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Musicolinguistics: New Methodologies for Integrating Musical and Linguistic Data

A dissertation submitted in partial satisfaction of the
requirements for the degree Doctor of Philosophy
in Linguistics

by

Morgan Thomas Sleeper

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June 2018

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June 2018

Musicolinguistics: New Methodologies for Integrating Musical and Linguistic Data

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Morgan Thomas Sleeper

For Nina

Acknowledgments

This dissertation would not have been possible without the faculty, staff, and students of UCSB Linguistics, and I am so grateful to have gotten to know, learn from, and work with them during my time in Santa Barbara. I'd especially like to thank my dissertation committee, Matt Gordon, Marianne Mithun, Eric Campbell, and Tim Cooley. Their guidance, insight, and presence were instrumental in this work, but also throughout my entire graduate school experience: Matt for being the best advisor I could ask for; Marianne for all her support and positivity; Eric for his thoughtful comments and inspirational kindness; and Tim for making me feel so warmly welcome as a linguistics student in ethnomusicology. I am also deeply grateful to Alicia Holm for all her help throughout the program.

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Abstract

Musicolinguistics: New Methodologies for Integrating Musical and Linguistic Data

by

Morgan Thomas Sleeper

Linguists have long examined language in musical contexts, just as ethnomusicologists have considered the language(s) of the musics they study. Though an increasing number of scholars are now combining (ethno)musicological and linguistic approaches in their work, this is still far from the norm in linguistics, where musical elements are often disregarded in analyses of language in musical context. This dissertation aims to challenge this status quo, by introducing and demonstrating new methodologies for integrating musical data into linguistic analyses in three subfields: structural linguistics, sociocultural linguistics, and language revitalization.

Each new method is illustrated through a representative study. In the first, I introduce a novel method for integrating musical transcription into language documentation using ABC notation in ELAN, which reveals a striking correspondence between lexical tone and musical melody in Tlahuapa Tù'un Sàví, a Mixtec language spoken in Guerrero, Mexico. In the second, I present a multimodal discourse analytic method for sociocultural linguistic research, and use it to show how three different Welsh rock artists enact diverse identities through co-temporal code-switching and musical style-shifting. In the third, I demonstrate how linguists can combine musical and linguistic data to create an UTAUloid — a combination speech and music synthesizer for collaborative vocal songwriting — to aid in musical language revitalization efforts, through an example in Cherokee.

Together, the results of these studies illustrate the rich potential of music in linguistic research across subfields, and show that the combination of musical and linguistic data yields unique analyses not possible by examining language alone. More than optional accompaniment, music is an essential component of a discourse functional approach to language in musical contexts, and the methodologies introduced in this dissertation aim to make including musical data as accessible as possible.

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Chapter 1: Introduction

1.1 Introduction

From at least the time of Sapir and his recording of Paiute songs with Tony Tillohash, linguists have turned to songs – whether traditional or modern – for linguistic data, as well as studying the music of the speech communities they work with (Sapir 1910; Hinton 1984; Hammond 2015). By the same token, ethnomusicologists have long been interested in and attentive to the role of language in the musical cultures they study (Charron 1978; Slobin 1985; Fox 2004). One encouraging trend – particularly in the last few decades – has been an increase in interdisciplinary scholarship which examines not only language, and not only music, but rather the integrated combination of both, through both linguistic and ethnomusicological lenses (Hughes 2000; Barwick 2006; Barwick et al. 2007; Marett and Barwick 2007; Tuttle 2012; Tuttle and Lundström 2015). These interdisciplinary approaches are intriguing, but remain far from the norm in linguistics, where – for the most part – the musical component of language in musical contexts plays little role in the resulting linguistic analyses. This is the issue which this dissertation addresses: what can we learn by treating the combination of music and language as a holistic site of inquiry, rather than simply language data with a melody?

Two potential obstacles to combining music and language data in linguistics are (1) a lack of methodological precedents for integrating the two, and (2) the belief that musical context does not add to (or change) linguistic analysis. To that end, this dissertation aims to provide the former, and to prove the latter false, by introducing new methodologies for integrating musical and linguistic data – combining both linguistic and ethnomusicological

approaches – and applying them to questions of structural linguistics, sociocultural linguistics, and language revitalization. Of course, all three of these areas of linguistics are deeply and necessarily interrelated, but by providing specific methodological frameworks and applying them to situations which will be familiar to linguists working in each of these subfields, I aim to make integrating music into linguistic research accessible and relevant for all linguists, whether working on their own or in collaboration with (ethno)musicologists.

The new methodologies introduced in this dissertation are guided by three principles. First, any technology used should be free and/or open source, in order to be as accessible as possible. Second, the combined musical and linguistic data should be both portable and exportable, to facilitate both the easy creation of materials and collaboration between linguists, (ethno)musicologists, community members, and archivists. Third, the methods should be designed with both linguists and speakers in mind, making sure that the results can benefit not only academic linguists, but also the speech and musicking communities from which the data emerges.

Each new methodology described in this dissertation will be presented through a specific application and exploration in the relevant linguistic subfield. For structural linguistics, I introduce a new multimodal methodology, which allows time-aligned musical notation and linguistic transcription to be analyzed together, and use this method to examine the relationship between lexical tone and musical melody in songs of Tlahuapa Tù'un Sàví (an indigenous language of Mexico). For sociocultural linguistics, I present a new method adapted from multimodal discourse analysis to show how three different contemporary Welsh rock artists construct and negotiate complex identities through co-temporal musical and

linguistic shifts – shifts between different semiotic bundlings of musics and languages – in their performances. Finally, for language revitalization, I show how musical and linguistic data can be combined in a novel way to create a Cherokee UTAUloid – a combination speech and music synthesizer built for collaborative vocal songwriting – to aid in the musical side of Cherokee language revitalization efforts.

