

> The glottal articulation in such segments [glottalised stops and affricates] results in a build-up of air pressure, usually a function of raising the sealed larynx and constricting the pharyngeal walls. At the time of oral release, this results in a high level of acoustic energy.

Specifically, then, the diversity of contexts in which glottalised stops and affricates occur in Oowekyala (e.g. (427)-(429)) may be explained by the fact that glottalisation can be recovered from segment-internal acoustic cues of ejection.

Though appealing at first, this phonetic explanation of the free distribution of glottalised obstruents in Oowekyala is insufficient. An initial complicating factor is that ejection is phonetically weak in Oowekyala, something that comes as a surprise if the segment-internal acoustic cues of glottalisation are indeed critical in this language. Consider Lincoln and Rath's (1980:8) description of these segments:

> The glottalised plosives give the phonetic impression of lenis stops and affricates pronounced with accompanying closure of the glottis. The glottal release is lenis.

In fact, glottalisation in obstruent stops is easily mistaken for voicing.[84] Another complicating factor is that a process of neutralisation affects glottalisation in obstruents in reduplicative prefixes. This neutralisation process is discussed in the next section. It may already be remarked, however, that a phonetic (as opposed to phonological) account cannot explain the morphological (prefixal) conditioning of neutralisation.

4.1.4.2. Deglottalisation in the reduplicant

Recall *from section* 3.6.1 *that the most common form of the plural in* Oowekyala is a CV-shaped reduplicative prefix. When the base of reduplication has a short vowel, this vowel syncopates after being copied. The outcome of this vowel-deletion process is that the first two consonants of the base become adjacent.

(430) Vowel deletion in the base of plural reduplication

$$/\mathrm{Red}_{\mathrm{PL}}\text{-}C_1VC_2\ldots/$$

$$C_1V\text{-}C_1\varnothing C_2\ldots$$

$$[C_1VC_1C_2\ldots]$$

The following examples illustrate this process with C_1 as an ejective and C_2 as an obstruent. For comparison, examples are also included in which C_1 is a voiced stop/affricate, to remind us that voicing —unlike glottalisation— is neutralised in this environment (see section 3.6.1).

(431) Plural reduplication: ejective-initial stems (cf. voiced C-initial stems)

	singular	*plural*		
a.	p̓ixʷa	p̓i-p̓xʷa	to grope, feel with the hands, to palpate (sick person)	EW
	buxʷls	bu-pxʷls	illegitimately pregnant	EW
b.	t̓ała	t̓a-t̓ła	to slice fish	EW, JSS3, WL
	daqa	da-tqa	to get sheets of red-cedar bark for roofing	BC63: DS
c.	c̓ikʷa	c̓i-c̓kʷa	clams (esp. butter clams)	EW, JSS3
	ʣikʷa	ʣi-ckʷa	to push with the feet	EW
d.	ƛ̓ata	ƛ̓a-ƛ̓ta	to oil the hair	EW
	λax̌ʷa	λa-ƛx̌ʷa	to stand	DS64
e.	k̓ix̌ʷa	k̓i-k̓x̌ʷa	to run away, escape, flee from	EW
	gix̌a	gi-kx̌a	to grind, to file, to sharpen	EW
f.	k̓ʷuta	k̓ʷu-k̓ʷta	to nail	EW
	gʷuta	gʷu-kʷta	to stack, pile things up	EW

[84] ...mistaken by linguists (as proofreading of my transcription notes sometimes reveals), not necessarily by speakers.

g.	q̓ata	q̓a-q̓ta	to cut with a chisel, to chisel	EW
	ğaƛa	ğa-qƛa	to hook, gaff, or crochet	EW, HS
h.	q̓ʷuta	q̓ʷu-q̓ʷta.	to eat berry cake or berries boiled until jam-like consistency is obtained	EW
	ğʷux̌ʷa	ğʷu-qʷx̌ʷa	slender, thin, lean, skinny	HS

Now consider the case of plurals where the base of reduplication is itself a reduplicated form, as exemplified in (432). (Reduplication in singular forms is usually triggered by the presence of specific suffixes, e.g. -(ğ)u 'together', -̓a 'to try to'.)

(432) Plural reduplication of reduplicated forms

	singular	*plural*		
	Red-C_1...	PL-Red-C_1...		
a.	k̓ʷu-k̓ʷatəwa	k̓ʷu-kʷ-k̓ʷatəwa	to nail together	HS
b.	q̓a-q̓ac̓əwa	q̓a-q-q̓ac̓əwa	to imitate, copy, replicate, reduplicate; to demonstrate	HS
c.	q̓a-q̓ğu	q̓a-q-q̓ğu	to come together	HS
d.	p̓a-p̓ğəwa	p̓a-p-p̓əğəwa	to put together sth. taken apart without nailing (as a jigsaw puzzle)	HS
e.	t̓a-t̓ikʷa	t̓a-t-t̓ikʷa	to fish for trout with a pole	EW
f.	ƛ̓a-ƛ̓ay̓a	ƛ̓a-ƛ-ƛ̓ay̓a	to try to buy	HS
g.	k̓ʷa-k̓ʷəl̓a	k̓ʷa-kʷ-k̓ʷəl̓a	to hunt for land otter	HS
h.	p̓a-p̓agila	p̓a-p-p̓agila	to have the hands stretched out	HS
i.	c̓a-c̓x̌əmala	c̓a-c-c̓x̌əmala	person who always picks out the easy jobs	HS
j.	c̓i-c̓xʔaliɬ	c̓i-c-c̓xʔaliɬ	to report in turns, to tell stories in turns	EW, HS
k.	q̓ʷu-q̓ʷən̓i	q̓ʷu-qʷ-q̓ʷən̓i	one's neck	EW
l.	t̓u-t̓əw̓a	t̓u-t-t̓əw̓a	stars	EW

As usual, the base of plural reduplication loses a vowel, such that the first two consonants of this base become adjacent. But here the first consonant of the base of plural reduplication is itself a copy (of the stem-initial segment). Interestingly, in this case glottalisation is neutralised in the copied consonant that immediately precedes the (otherwise identical) root-initial consonant.

(433) Plural reduplication of a reduplicated form

$$/\ \text{PL} - \text{RED} - \text{C}'_i\ldots\ / \rightarrow \underbrace{\text{C}'_i\ \text{V} - \text{C}_i}_{\text{Prefixes}} - \underbrace{\text{C}'_i\ldots}_{\text{Stem}} \qquad (\ {*}\ \text{C}'_i\ \text{V} - \text{C}'_i - \text{C}'_i\ldots\ )$$

It is proposed that the neutralisation of glottalisation in this context is due to a context-sensitive markedness constraint that bans the glottalisation feature from syllable coda position.