1.2. Previous work on music and language

Much of the previous scholarly work on music and language can be conceptualized as part of one of four broad categories noted by Feld and Fox (1994): *music in language*, *music as language*, *language about music*, and *language in music*. Along with more specific analyses of relevant literature in subsequent chapters, the following provides a general overview of previous research in each of these four areas.

Music in language

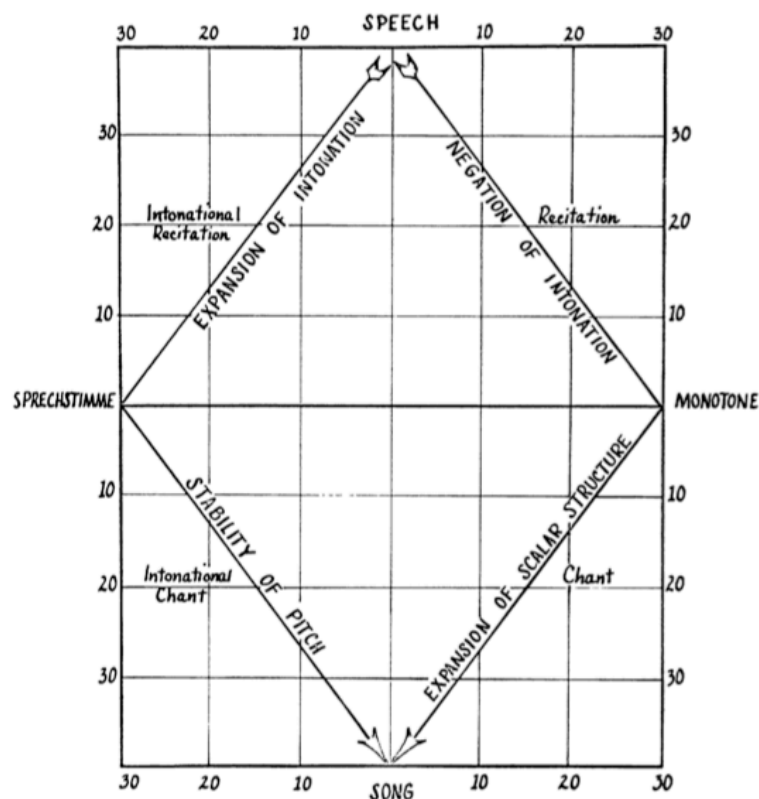
Music in language refers to the musical dimensions of language, including prosody, rhythm, and timing. These aspects of language are well-studied in functional linguistics (Gussenhoven 2004; Jun 2005; Kohler 2009), and sometimes rely on conventions from musical scholarship; Donegan and Stampe (2004), for instance, use musical notation to show how a diachronic shift in speech rhythm led to a change from head-first analytic to head-last synthetic structure in Munda. While much linguistic research on prosody and rhythm is rooted at least partially in musical concepts, a subset is more explicitly connected to either music theory (i.e. Gardiner 1980) or musical practice (i.e. Boswell 1977). Burling (1966), for example, provides a cross-linguistic study of rhythm in children's songs which finds a

preference for 16-beat structure, while Hinton (1990) shows that linguistic and musical metrics are deeply intertwined, and should be treated as a single rhythmic system in Havasupai songs.

Music as language

The category of *music as language* refers to work which equates these two systems, chiefly (especially in the previous century) through applying formal linguistic models to music in order to create different 'grammars' of music (i.e. Becker and Becker 1979), or proposing musical analogues of linguistic subsystems such as phonology (Bright 1963). Perhaps the best known of these models is Lerdahl and Jackendoff's (1983) 'generative theory of tonal music', which attempts to apply the formalisms and concepts of Chomsky's (1957) generative grammar – including universals and competence vs. performance – to music. This category also includes work which goes beyond metaphors to compare (and contrast) how music and language are processed cognitively in the brain (Raffman 1990; Patel 2008), as well as functionally-motivated explorations of the boundaries between music and language. List (1963), for instance, developed an influential two-dimensional cline (reproduced below) for classifying forms of verbal expression intermediate to speech and song, which has been applied to genres as diverse as Warao ritual wailing (Briggs 1993), Miskitu song games (Minks 2008), and antique auctioneering (Miller 1984).

Figure 1.1: List's (1963) classification of intermediate forms between speech and song



Language about music

Language about music refers to the discourse which surrounds and interacts with musical practice, in terms of both theory and conceptualization (i.e. how people talk about, teach, and analyze music) and evaluation (i.e. how people use language to engage with and reflect on musical performance). Much of the scholarship in this area explores the language of culturally-specific musical theory; Zemp (1978; Zemp and Malkus 1979), for instance, examines the classification of 'Are'are instruments through the lens of semantic fields, as well as the linguistic construction of interval and rhythmic classifications in 'Are'are theory. Powers (1980) looks at Oglala discourses of perception of song and performance, Feld (1981) examines metaphors in the metalinguistic discourse of Kaluli musical theory, and

Kingsbury (1988) famously makes the familiar strange by turning an analytical lens on verbal evaluations of 'musical talent' in a Western music conservatory.

Language in music

Finally, research on *language in music* explores the many different ways in which language and music interact in musical contexts, and especially in song texts. One notable area of research on language in music has been in the relationship between lyrical text and musical melody in languages with lexical tone (List 1961; Schneider 1961; McAllester 1980; Yung 1983a; Agawu 1984; Sollis 2010), the findings and typology of which will be presented in more detail in Chapter 2. Along with the tone-tune relationship, other work in this area has explored phonetic and phonological considerations particular to song genres. Turpin (2007) describes unique phonological constraints of Central Australian *Akwelye* songs, for instance, while Nancarrow (2010) shows that the distribution of phonemes and allophones differs between spoken Lardil and the *burdal* song genre sung in the language. Johnson (1984) provides acoustic and articulatory measurements for Swedish herding songs, showing that specific ranges of frequency, jaw opening, and larynx height are highly valued within the genre, while Charron (1978) describes Inuit throat song games in a study proposing a shape- and shading-based notation system to differentiate between egressive and ingressive, and voiced and voiceless qualities on sung notes.

Further scholarship explores the function of certain types of language (either language varieties or specific linguistic features) in musical cultures or genres (Slobin 1985; Fox 2004; Ford 2007; O'Keefe 2010), from Sapir's (1910) work on recitative in Paiute mythology to recent research on syntactic variation as a stylistic feature in different types of Tai Phake

songs (Morey 2010). The study of vocables – words and/or syllables used for their form, rather than meaning – in song has been especially fruitful (Hinton 1980; Yung 1983c; Hughes 2000; Ford 2007; O'Keeffe 2007; Tuttle 2012), as has the investigation – particularly in Australia – of 'song language', specific linguistic registers exclusive to song which can differ from everyday language in terms of lexicon, phonology, or syntax (Apted 2010; Ford 2005; Ford 2007; Garde 2007; O'Keeffe 2007).

Text-setting has served as another locus of research on language in music, from both functional (Yung 1983b; Tuttle 2012) and formalist (Rodríguez-Vásquez 2010) perspectives, and broader patterns of discourse have also been considered. Sherzer and Wicks (1982) examine a variety of Kuna verbal forms, for instance, highlighting both musical and linguistic strategies for discourse organization, while Crozet (2010) considers discursive strategies of meaning-making in several variations on the French political song *La Marseillaise*.

Recent literature has also begun to specifically consider language in music in revitalization contexts, for both language and music revival, especially following Marett and Barwick's (2001) review of the particularities and importance of documenting both endangered languages and musics. Turpin (2012) looks at the structural elements involved in sustaining and reviving the traditional Central Australian women's song style of *awelye*, for example, and Marett (2007) describes a conscious decision by bearers of the Walakandha *wangga* to simplify complex rhythmic modes in the musical practice in order to allow greater participation from members of other linguistic groups.

While all four of these overarching categories offer promising areas for future work on music and language, this dissertation and the methodologies and analyses presented in the subsequent chapters are broadly situated within this last category, of *language in music*. This is the main focus of musicolinguistics, and this dissertation aims to contribute frameworks for multiple linguistic subfields through which interested linguists can easily and productively engage in research on language in music regardless of their specialization. The combination of language and music in song offers a unique opportunity for linguistic analyses not otherwise possible, and the methodologies demonstrated here aim to show the value of this combination for linguistics – as well as the important insight linguistics has to offer the study of song – in structural linguistics, sociocultural linguistics, and language revitalization.

1.3. Outline

The rest of the dissertation is structured as follows: Chapter 2 presents the argument for integrating musical data into structural linguistics, through a case study on the relationship between lexical tone and musical melody in Tlahuapa Tù'un Sàví. It first introduces the language and the method to be used for including musical notation in linguistic corpora, and then presents the results of the analysis using this methodology in the context of previous tone-tune studies.

Chapter 3 focuses on the potential of musical data in sociocultural linguistics, and illustrates how music and language are both essential components of social meaning-making in musical contexts, through a study of code-switching, musical style-shifting, and identity in three different Welsh rock artists. It first provides background on Welsh and the Welsh

popular music scene, before detailing the multimodal discourse analytic method used to examine music and language simultaneously, and then presents results for each artist in turn.

Chapter 4 turns to the use of music in language revitalization, and focuses on one specific method through which linguists can use their specialized knowledge and training to contribute to music-making in revitalization contexts: UTAUloid. The chapter provides an overview of benefits of music in language revival, introduces the concept of UTAUloid, demonstrates step-by-step the methodology for creating a Cherokee UTAUloid as an example, and ends with a discussion of usage cases that can make UTAUloid a uniquely useful platform for language revival. Finally, Chapter 5 concludes the dissertation with brief remarks summarizing and synthesizing the findings of the three main chapters, and presenting implications for future research.

Chapter 2: Lexical Tone & Musical Tune in Tlahuapa Tù'un Sàví Songs

This chapter presents the argument for combining musical data and language data in structural linguistics and language documentation, describing and illustrating new methodologies for doing so by exploring the relationship between lexical tone and musical melody in songs from Tlahuapa Tù'un Sàví, an indigenous Mixtecan language of Mexico. It begins by describing previous research on tone-tune correspondences in section 2.1 and providing a brief sketch of relevant features of Tlahuapa Tù'un Sàví in section 2.2, before introducing the methodology and data used in sections 2.3 and 2.4. In section 2.5, I present the results of an analysis of the combined musicolinguistic data, and section 2.6 is a discussion of the significance of these results for Tlahuapa Tù'un Sàví and tone-tune typology, and its applications for language documentation.