(434) *[cg] $]_\sigma$ (cf. Howe & Pulleyblank in press)

The feature [constricted glottis] must not occur in coda position.

That [cg] neutralisation takes place in the coda, and not simply wherever a glottalised consonant precedes an identical glottalised obstruent, is suggested by examples like the following. Note that each singular form includes a sequence of identical glottalised obstruents yet neutralisation does not occur.[85] Neutralisation occurs only in the plural forms, where a prefixal glottalised obstruent is evidently avoided in coda position.

(435)

	singular	*plural*		
a.	c̓-c̓n	c̓i-c-c̓n	tidal rapids	HS
b.	p̓-p̓kn	p̓i-p-p̓akn	overworked	HS

The constraint *[cg] $]_\sigma$ (434) must be ranked below Faith-IO[cg], in order to ensure that glottalisation contrasts are generally preserved in syllable coda positions in Oowekyala, e.g. k̓ʷuk̓ʷta 'plural of: to nail' (*k̓ʷukʷta).

(436) [cg] preserved in coda position

/PL-k̓ʷut-a/	Faith-IO[cg]	*[cg] $]_\sigma$
⇒i. k̓ʷu-k̓ʷta		*
ii. k̓ʷu-kʷta	*!	

To explain the neutralisation of [cg] in reduplicative prefixes, e.g. (432), it is crucial that *[cg] $]_\sigma$ be ranked above Faith-BR[cg].

(437) Faith-BR[cg]

Every feature [constricted glottis] in the base has a correspondent in the reduplicant (associated with the presence of certain suffixes, e.g. -(ğ)u 'together', -̓a 'to try to'.).

The complete hierarchy is thus

(438) Faith-IO[cg] ≫ *[cg] $]_\sigma$ ≫ Faith-BR[cg]

---

[85] Other examples with sequences of identical glottalised stops include:

a.	q̓ʷq̓ʷaskn	worn out with crying	HS
b.	t̓t̓aulikn	passed out (as e.g. after drinking too much liquor)	HS
c.	k̓k̓ala	squeaking noise	EW
d.	k̓k̓əlm̓s	"tongue on ground"? Cone-headed Liverwort (Conocephalum conicum)	BC51
e.	k̓ʷk̓ʷx̌ʷsəy̓akʷ	sth. chopped up, kindling	HS

as illustrated in the following tableau for e.g. k̓ʷukʷk̓ʷatəwa 'plural of: to nail together'.[86]

(439) [cg] neutralisation in coda position

	/PL- R- k̓ʷut-(ğ)u-a/	Faith-IO[cg]	*[cg] $]_\sigma$	Faith-BR[cg]
i.	k̓ʷu-k̓ʷ-k̓ʷatəwa		*!	
⇒ii.	k̓ʷu-kʷ-k̓ʷatəwa			*[87]

Note that this interaction fits the 'emergence of the unmarked' schema of McCarthy and Prince (1994, 1995, 1999).

> A structural constraint rendered inactive in the language as a whole because of I-O Faithfulness may nonetheless emerge as visibly active in situations where I-O Faithfulness is not relevant. In particular, it may determine the form of the reduplicant, which is subject to constraints on B-R Identity rather than I-O Faithfulness. (McCarthy and Prince 1999:261)

4.1.4.3. Distribution of glottalised stops and affricates: conclusion

It has been observed that glottalised stops and affricates have a relatively free distribution in Oowekyala. In fact, these segments are disallowed only in coda position within reduplicative prefixes.

The process of deglottalisation that affects stops and affricates in this specific position —as illustrated in (432)— is of general interest in two ways. First, it supports the OT conception of structural constraints as ranked, rather than parametrised. If the driving force behind the deglottalisation process, viz. *[cg] $]_\sigma$ (434), were parametrised, its effects (or lack thereof) should be uniform throughout Oowekyala. But in fact, this constraint is enforced only in reduplicative prefixes. This state of affairs follows from the 'emergence of the unmarked' schema (438).

Another point of interest is that deglottalisation (432) results in 'aspirated' stops and affricates. These segments thus appear to be phonologically 'plain' —since they are the consequence of a neutralisation process. By contrast, if Lincoln & Rath (1980) and Hilton & Rath (1982) were correct in assuming that voiced stops and affricates are phonologically 'plain' in Oowekyala, we would (incorrectly) expect deglottalisation to result in voiced stops and affricates instead.

[86] Another possible candidate, kʷukʷk̓ʷatəwa, is ruled out presumably because it violates lowly-ranked Max-IR[cg] twice rather than just once (to satisfy *[cg] $]_\sigma$).

[87] Max-BR(cg) is specific to the reduplicant that accompanies particular suffixes. It is assumed that a separate Max-BPL(cg) moderates correspondence between the base and the plural prefix.

4.2. Output-to-output correspondence

This section presents two cases in which a pattern overapplies.

4.2.1. Overapplication of post-/u/ rounding

Recall that Oowekyala has a very general process whereby back obstruents (i.e. velars and uvulars) are rounded after /u/ (see section 3.2.1). For instance, consider again the inchoative suffix -xʔit, illustrated in (440) (repeated from (195) above); its initial /x/ becomes rounded [xʷ] after /u/, as illustrated in (441) (repeated from (196) above).

(440) -xʔit 'to become, to start'

a.	ɬl̓-xʔit	to become dead	HS
	ɬl̓	dead, inactive, paralysed	EW, HS
b.	pq̓ʷc̓-xʔit	to become sleepy or drowsy	HS
	pq̓ʷc̓	drowsy, sleepy	EW
c.	pusq̓a-xʔit	to become very hungry, to get a very hungry feeling	EW
	pusq̓a	very hungry feeling (as when starved), to feel very hungry	HS

(441) -xʷʔit 'to become, to start'

a.	tu-xʷʔit	to take a walk, to start to walk	HS
	təw-a	to walk	EW, DS146
b.	su-xʷʔit	to start to go fetch	HS
	səw-a	to fetch	HS
c.	ʔlx̌ʷstu-xʷʔit	to assume the colour of blood	HS
	ʔlx̌ʷstu	colour of blood, having the colour of blood	HS
d.	ƛ̓ux̌ʷalasu-xʷʔit	to fall ill, to become sick	WL
	ƛ̓ux̌ʷalasu	to suffer from a disease, to be ill, sick	WL

The interaction of this rounding effect with reduplication-related syncope gives rise to an opacity effect. As shown below, the plural forms of (441a, b) have rounded [xʷ] even though regular plural reduplication syncope has removed the base vowel /u/ that triggers the rounding of [xʷ].

(442) -xʷʔit 'inchoative'

a.	tu-t-xʷit (*tutxʔit)	plural of: to start to walk	HS
	tu-xʷʔit	to start to walk	HS
b.	su-s-xʷit (*susxʔit)	plural of: to start to fetch	HS
	su-xʷʔit	to start to fetch	HS

Similarly, the initial segment of the lexical suffix -k̓ala 'sound' (e.g. nan-k̓ala 'sound of a grizzly bear') undergoes rounding in plural reduplication even when the /u/-trigger is syncopated.

(443) -k̓ala 'sound, speech'

a.	tu-t-k̓ʷala (*tutk̓ala)	plural of: sound of walking	HS
	tu-k̓ʷala	sound of walking	HS
	təw-a	to walk	HS

In derivational phonology, this opacity effect could be handled by ordering rounding assimilation before plural-reduplication syncope, e.g.:

(444) Derivational account of rounding opacity

Reduplication	tu-tu-xʔit	tu-tu-k̓ala
	↓	↓
C rounding	tu-tu-xʷʔit	tu-tu-k̓ʷala
	↓	↓
V syncope	tu-t-xʷʔit	tu-t-k̓ʷala
	↓	↓
Output	tutxʷʔit	tutk̓ʷala
	'to begin to walk'	'to take place'

A plausible alternative analysis in a surface-oriented theory like OT might invoke rounding stability. Recall from section 3.3.3 (p. 100ff.) that rounding stability has already been established for degemination contexts: when xʷ (or x̌ʷ) deletes under degemination, its [+round] feature 'survives' via Max-IO[round] (repeated here from section 3.3.3).

(445) Max-IO[round]

Every feature [round] of the input has a correspondent in the output.

In a comparable fashion, it might be claimed that /u/ has a [+round] feature which 'survives' on a nearby consonant (via Max-IO[round]) following the V-syncope operation in plural reduplication. As illustrated here, no derivation is needed on this account.

(446) 'Stability' account of rounding opacity

Input: Red-tu-xʔit
|
+rd

Output: tu-t∅-xʷʔit
/
+rd
'to begin to walk'

However, if the analysis of rounding presented in section 3.2.1.2 (p. 84ff.) is correct, the vowel /u/ is specified [+round] only if it shares this feature with a following consonant. It is not the case, therefore, that the vowel in e.g. /tu-/ 'to walk' or /su-/ 'to fetch' is necessarily specified [+round] in the input. Consequently, a consistent stability effect like that illustrated in (446) is not predicted. An alternative solution must be sought.

It is here proposed that the 'overapplication' of obstruent rounding in plural forms reflects the paradigmatic relatedness of these forms with their singular bases which show the normal application of obstruent rounding. For instance, overapplication in tutx^{w}ʔit (*tutxʔit) 'plural of: to start to walk' may be due to its relatedness with the paradigmatic base, tux^{w}ʔit (*tuxʔit). This relatedness can be formalised as an output-output correspondence constraint, after Benua (1999), Buckley (1999) and Burzio (2000) among others.

(447) Faith-OO(C, round)

Let α be a consonant in the base form and β be a correspondent of α in the plural form. If α is [γround], then β is [γround].

(448) Overapplication as Faith-OO[round]

/tu-xʔid/

Faith-IO(C, round) ⇕

$\underbrace{\text{[tux}^w\text{ʔit]} \Leftrightarrow \text{[tutx}^w\text{ʔit]}}_{\textit{Faith-OO(C, round)}}$

That is, rounding assimilation applies normally in the non-reduplicated word and output-output correspondence arguably forces the "overapplication" of rounding assimilation in the reduplicated form. (The normal application of rounding in the base /tu-k̓ala/→[tuk̓^{w}ala] can be seen in tableau (215), p. 88.)

(449)

Input: /Red-tu-k̓ala/ Base: [tuk̓^{w}ala]	Faith-OO(C, round)	Faith-IO(C, round)	$*\begin{bmatrix}+\text{cons}\\+\text{round}\end{bmatrix}$
a. tutk̓ala	*!		
⇒b. tutk̓^{w}ala		*	*

4.2.2. Overapplication of spirantisation

Recall from section (3.4) that word-final spirantisation is variable, as shown here (see additional examples in (269)-(290) above).

(450) Variable word-final spirantisation

a.	ğ^{w}əl̓k ~ ğ^{w}əl̓x	spruce pitch, chewing gum made out of spruce pitch; used as medicine	EW, BC64: DS
b.	x̌aːq ~ x̌aːx̌	bone	EW, HS
c.	ğ^{w}uluq^w ~ ğ^{w}ulux̌^{w}	animal fat, suet, tallow	EW
d.	ƛ̓uk̓^{w}p ~ ƛ̓uk̓^{w}m	root; licorice fern (Polypodium glycyrrhiza); "root" (rhizome) chewed, possibly for medicinal purposes	EW, SW73, BC59: LJ

e.	p̓əl̓up ~ p̓əl̓əw̓m	sister-in-law (according to Franz Boas the precise meaning is: "husband's sister" and "woman's brother's wife")	EW
f.	k̓ibat ~ k̓ibaɫ	red elderberry (Sambucus racemosa) fruit	HS; BC90

It is argued in section 3.4 that the feature [-continuant] is preserved through right edge-anchoring (Right-Anchor-IO[cont]) and that this faithfulness constraint is crucially unranked relative to the markedness constraint responsible for spirantisation, viz. *[-cont]]$_\sigma$. This analysis predicts that spirantisation should only affect obstruent stops and affricates in coda position, and only when *[-cont]]$_\sigma$ outranks Right-Anchor-IO[cont], as in the following constraint tableau (repeated from section 3.4).

(451) Word-final spirantisation in Oowekyala

/ǧʷuluqʷ/	*[-cont]]$_\sigma$	R-Anchor-IO [cont]	Faith-IO [cont]
a. ǧʷuluqʷ	*!		
⇒b. ǧʷuluxʷ̌		*	*

In fact, this prediction fails when vowel-initial enclitics are considered. Such enclitics include -i '3rd person distal indicative' and -ax̌i '3rd person distal demonstrative'. When these endings are added to words like (450), variable spirantisation persists, as shown here:

(452) Overapplication of spirantisation

a.	ǧʷəliki ~ ǧʷəlixi	that-over-there is spruce pitch	HS
b.	x̌aːqi ~ x̌aːx̌i	bone	HS
c.	ǧʷuluqʷi ~ ǧʷulux̌ʷi	that-over-there is animal fat, suet, tallow	HS
d.	ƛ̓uk̓ʷpax̌i ~ ƛ̓uk̓ʷmax̌i	the/a root over-there	HS

Variable spirantisation is unexpected in these forms because nothing overtly triggers it. Indeed, when a vowel-initial enclitic follows a word-final obstruent stop, the latter is in onset position and so it does not meet the structural description of spirantisation.[88] In particular, the analysis developed in section 3.4 does not foresee the variable spirantisation illustrated in (452) which involves an apparently unmotivated violation of Faith-IO[cont], as shown in the following tableau.