2.1 Previous research on tone-tune correspondences

The relationship between tone and tune in song has been a fruitful area of study in many speech and musicking communities around the world. Most previous studies have been empirical investigations which look at both musical transitions (from sung pitch to sung pitch) and lexical tone transitions (from tone target to tone target, syllable to syllable, or mora to mora) to determine where these two systems move in parallel. Corresponding transitions are then calculated as a percentage of the total number of transitions, to give a measure of tone-tune correspondence. These percentages can be based either on the stricter definition of 'parallel' transitions, where only tone-tune correspondences moving in the same direction are

counted (i.e. an ascending musical melody on a LH lexical tone melody), or the more lenient system of 'non-opposing' correspondence (c.f. Schellenberg 2012), where any transition in which musical melody and lexical tone are not moving in opposing directions is counted as a correspondence.

Previous research in this area has been especially concentrated on the languages of Africa and Asia. Table 2.1 below (adapted from Schellenberg (2012) and McPherson and Ryan (2018)) shows selected results of published studies, including levels of tone-tune correspondence in terms of both parallel and non-opposing systems of analysis:

Table 2.1: Selected results of published tone-tune correspondence studies

Area	Language	Reference	Parallel	Non-opposing
Asia	Cantonese	Wong and Diehl (2002)	92%	98%
	Kalam Kohistani ¹	Baart (2004)	48%	89%
	Thai	List (1961)	76%	(no data)
	Vietnamese	Kirby and Ladd (2016)	77%	99%
	Wu-Ming Tai	Mark and Li (1966)	63%	(no data)
Africa	Ewe	Jones (1959)	68%	95%
	Hausa	Richards (1972)	53%	96%
	Shona	Schellenberg (2009)	53%	67%
	Xhosa	Starke (1930), cited in Schellenberg (2012)	67%	95%
	Zulu	Rycroft (1959, 1979), cited in Schellenberg (2012)	92%	97%
Papua New Guinea	Duna	Sollis (2010)	66%	92%

Although there is rich work on Asian and African languages, studies on languages and musics of the Americas are far fewer, even though many indigenous languages of North, Central, and South America are tonal. There are no published studies of the tone-tune

¹ Kalam Kohistani is an Indo-European (Dardic) language spoken in Upper Swat, Pakistan

relationship in Mesoamerican languages, and of North American indigenous languages; the only studied language has been Navajo. Herzog (1934) finds a high degree of correspondence in Navajo gambling songs but a low degree in healing songs, while McAllester (1980:2) notes that the lexical tone on the sung lyrics of the ceremonial First Snake Song are “almost always different from their prosodic form”.

The majority of tone-tune studies have focused on traditional musics, with fewer addressing commercial popular music in tonal languages. One of these, Kirby and Ladd (2016), examine tone-tune correspondence in a corpus of 20 popular songs in Vietnamese. They find a strong preference for parallel movement of musical melody and lexical tone (at around 77%), that oblique movements (where either music melody or lexical tone stays constant while the other shifts) are allowed in certain cases, and that opposing movement of tone and tune is dispreferred, and conclude that avoidance of contrary movement between tone and tune is more important in Vietnamese pop music than parallel adherence. Wong and Diehl (2002) similarly examine four Cantonese pop songs popular in the 1990s, and find that the melodic movement generally parallels lexical tone transitions, in an ordinal rather than ratio scale; i.e. directionality but not magnitude of lexical tone differences is mirrored in the musical melody.

Another subset of the literature examines the relationship between melody and linguistic tone in the formal composition process. Agawu (1984), for instance, presents an in-depth analysis of tone-tune correspondence over the career of Ghanaian composer Ephraim Amu. Amu's Ewe and Twi compositions displayed progressively stronger correspondences between melody and linguistic tone as his career developed, with particular stylistic considerations allowing for increased parallelisms in his later pieces. Mugovhani (2007)

examines the work of six choral composers working in the Bantu language Venda, and concludes that lexical tone melodies play little role in their musical compositions, attributing this to the more Western style of their choral pieces. Rycroft (1970) presents a unique self-analysis by a linguist-ethnomusicologist who was selected to compose the national anthem of Swaziland, in which the author details his compositional process of setting the (already composed) Swazi text with careful parallel adherence to tonal patterns.

In broader compositional styles, Yung (1983a) details how Cantonese opera singers alter pre-composed melodies as they perform to mirror lexical tone melodies of the lyrics of each particular opera. Liu (1974) shows the importance of 'even' (the level tone) and 'oblique' (all other tones) tone groups to the traditional composition techniques of Beijing (Peking) Opera, though Stock (1999) analyzes recordings of actual Beijing Opera performances and finds that the expected relationship between musical melody and lexical tone is often not maintained in practice.

Little work thus far has explored the cognitive side of the relationship between tone and tune, though Wong and Diehl (2002) include a perceptual experiment that shows Cantonese speakers use musical pitch differences to differentiate between ambiguous lexical tone patterns in sung lyrics. As Schellenberg (2012) points out, the experiment relies on a carrier sentence that removes the word in question from the natural musicolinguistic context in which listeners may have other means to disambiguate tonally ambiguous words; but the fact that listeners can use musical information in the absence of linguistic information is still an important finding in the understanding of tone-tune processing.

The present chapter aims to address several gaps in the literature. It represents the first tone-tune study of a Mesoamerican language, the first study to address tone-tune

correspondence as part of a wider language documentation project, and the first to consider the relationship between musical ornamentation and lexical tone, in addition to musical melody and lexical tone.