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[88] Pulleyblank (p.c.) suggests that syllabification over a clitic boundary might be optional (e.g., Onset and AlignL(clitic, σ) could be variably ranked). Though initially appealing, this analysis incorrectly predicts that root-final or stem-final voiced stops will variably devoice before vowel-initial enclitics, e.g. /ʔag+i/ → ʔagi ~ *ʔaki (ʔag- 'all, every'; -i '3rd pers. sing. nomin.').

(453)

/ğ^{w}uluq^{w}/+/i/	*[-cont] $]_{\sigma}$	R-Anchor-IO [cont]	Faith-IO [cont]
⇒a. ğ^{w}uluq^{w}i			
b. ğ^{w}ulux̌^{w}i			*!

To solve this problem in parallelist (as opposed to derivational) OT, it must be formally recognised that the output forms in (450) and those in (452) are paradigmatically related. It may indeed be argued that the normal application of variable spirantisation in (450) is responsible for the 'overapplication' of variable spirantisation in (452). For instance, overapplication in [ğ^{w}ulux̌^{w}i] may be due to its relatedness to the paradigmatic base [ğ^{w}ulux̌^{w}]. This relatedness can be formulated as an output-output correspondence constraint, after Benua (1999), Buckley (1999) and Burzio (2000) among others.

(454) Faith-OO[cont]

Let α be a segment in the base and β be a correspondent of α in the encliticised form of A. If α is [γcontinuant], then β is [γcontinuant].

(455) Overapplication as R-Anchoring-BP[cont]

/ğ^{w}uluq^{w}/

Faith-IO[cont] ⇕

[ğ^{w}ulux̌^{w}] ⇔ [ğ^{w}ulux̌^{w}i]

Faith-OO[cont]

To see how this analysis works, consider first the subhierarchy which results in word-final spirantisation (section 3.4), with R-Anchor-BP[cont] added.

$$(456)\ \left\{ \begin{array}{l} \text{*[-cont] }]_{\sigma} \gg \text{R-Anchor-IO[cont]} \\ \\ \qquad \text{R-Anchor-BP[cont]} \end{array} \right\} \gg \text{Faith-IO[cont]}$$

This interaction is illustrated in the following two tableaux. Note first in tableau (457) that /ğ^{w}uluq^{w}/ is optimally mapped as [ğ^{w}ulux̌^{w}] because *[-cont] $]_{\sigma}$ dominates R-Anchor-IO[cont]. Next observe in tableau (458) that /ğ^{w}uluq^{w}+i/ is optimally mapped as [ğ^{w}ulux̌^{w}i] because Faith-OO[cont] dominates Faith-IO[cont] and this output is closer than [ğ^{w}uluq^{w}i] to its paradigmatic base — [ğ^{w}ulux̌^{w}] in this subhierarchy.

(457)

/ğ^{w}uluq^{w}/	*[-cont] $]_{\sigma}$	R-Anchor-IO [cont]	Faith-OO [cont]	Faith-IO [cont]
a. ğ^{w}uluq^{w}	*!			
⇒b. ğ^{w}ulux̌^{w}		*		*

(458)

Input: /ğʷuluqʷ/+/i/ Base: [ğʷuluxʷ]	*[-cont]]$_\sigma$	R-Anchor-IO [cont]	Faith-OO [cont]	Faith-IO [cont]
a. ğʷuluqʷi			*!	
⇒b. ğʷuluxʷi				*

Now consider the alternative subhierarchy in which R-Anchor-IO[cont] dominates *[-cont]]$_\sigma$; Faith-OO[cont] still dominates Faith-IO[cont].

(459) { R-Anchor-IO[cont] ≫ *[-cont]]$_\sigma$; Faith-OO[cont] } ≫ Faith-IO[cont]

This interaction is illustrated in the next two tableaux. Observe that /ğʷuluqʷ/ is optimally mapped as fully-faithful [ğʷuluqʷ] (R-Anchor-IO[cont] ≫ *[-cont]]$_\sigma$) and, similarly, /ğʷuluqʷ+i/ is optimally mapped as [ğʷuluqʷi] because this output is maximally faithful to its input as well as to its paradigmatic base —[ğʷuluqʷ] in this subhierarchy.

(460)

/ğʷuluqʷ/	R-Anchor-IO [cont]	*[-cont]]$_\sigma$	Faith-OO [cont]	Faith-IO [cont]
⇒a. ğʷuluqʷ		*		
b. ğʷuluxʷ	*!			*

(461)

Input: /ğʷuluqʷ/+/i/ Base: [ğʷuluqʷ]	R-Anchor-IO [cont]	*[-cont]]$_\sigma$	Faith-OO [cont]	Faith-IO [cont]
⇒a. ğʷuluqʷi				
b. ğʷuluxʷi			*!	*

The foregoing analysis makes the assumption that each enclitisised form and its paradigmatic base are evaluated within the same subhierarchy of grammar. In the hierarchy that has *[-cont]]$_\sigma$ ≫ Right-Anchor-IO[cont], both the enclitisised form and its paradigmatic base involve spirantisation. In the hierarchy that has Right-Anchor-IO[cont] ≫ *[-cont]]$_\sigma$, neither the enclitisised form nor its paradigmatic base involve spirantisation. This assumption may ultimately be unnecessary (the free evaluation of pairs ought to give results that are attested on the surface anyway), but its validity can be tested: it makes a prediction of *perseverance* (or *concord*).

'Perseverance' describes situations in which the use of a free-variant results in the use of the same free-variant in some domain (e.g. within a phrase). This phenomenon is well documented for numerous cases of variation (see e.g. Poplack 1979, Labov 1994:557-60). In our case, the expectation is that when an encliticised form is used with its paradigmatic base in the same domain (say, a phrase), both forms will agree in terms of the (non)application of spirantisation. The crucial finding is that the grammar remains constant within limited domains (like phrases). Whether this prediction of perseverance is actually borne out in Oowekyala is left here for future research.

4.3. Candidate-to-candidate correspondence

This final section discusses four cases involving opacity, i.e. output forms that are shaped by non-surface true generalisations. The most recent OT tactic against opacity is McCarthy's (1999) Sympathy Theory which concedes (rather abstract) candidate-to-candidate correspondence relations.

4.3.1. On the change from /x/ to [n, ń]

Recall from section 2.3.2 that Oowekyala shows peculiar changes from /x/ to [n, ń] before voicing and glottalising suffixes, respectively. For example, when the root of p̓xa 'dented, grooved' is combined with the voicing suffix -iɬ 'indoors', the result is p̓əniɬ 'pit in the floor of the house'. When the same root is combined with the glottalising suffix -̓s 'outdoors', the result is p̓ńs 'pit in the ground outdoors'. It is here proposed that such changes from /x/ to [n, ń] are unusual because they implicate abstract intermediate representations: *[ŋ, ŋ̓]. Specifically:

On the one hand, it is recognised that /x/ corresponds to the homorganic sonorants *[ŋ, ŋ̓] before voicing and glottalising suffixes, respectively, in the same way that /s/ corresponds to the homorganic sonorants [y, ẏ] in these contexts, that /ɬ/ corresponds to the homorganic sonorants [l, l̓] in these contexts, and that /xʷ, x̌ʷ/ correspond to the homorganic sonorants [w, w̓] in these contexts (see section 2.3.2). As shown in the following tableau (adapted from section 2.3.2), Max-IO[voi/cg] is satisfied by changing a fricative to a sonorant, i.e. by violating Faith-IO[son]. Moreover, since a velar nasal is the only (homorganic) sonorant counterpart of /x/, Dep-IO[nas] must also be violated in order to satisfy Max-IO[voi/cg].

(462) /məx-⁺ᵛᵒⁱac̓i/ → *məŋac̓i 'drum'

/məx-, ⁺ᵛᵒⁱac̓i/	Max-IO[voi]	Faith-IO[son]	Dep-IO[nas]
a. məxac̓i	*!		
⇒b. məŋac̓i		*	*

On the other hand, it is recognised that [n, ń] correspond to *[ŋ, ŋ̓] in Oowekyala since velar nasals are prohibited in this language, presumably via the ranking *[+nas, dor] ≫ Faith-IO[Place]. Recall that e.g. English 'king' is realised as [kin] in Oowekyala (section 2.4.5, p. 70).

(463) /kɪŋ/	*[+nas, dor]	Faith-IO[Place]
a. [kiŋ]	*!	
⇒b. [kin]		*

In other words, the mapping of /x/ to [n, n̓] before voicing and glottalising suffixes (respectively) can be understood once abstract intermediate representations with velar nasals are admitted. Indeed, the mapping from input /x/ to 'intermediate' homorganic [ŋ, ŋ̓] is independently-motivated (see section 2.3.2 on fricatives changing to homorganic sonorants), as is the mapping from 'intermediate' [ŋ, ŋ̓] to [n, n̓] (see section 2.4.5).

McCarthy (1999) proposes to formalise the notion of abstract 'intermediate' representations as 'sympathetic' candidates toward which other outputs must be faithful. A candidate is 'sympathetic' if it fails while otherwise being more faithful to the input than the successful candidate itself. For instance, consider the tableau in (465), which combines the constraints from tableaux (462) and (463), and which also includes Max-$O[nas], a constraint demanding that outputs match the nasal specification of the sympathetic candidate.

(464) Faith-$O[nasal] (McCarthy 1999)

Let α be a segment in the sympathetic candidate and β be a correspondent of α in an output. If α is [γnasal], then β is [γnasal].

The sympathetic candidate, marked $, is (465b). It fatally violates *[+nas, dor] but otherwise fulfills Max-IO[voi] while being Place-faithful to the input /x/. (465a) is also Place-faithful, but it fatally violates higher-ranking Faith-$O[nas]. (465c) thus emerges as the winning candidate because it fulfills both *[+nas, dor] and Faith-$O[nas].

(465) /məx-+voiac̓i/ → *məŋac̓i 'drum'

/məx-, +voiac̓i/	*[+nas, dor]	Faith-$O [nas]	Faith-IO [Pl]	Max-IO [voi]	Dep-IO [nas]	Faith-IO [son]
a. məxac̓i		*!		*!		
$ b. məŋac̓i	*!				*	*
⇒c. mənac̓i			*		*	*
d. məγac̓i		*!	*		*	*

4.3.2. Overapplication of dissimilation of [+continuant]

Recall from section 3.5 that Oowekyala has a dissimilation process that affects adjacent coronal consonants specified [+continuant]. For example, the initial segment of the suffix -sm 'round and/or bulky object' is pronounced [s] after q̓axʷ- 'to be visible' (q̓axʷsm 'sth. round and/or bulky that has become visible in the water') but [c] after ʔaluɬ 'new' (ʔaluɬcm 'round and/or bulky thing (e.g. a cooking stone) that is new') (see section 3.5 for additional examples). The following constraint is held responsible for continuancy dissimilation in Oowekyala.

(466) OCP(Cor+cont)

A sequence of two segments, both [coronal] and both [+continuant], is disallowed.

Because it triggers a loss of [+continuant], OCP(Cor+cont) must outrank Faith-IO[cont]. Recall that *[-cont] $]_\sigma$ also outranks Faith-IO[cont] (see section 3.4.2 on spirantisation). Together, then, OCP(Cor+cont) and *[-cont]$]_\sigma$ ensure that in a sequence of two coronal fricatives, the second (rather than the first) will lose its [+continuant] specification, as illustrated in the following tableau.

(467) Continuancy dissimilation in coronals

	/ʔaluɬ-s(ğ)m/	OCP(Cor+cont)	*[-cont] $]_\sigma$	Faith-IO[cont]
a.	ʔaluɬ-sm	*!		
b.	ʔaluƛ-sm		*!	*
⇒c.	ʔaluɬ-cm			*

Now recall what happens when -sm is added to a stem that ends in /s/. As exemplified in (468) below, a single [c] results. The same pattern is illustrated with other suffixes/enclitics in section 3.5 ((310), (315), (321)).

(468) ...s+sm 'round and/or bulky object'

a.	dənacm	sth. that is round and/or bulky (such as a box) and that is made of red cedar bark	BC63: DS
	dənas	inner bark of red cedar	BC63: DS
b.	p̓icm	thing that is round and/or bulky and that is hard	HS
	p̓isa	hard	EW
c.	q̓ikacm	thing that is big and round and/or bulky	HS
	q̓ikas	big, large, important, considerable	HS

This transformation ...s+s...→...c... has two components: the featural change of suffix-initial /s/ to [c], and the deletion of stem-final /s/. Crucially, both processes are independently-motivated in Oowekyala.