2.2 Tlahuapa Tù'un Sàví

Tlahuapa Tù'un Sàví is a Mixtecan language spoken in the village of Tlahuapa (population: 1,292²), in the mountainous eastern region of Guerrero, Mexico, close to the border with Oaxaca and within the municipality of Alcozauca de Guerrero. Genealogically, Tlahuapa Tù'un Sàví is likely a variety of Alcozauca Mixtec, a Mixtec language within the Mixtecan branch of the Amuzgo-Mixtecan group, which falls within the Eastern-Otomanguean branch of the Otomanguean family (Simons and Fennig 2018). There are no specific figures for speaker numbers of Tlahuapa Tù'un Sàví, but 2010 census data show 87% of Tlahuapan residents (1,126) over three years old to speak an indigenous language (INEGI 2010).

I was first introduced to Tlahuapa Tù'un Sàví through Griselda Reyes Basurto, a native speaker and consultant for a 2015-2016 Field Methods class at University of California, Santa Barbara. Tlahuapa Tù'un Sàví is spoken alongside other varieties of Mixtec (including San Martín Peras, San Sebastián del Monte, San Juan Mixtepec, and many more) – as well as Triqui, Zapotec, and other indigenous languages of Mexico – in the Oxnard region of Ventura County, California, with an estimated indigenous immigrant Oaxacan/Guerreran community of 20,000 (Kresge 2007). Though there is no previous linguistic research

2 Population figures from INEGI (2010).

specifically on Tlahuapa Tù'un Sàví, it is being documented (along with other Mixtec varieties spoken in California) as part of an ongoing collaboration between UCSB linguists and the indigenous community in Oxnard. This collaboration includes the 2015-2016 and subsequent Field Methods classes, as well as an NSF-funded project combining methods from linguistic documentation, sociocultural linguistics, and linguist anthropology to examine the linguistic situation in Oxnard.

Relevant to the study of tone and tune correspondence, Tlahuapa Tù'un Sàví is a tonal language, in which pitch contrasts on morphemes are responsible for different lexical and grammatical realizations (Hyman 2006). Tlahuapa Tù'un Sàví has three tones, low (L), mid (M), and high (H). In the practical orthography, low tone is indicated by a grave accent <à>, mid tone is indicated by the lack of an accent <a>, and high tone by an acute accent <á>. Tones can distinguish lexemes from one another, as in the following minimal pair which differs only in tone:

- (1) ñu'ù 'fire'
 ñu'ú 'dirt'

Tones in Tlahuapa Tù'un Sàví also serve grammatical functions, such as marking aspect and mood on verbs. In at least some verbs, for instance, tonal marking on the stem differentiates between perfective aspect (low tone), imperfective aspect (high tone), and irrealis mood (mid tone), as in the following minimal triplet (Rogers 2016):

- (2) kà'vi-ñá 'she read' (PFV)
 PFV.read=3SG.F
- ká'vi-ñá 'she reads' (IPV)
 IPV.read=3SG.F
- ka'vi-ñá 'she will read' (IRR)
 IRR.read=3SG.F

All of the nine possible combinations of Tlahuapa Tù'un Sàví's three tones are attested in both CVCV and CVV lexemes (Sims 2016; Eric Campbell p.c. May 2018):

Table 2.2: Attested tonal patterns in Tlahuapa Tù'un Sàví

Tone pattern	Syllable structure	
	CVV	CVCV
HH	ndáá 'dark'	lílú 'skunk'
HM	kwáan 'yellow'	tíku 'needle'
HL	xáà 'arrives (IPV)'	lá'và 'frog'
MH	íin 'skin'	itú 'wood'
MM	yaa 'white'	itu 'cornfield'
ML	iìn 'nine'	ità 'grass'
LH	ìin 'salt'	tìkú 'louse'
LM	tàa 'man'	ìta 'river'
LL	sàa 'bird'	sàtà 'dove'

There are also a smaller number of monosyllabic words with more than two pitch targets, as in the following example:

- (3) jôó (HLH) 'moon'
 ñúun (MHM) 'night'

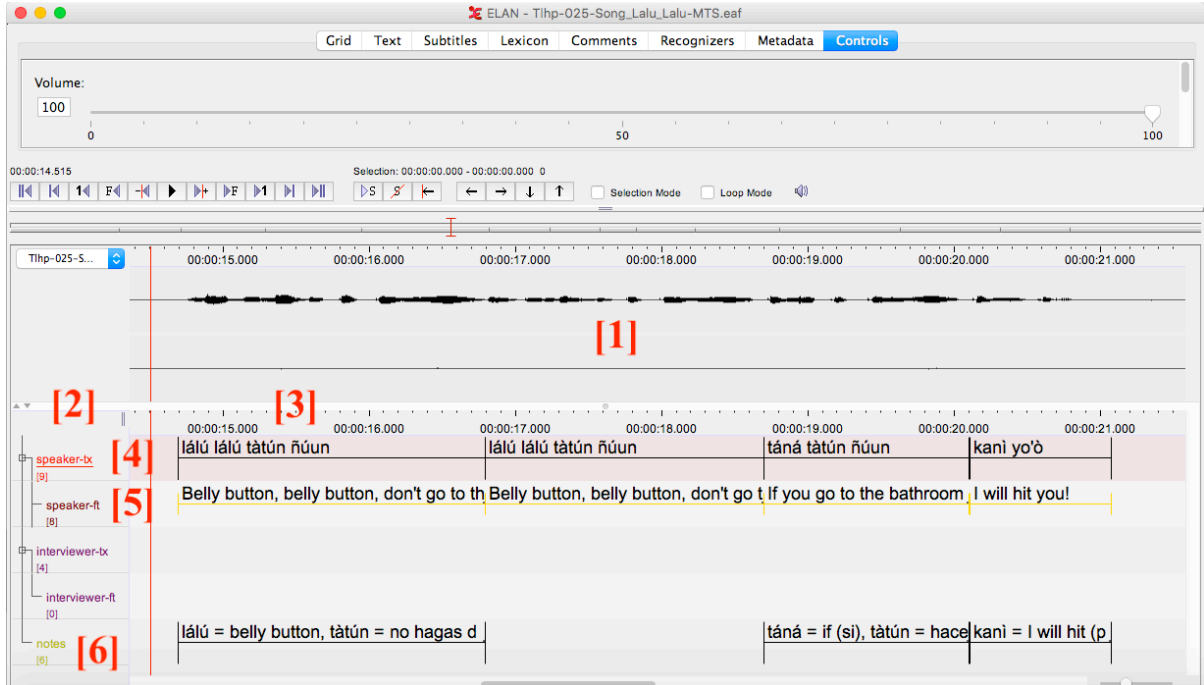
2.3 Method: combining musical and linguistic data in language documentation