- The occlusivisation of suffix-initial /s/ to [c] is evidently related to the dissimilatory change ...ɬ+s...→...ɬc...., which is exemplified in (308), (309), (313), (314), (319) and (320), and which is analysed in e.g. tableau (323) in section 3.5; see also (467) above.

- On the other hand, the deletion of stem-final /s/ before suffix-initial [c] is part of a general degemination process that elides the first consonant in a sequence of two (near) identical segments. This process was discussed in section 3.3. It suffices to note here that the sequences [ss], [sc], [cs], [cc] are generally excluded in Oowekyala.

In derivational phonology, the correct outputs can be obtained if these two independently motivated structural changes are interpreted as rules arranged in counterbleeding order, as illustrated in (469). Crucially, in (469b) the coronal fricative that triggers continuancy dissimilation gets deleted by degemination.

(469) Opacity of occlusivisation in Oowekyala

a.	/ğʷaɬ-su/	b. /ʔas-su/	
	ğʷaɬ-cu	ʔas-cu	Coronal continuancy dissimilation (section 3.5)
	n/a	ʔa-cu	Degemination (section 3.3)
	[ğʷaɬcu]	[ʔacu]	

The fact that the trigger for continuancy dissimilation is not always surface-apparent poses a basic challenge to the OT analysis of this phenomenon. To address this, McCarthy's (1999) Sympathy Theory is again invoked. Specifically, the intermediate form in (469b) resulting from continuancy dissimilation (e.g. ʔas-cu) is considered a 'sympathetic' candidate, i.e. an abstract representation that mediates between the input and the (opaque) output. As noted in the previous section, the sympathetic candidate is always a failed candidate that is otherwise maximally faithful to the input. Consider the tableau below, which also includes Faith-$O[cont], a constraint requiring that outputs match the continuancy specification of the sympathetic candidate.

(470) Faith-$O[continuant] (McCarthy 1999)

Let α be a segment in the sympathetic candidate and β be a correspondent of α in an output. If α is [γcontinuant], then β is [γcontinuant].

(471) 'Overapplicaton' of continuancy dissimilation in coronals

	Anti-gem.	Left Anchor IO	OCP (Cor, +cont)	*[-cont]]$_\sigma$	Max-IO	Faith $O [cont]	Faith IO [cont]
a. ʔas-su	*!		*!			*	
b. ʔac-su	*!			*!		*	*
$ c. ʔas-cu	*!						*
d. ʔas-∅u		*!					
e. ʔac-∅u		*!					
f. ʔa∅-su					*	*!	
⇒g. ʔa∅-cu					*		*

The 'sympathy' candidate (471c), marked $, fatally violates Antigemination but otherwise incurs the least constraint violations. Of the various other candidates, only (471g) fulfills Faith-$O[cont]. Note that the latter outranks Faith-IO[cont] which would have selected (471f) had Faith-$O[cont] not been included. Indeed, without Faith-$O[cont], the optimal candidate would necessarily be *ʔasu (471f) which has one fewer violation of Faith-IO[cont] than ʔacu (471f). In fact, the violation marks associated with candidate (471f) are a proper subset of those associated with candidate (471g), so no amount of constraint reranking (or conjunction; Smolensky

1995) will ensure that the correct output (ʔacu) is chosen. This clearly establishes the need for a sympathy-output faithfulness constraint Faith-$O[cont].

4.3.3. Overapplication of deocclusivisation

Recall from section 3.6.4.3 that the inchoative suffix has the form -ʔit after plain (i.e. voiceless, nonglottalised) obstruents; cf. (392). Because this suffix begins a new syllable, it triggers regular spirantisation in the preceding consonant, as the following data illustrate.

(472) Spirantisation before Inchoative -ʔit

a.	siɬ-ʔit	to start to poke through an opening with a stick or stick-like thing	HS
	sit-a	to poke, push through an opening	EW
b.	m̓uc-əla	to round the mouth	EW
	m̓us-ʔit	to round the mouth, to pucker the lips	HS
c.	waiɬʔit	to become weak, to become too weak to do sth.	HS
	waiƛ̓	weak, feeble	HS, EW
d.	q̓xʔit	to start to bite	HS
	q̓ka	to bite (e.g., mosquito)	EW, JSS3
e.	q̓mxʷʔit	to start to chew sth. brittle noisily	HS
	q̓mkʷa	to bite something hard or brittle; to eat (said of animals)	EW
f.	m̓əx̌ʔit	to discard, throw away, drop (ceremonial word)	EW
	m̓əqa	to throw away (ceremonial word only)	HS
g.	c̓mx̌ʷ-ʔit	to swallow at once without chewing	HS
	c̓mqʷa	to bolt food, to swallow whole (e.g. pills)	EW

Next recall from section 3.4.3 (p. 111ff.) that /p/ deocclusivises as [m]. Root-final /p/ also deocclusivises as [m] before the inchoative suffix -ʔit. A complicating factor here, however, is that the resulting [m] merges with the initial [ʔ] of the inchoative suffix, yielding [m̓]. This pattern is illustrated in the following data.

(473) p → m̓ before inchoative suffix

a.	dam̓it	to start towing	HS
	dapa	to tow	EW, HS
b.	kʷum̓it	to start to break (as a stick)	WL
	kʷupa	to snap, to break (said of a stick or long stick-like thing)	EW
c.	x̌um̓it	to become rough, to lose smoothness; to start to gather debris, pieces of wood (for firewood)	HS
	x̌upa	rough (said of lumber); to gather (debris, pieces of wood for the fire)	EW
d.	yam̓it	to (start to) send on an errand	HS
	yapa	to send somebody	EW, HS

e.	ʣum̓it	to start to plug soft material in holes, to start to stuff with a cloth	HS
	ʣupa	to fill, stuff, or plug up with soft material	EW
f.	ʔam̓it	to begin to show maggots, to become maggoty, to become mag-got-infested	HS
	ʔapa	maggoty	EW
g.	x̌lm̓it	to start to scrape up sth. with the fingers using a clawing move-ment	HS
	x̌lpa	to rake, to scrape with the fingers	EW
h.	c̓əm̓it	to start to dip grease from a dish	HS
	c̓pa	to dip food (in oil, syrup, or water)	EW
i.	λam̓it	to start digging clams	HS
	λapa	to dig for clams or cockles	EW, JSS1
j.	ǧlm̓it	to give a pull towards oneself with the hands, to pull the trigger of a gun, to beckon a person with the finger that he should come over	HS
	ǧlpa	to grasp, hold on, pull towards oneself (esp. with a hooked finger or hand, e.g. gun)	EW
h.	kəm̓it	to start to tuck, jam or button up	HS
	kpa	to plug (hole), tuck in, jam in, to button up, insert (lever)	EW
i.	kʷam̓it	to start to tear fabric (e.g. a mat) or a flat thing	HS
	kʷapa	to tear fabric (e.g. a mat) or a flat thing	EW
j.	l̓am̓it	to start to spread open with one's thumbs (as e.g. a deck of cards)	HS
	l̓apa	to spread apart with the thumbs	EW
k.	ɬnm̓it	to become soft	HS
	ɬnpa	saggy, loose, soft, wrinkled	EW