The methodology that will be introduced in this section for combining musical and linguistic data in language documentation relies on two main tools: the computer program ELAN (Brugman and Russel 2004), and the ABC system of musical notation.

2.3.1 ELAN

ELAN is a free, open-source software packaged designed for time-aligned transcription and annotation of audio and video data. Developed at the Max Planck Institute for Psycholinguistics, it is available for Mac OS X, Linux, and Windows operating systems. It is widely used in academic research and corpus building, and especially in language documentation (Brugman and Russel 2004), and is the primary tool which our Field Methods class used to document Tlahuapa Tù'un Sàví and create an annotated, searchable corpus of texts in the language. It uses a multi-tier transcription system, which can be seen in the screenshot in Figure 2.1:

Figure 2.1: ELAN



Below the waveform of audio data ([1]), there are multiple tiers ([2]) which can each contain time-aligned annotations ([3]) of transcriptions relevant to the delineated section of audio. In this example, each annotation represents an Intonation Unit (IU), a prosodic unit associated with a coherent pitch contour (Chafe 1994). Tiers can be linked to each other in hierarchical relationships, so that one tier can be the parent of another. In the example above, for instance, the parent tier marked by [4] (speaker-tx) represents transcriptions of the speaker in the practical orthography, while its daughter tier [5] (speaker-ft) is used for free translation (here, into English) of each linked IU in the parent tier. Along with transcription and translation, tiers can also be used to record additional linguistic information, such as individual lexical glosses or usage notes, as in [6].

One of the advantages of using ELAN for language documentation is that its files are designed to be easily exportable to other formats. ELAN files can be exported to work with

other corpus management and language documentation software (including CLAN, CHAT, Toolbox/FLEx, and others), and also to video subtitles and various presentational text formats. A single orthographic tier could be exported to present the text to a story for community use, for instance, or several tiers containing transcription, morpheme-by-morpheme glosses, and free translations could be exported simultaneously to create multilinear formats for use in academic work.

While the default functions of ELAN worked well for transcribing the texts and conversations in our Tlahuapa Tù'un Sàví corpus, once we started to add recorded songs to the database, I began looking for a way to incorporate the musical data into the ELAN files as well. Since annotations in ELAN can only consist of text-based information (rather than images), an alternative to graphical musical notation systems such as Western staff notation was needed: ABC notation.

2.3.2 ABC notation

A text-based system of musical transcription, ABC notation (Walshaw 2011) was selected as an ideal way to incorporate musical data into ELAN annotations. ABC is a system for notating music in plain text which uses only ASCII characters, and is thus well-suited for formats without graphical capabilities (including, notably, ELAN annotations). Unlike other text-based music notation systems such as MusicXML – a file format commonly used for encoding Western staff notation on the internet – ABC is designed to be readable by humans as well as computers; it was initially developed as a way for Western folk musicians to quickly and easily share and sight-read melodies.

To give an example of the system in use, the following is an ABC transcription of *Twinkle Twinkle, Little Star*:

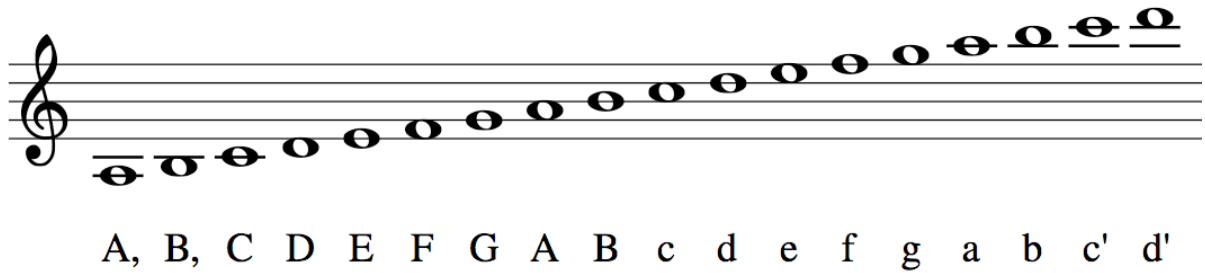
```
(4) X:1
    T:Twinkle, Twinkle, Little Star
    M:4/4
    L:1/4
    K:D
    | D D A A | B B A2 |
```

ABC notation begins with a header, which contains a number of informational fields about the notated song. The first field in the example above, 'X', gives the piece a unique numerical identifier. The second, 'T', is for the title. The 'M' field is used to denote the starting meter (here, 4/4 time), while the 'L' field specifies the default note unit length (here '1/4' for a quarter note). The 'K' field specifies the starting key, here D major.