The merger of m+ʔ in the data above is a general property of Oowekyala. /ʔ/ is generally disallowed after resonants, i.e. the sequences /mʔ, nʔ, lʔ, wʔ (uʔ), yʔ (iʔ)/ are forbidden. The high incidence of word-medial glottalised resonants, and the overall absence of resonant + glottal stop sequences, together suggest that /ʔ/ regularly coalesces with preceding resonants. In correspondence-theoretic terms, coalescence can be achieved through the ranking *Rʔ ≫ Uniformity-IO.

(474) *Rʔ ʔ must not occur after a resonant. (Domain = word)

(475) Uniformity-IO (McCarthy & Prince 1995:371)
No segment of the output has multiple correspondents in the input.

Coalescence in (473) creates some difficulty for a surface-oriented theory like OT, as the application of coalescence removes the surface-apparent need for deocclusivisation (/p/→[m]).

This problem does not arise in derivational phonology, where coalescence can be sequenced after regular deocclusivisation (in counterbleeding order), as illustrated in (476b).

(476)

	a. /sit-(x)ʔid/	b. /dap-(x)ʔid/	
	siɬʔit	damʔit	Deocclusivisation (section 3.4.3, p. 111)
	n/a	damʼit	Rʔ → Rʼ (coalescence)
	[siɬʔit]	[damʼit]	

The problem for OT can be resolved by admitting sympathetic correspondence relations, after McCarthy (1999). The 'sympathetic' candidate that influences the pattern in (473) is one that fatally violates *Rʔ but is otherwise the most harmonic in terms of the constraint hierarchy of Oowekyala. The grammar requires that each output be faithful to this sympathetic candidate in terms of continuancy.

(477) Faith-$O[continuant] (cf. McCarthy 1999)
Let α be a segment in the sympathetic candidate and β be a correspondent of α in an output. If α is [γcontinuant], then β is [γcontinuant].

The relevant interaction of constraints is illustrated in the following tableau. (Continuancy is shown only for the root-final consonant.) (478a) fatally violates *[-cont] $]_\sigma$; (478b) fatally violates *Rʔ. These context-sensitive markedness constraints are fulfilled by (478c) and (478d) which both violate lower-ranked Uniformity. (478d) wins because it also fulfills Faith-$O[cont]. Note that Dep-IO[nas] and Faith-IO[cont], which otherwise select (478c) as optimal, are crucially dominated by Faith-$O[cont]. That is, the sympathetic faithfulness constraint is crucial, since without it, (478c) would incorrectly be chosen.

(478) Deocclusivisation of word-medial /p/ in Oowekyala

	/dap-(x)ʔid-i/ | -cont	*Rʔ	*[-cont]]$_\sigma$	Uniform-IO	Faith-$O [cont]	Dep-IO [nas]	Faith-IO [cont]
a.	dap.ʔi.di | -cont		*!				
$ b.	dam.ʔi.di	*!				*	*
c.	da.p̓i.di | -cont			*	*!		
⇒d.	da.m̓i.di			*		*	*

4.3.4. *Sonorant glottalisation before voicing suffixes*

Recall from section 2.3 that Oowekyala has voicing suffixes that cause stem-final obstruent stops and affricates to become voiced (see section 2.3.1, p. 30ff. for examples) and stem-final fricatives to become homorganic sonorants (see section 2.3.2, p. 41ff. for examples). Consider now what happens when voicing suffixes are added to stems ending in sonorants. As Boas (1911) first observed, stem-final sonorants become glottalised before voicing suffixes. This pattern is exemplified in (479) and (480) with the voicing suffixes -iɬ 'indoors' and -ac̓i 'container'.

(479) -$^{+voi}$iɬ 'indoors'

a.	mam̓iɬ	bedding	HS
	mam	blanket, bedding, bedcover	EW, HS, JSS3
b.	ʔik̓sǧəm̓iɬ	round and/or bulky (clumsy) thing that is high and indoors	HS
	ʔik̓sǧm	round and/or bulky (big) thing that is high (as e.g. a mountain)	HS
c.	ɬəm̓iɬ	curtain (as used on the stage)	HS
	ɬəma	to cover with a curtain; to tie up, to moor	EW
d.	han̓iɬ	to be indoors (said of a boat inside a boat shop)	HS
	hana	to be somewhere (said of hollow object), to put a hollow object somewhere, to can, to put things into a container	EW
e.	ʔakǧəw̓iɬ	all together indoors (as a family)	HS
	ʔakǧəwa	all together, to gather people together	HS
f.	k̓ʷaʣəw̓iɬ	to sit on a relatively small flat surface indoors (e.g. on a bed)	HS
	k̓ʷaʣəwa	to sit on a flat surface (such as a table); in a box	HS

(480) -+voiaci̓ 'container'

a.	ƛ̓bəm̓aci̓	door frame	HS
	ƛ̓bm	door	JSS3, HS
b.	p̓ay̓əw̓aci̓	toolbox	HS
	p̓ay̓u	tool, instrument	JSS3
c.	dnkƛəy̓aci̓	seine boat	JSS3
	dnkƛi	to fish with the seine; seine boat	HS

It is proposed that this pattern reflects an abstract intermediate representation in which a glottal stop follows stem-final resonants before voicing suffixes, e.g. mamʔiɬ, ƛ̓bmʔaci̓. In OT these abstract representations are 'sympathetic' candidates (McCarthy 1999); see below. In derivational phonology, the abstract representations in question would be sequenced before the outputs are realised, e.g.:

(481) Derivational analysis

a. / mam-+voiiɬ/

↓

mamʔiɬ Glottal stop formation

↓

mam̓iɬ Rʔ → R' (coalescence) (see preceding subsection)

↓

[mam̓iɬ]

The glottal stop in the alleged 'intermediate' representations is actually realised following stem-final [a], as the following examples show.

(482) -+voiiɬ 'indoors'

a.	kʷaʔiɬ	to sit (indoors)	WL, JSS2, HS
	kʷa:la	sitting; term is used to refer to the marriage ceremony "seated together"	EW, DS100
b.	laʔiɬʔit	to start to go into the building	HS
	la:x̌a	down, to go down, to be down, to change to down position, to move downwards	EW
c.	x̌əm̓aʔiɬ	to stay overnight at a house (esp. with a sweetheart), person staying overnight	HS
	x̌əm̓ala	to stay overnight	EW

The glottal stop in question is also realised when resonant-ending stems are followed by cognate 'weakening' suffixes in South Wakashan languages (Rose 1976). Crucially, unlike their North Wakashan relatives, South Wakashan languages allow resonant+glottal stop sequences. The following data are from Ahousaht Nuuchahnulth (Dick et al., in prep.).

(483) -iɬ 'indoors' in Ahousaht Nuuchahnulth

a.	čum-ʔiɬ	bed
b.	ʔapw̓in-ʔiɬ	living area in middle
c.	timaɬsu-ʔiɬ	to wash the walls indoors
d.	ɬu-ʔiɬum	flooring

It is unclear why the floating [+voice] feature of voicing suffixes should ever be realised as [ʔ] in Wakashan languages, including Oowekyala (482). One possibility is that even a floating laryngeal feature is dominated by a Laryngeal node. In that case, the grammar may insert a segmental root in order to parse the Laryngeal node (though not its dependent [+voice]). That is, Max-IO[Lar] outranks Dep-IO[root] and also Dep-IO[cg] (since [ʔ] necessarily implies [+cg]). This interaction is illustrated in the following tableau. As shown, the optimal output (484b) fulfills Max-IO[Lar] by realising the floating [Lar] as [ʔ], not as [ɦ] (484a) which fatally violates *Xh.

(484) /kʷa-+voiiɬ/ → kʷaʔiɬ 'sit indoors'

/kʷa - iɬ/ | Lar Lar | | +voi +voi	*Xh	Max-IO[Lar]	Dep-IO[root]	Dep-IO[+cg]
a. kʷa ɦ iɬ | | Lar Lar | | +voi +voi	*!		*	
⇒b. kʷa ʔ iɬ | | Lar Lar | | +voi +cg			*	*
c. kʷa iɬ		*!		

Returning to the glottalisation pattern in e.g. (479) and (480), the 'sympathetic' candidate that provokes each instance of dynamic glottalisation is one that fatally violates *Rʔ but is otherwise the most harmonic in terms of the constraint hierarchy of Oowekyala. The grammar requires that each output be faithful to this sympathetic candidate in terms of glottalisation.

(485) Max-$O[+cg] (cf. McCarthy 1999)

Every [+constricted glottis] in the sympathetic candidate has a correspondent in the output.

The effect of Max-\$O[+cg] is shown in the following tableau for /mam+$^{+voi}$iɬ/ → mam̓iɬ 'bedding (indoors)'. (486a) fulfills Max-IO[Lar] by realising the floating [Lar$_j$] as ɦ, but the latter fatally violates *Xh. Similarly, (486b) fulfills Max-IO[Lar] by realising the floating [Lar$_j$] as ʔ, but the latter fatally violates *Rʔ. The other candidates, (486c) and (486d), both satisfy the high-ranking contextual markedness constraints *Xh and *Rʔ, and they both violate Max-IO[Lar] (because they fail to realise [Lar$_j$]). (486c) is chosen over (486d), however, because the latter is unfaithful to the glottalisation feature of the sympathetic candidate mamʔiɬ. Note that sympathy is crucial here. Had Max-\$O[+cg] not been included above Dep-IO[+cg], the latter faithfulness constraint would have selected (486d) as optimal.

(486) /mam+$^{+voi}$iɬ/ → mam̓iɬ 'bedding (indoors)'

/mam - iɬ/ | Lar$_i$ Lar$_j$ | | +voi +voi	*Xh	*Rʔ	Max-IO[Lar]	Dep-IO[root]	Max-\$O[+cg]	Dep-IO[+cg]
a. mam ɦ iɬ | | Lar$_i$ Lar$_j$ | | +voi +voi	*!			*	*	
\$ b. mam ʔ iɬ | | Lar$_i$ Lar$_j$ | | +voi +cg		*!		*		*
⇒c. mam̓iɬ | Lar$_i$ | +cg			*			*
d. mamiɬ | Lar$_i$ | +voi			*		*!	

5. Conclusion

Perhaps because OT was first developed in the study of prosodic phonology (and morphology) (Prince & Smolensky 1993, McCarthy & Prince 1993), the application of OT to segmental phonology has been met with skepticism. For instance, Chomsky (1995:224, 380) notes that OT's surface orientation seems appropriate enough for prosodic processes but he predicts that OT will fail to account for segmental processes. Indeed, most arguments levelled against OT so far draw on segmental phonology (e.g., Roca 1997). The view that OT is adequate only for prosodic phonology exists even among avowed OT practioners. Here is Hammond (1999:vii):

> OT has grown out of much work which leads to the conclusion that a surface-oriented constraint-based approach is appropriate for the theory of prosody. Other domains of phonology are not so readily treated or so obviously best treated in terms of such a theory.

Not surprisingly, perhaps, whole prosodic systems have now been analysed in OT (e.g., Hammond 1999 on English, van Oostendorp 2000 on Dutch) while OT has not yet been used to treat whole segmental phonologies (but cf. Elzinga's 1999 OT treatment of Gosiute consonants). An important realisation of this dissertation has been to show that OT can be used effectively to describe and analyse a whole segmental phonology.

This dissertation has treated the sound pattern of Oowekyala, a nearly extinct Wakashan language of the west coast of British Columbia, Canada. The segment-internal (paradigmatic) dimension of Oowekyala phonology was discussed first. This part of grammar results from the interaction between input-output faithfulness and context-free markedness constraints. This interaction was discussed with respect to the various features that crossclassify the segment inventory of Oowekyala. Among other things, it was argued that laryngeals are resonants, that affricates are noncontoured segments, that voicing and glottalisation features not only cross-classify the segment inventory but also occur as floating elements and that these floaters cause lenition.

The intersegmental (syntagmatic) phonology was treated next. These are patterns that result from the interaction between input-output faithfulness constraints and context-sensitive markedness constraints. Patterns discussed included: rounding of consonants, degemination, spirantisation/deocclusivisation, continuancy dissimilation, voicing neutralisation, and allophonic variation.

Exceptional phonological patterns that could not be explained through the interaction between input-output faithfulness constraints and markedness constraints were addressed last. It was argued that these exceptional patterns reflect various correspondence relations (cf. McCarthy & Prince 1995, 1999): base-reduplicant correspondence, output-to-output correspondence, and candidate-to-candidate correspondence.

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