After the header is the music itself, with measures denoted by pipe symbols ('|'). Notes are denoted by the alphabetic characters <A> through <G>, with capitalization and diacritics determining the specific pitches: uppercase 'C' represents Middle C³, for instance, while lowercase 'c' represents the note an octave above, and following commas (<C,>) or apostrophes (<c'>) raise or lower a given note an octave, respectively. The following chart illustrates selected correspondences of ABC pitches to Western staff notation:

3 Corresponding to C4 in scientific pitch notation, MIDI note 60, and a frequency of ~262Hz.

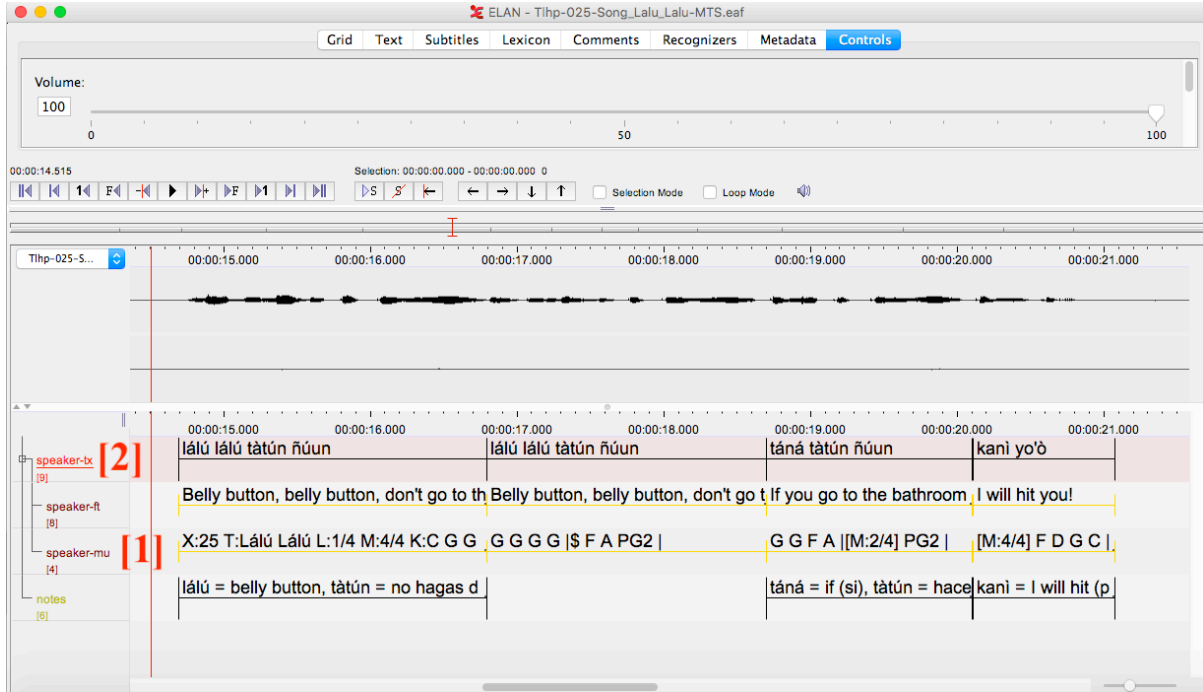
Figure 2.2: Selected pitches in Western staff notation and ABC



Note length is specified by numbers immediately following the pitch, and are relative to the default value set out in the 'L' field of the header. The 'A2' in the *Twinkle, Twinkle, Little Star* example above, for instance, indicates an A above Middle C that is held for twice as long as the default quarter note – in other words, a half note. Note lengths shorter than the default are indicated by a fraction following the pitch; if the last note of *Twinkle, Twinkle, Little Star* were notated 'A/2', it would be an eighth note, held for half as long as the specified default.

ABC notation has several characteristics that make it well-suited for being integrated with linguistic data in ELAN. First and foremost, because it does not rely on any specific vertical formatting – it can be written in multiple lines as in the *Twinkle, Twinkle, Little Star* example above, or read in a single line – ABC can be input directly into an ELAN annotation, as shown in the following screenshot:

Figure 2.3: ABC notation in ELAN



Adding ABC notation in an annotation tier in ELAN (in this case, a daughter tier [1] (speaker-mu) tied to the parent tier [2] of linguistic transcription (speaker-tx) allows researchers access to both the musical and linguistic data in a single file, which can then easily be shared as a cohesive whole with collaborators, making the combined musicological data easily portable⁴.

In addition to portability, another advantage of using ABC for this purpose is that it is inherently exportable. Using free, open-source conversion tools (such as abcm2ps, abc2svg, abcmidi, EasyABC, and more), ABC can easily be converted into other types of musical notation that may be more useful for a given situation or community context. This includes Western staff notation, but also Braille music, tablature, solfège, shape notes, cipher notation,

⁴ While this study focuses on using ABC to integrate musical data into ELAN, the same method could be applied to any multi-tiered linguistic transcription environment, such as text grids in Praat (Boersma & Weenink 2018)

简谱 (*jiǎnpǔ*), and many more. Likewise, by utilizing free and open-source graphical musical editors like MuseScore (MuseScore Contributors 2018), it is also possible to first transcribe music in a more familiar graphical system and then convert that transcription to ABC for inclusion in an ELAN file. This ease of conversion means that anyone with access to the ELAN file will have both the linguistic and musical data, with that musical data able to be rendered in whatever notation format is most useful for them.

A further advantage of ABC notation in language documentation is that it is inherently extensible to be able to serve the needs of specific communities. The package *microABC* (Lacerda 2010), for instance, allows for the transcription of microtonal music⁵ through ABC, and even before this formalized package became available, community members developed conventions for notating non-even-tempered tones in ABC. In transcribing Middle Eastern music, for example, '^/' and '_/' have been used to denote half-sharp and half-flat accidentals, respectively, so that '_/C' represents a note a quarter-tone below Middle C. Finally, since the beta release of ABC 2.2 (Walshaw 2015), it is possible to define specific pitch values for individual notes in Hz using the “instructions” header field ('I'), allowing users to transcribe natively in any microtonal scale.

Transcribers can also make use of the optional “notes” header field ('N') to further specify how the ABC notation should be interpreted. Not only does this field allow for user-defined symbols (one could specify that a '@' after a note indicates ingressive airflow, or that a following '?' indicates creaky phonation), it also lets transcribers incorporate culturally-

5 Music using notes that are not part of the Western 12-tone scale; many Middle Eastern and Asian musics (among others) make use of microtones

relevant musical concepts; ABC transcriptions of Indian classical music, for instance, use the 'N' field to indicate which *tāla* (rhythmic mode) a piece should be played in.

2.4 Data

Over the course of the 2015-2016 Field Methods class, Griselda and I recorded three songs which will serve as the data for this analysis: *Lálú Lálú*, *Conéjo la kò'onchí*, and *Ñà lo'o kwé'e*, with this last song sung by Griselda's mother, Benita Basurto Olivera. *Lálú Lálú* and *Conéjo la kò'onchí* were recorded digitally with a Shure SM10A headworn cardioid, dynamic microphone, using a Tascam DR100-mkII recorder. *Ñà lo'o kwé'e* was sung on an audio Skype call from Oaxaca, and was recorded internally from the Apple MacBook Air making the call using QuickTime Player. Griselda and I worked together to transcribe the text to each song in ELAN, with Griselda translating into Spanish and English as we went. Texts were transcribed with reference to their spoken form; as we listened, Griselda would write down what she (or her mother) had sung, speak it, and then we would transcribe the tones from there. After the linguistic transcription was complete, I transcribed the melody to each song using ABC (or staff notation later converted to ABC, in the case of *Ñà lo'o kwé'e*), checking with Griselda by singing and playing back the transcribed melodies together. The ABC notation for each song was then added into the time-aligned ELAN file. Sheet music for each song was created by importing the ABC source into MuseScore, where the linguistic data (transcription and free translation into English and Spanish, exported from ELAN tiers) were added below the staves, as seen in Figures 2.4-2.6 below.

This section will introduce and provide a brief overview of each of the three recorded songs, as well as general observation on some of their musical features.

Lálú Lálú

This is a nursery rhyme-style song, sung to remind children not to wet the bed at night. It is sung addressing the belly button (*lálú*) because it is seen as the locus of conscious decision making.

Figure 2.4: *Lálú Lálú*⁶

The musical score for 'Lálú Lálú' is presented in three staves, each with a treble clef and a 4/4 time signature. The lyrics are written below the notes, with hyphens indicating syllable placement. The first staff begins with a key signature of one sharp (F#) and a common time signature (C). The second staff begins with a key signature of one sharp (F#) and a common time signature (C). The third staff begins with a key signature of one sharp (F#) and a common time signature (C), but includes a key signature change to two sharps (F# and C#) for the final measure, indicated by a double bar line and a key signature change symbol.

Staff 1:
 Lá - lú lú - lú tà - tún ñúun
 belly - button belly - button, don't go to - the bathroom at night
 ombligo ombligo no - hagas del baño por la noche

Staff 2:
 lá - lú lú - lú tà - tún ñúun
 belly button belly button don't go to - the bathroom at night
 ombligo ombligo no - hagas del baño por la noche

Staff 3:
 tá - ná tà - tún ñúun ka - ni yo - 'ò
 if you go to - the bathroom at night I'll - hit you!
 si hagas - del baño por la noche voy a - pegarte!

6 In these and all following musical examples, the English and Spanish are free translations rather than morpheme-by-morpheme glosses, and do not necessarily follow the same morpheme order as the Tlahuapa Tù'un Sàví

Conéjo la kò'onchí

This song is a musical component of a larger narrative, in which children are told by their parents to catch a rabbit. The rabbit, once caught, promises the children that if they let him out, he will dance for them and then return. The children let him out, and instead of dancing and returning to them, runs away while singing this song.

Figure 2.5: *Conéjo la kò'onchí*

The musical score is written in treble clef with a 6/8 time signature. It consists of three lines of music. The first line contains the first two phrases of the song. The second line starts at measure 5 and contains two more phrases. The third line starts at measure 8 and contains the final phrase. The lyrics are provided in Spanish and English below the notes.

Co - né - jo la kò - 'on - chí áá ka - ndi - ta! Co - né - jo la kò - 'on - chí
rabbit ragged now jump! rabbit ragged
conejo churpio ahora brinca! conejo churpio

5 áá ka - ndee! Co - né - jo? Co - né - jo fi - no!
now get down! rabbit? rabbit dapper!
ahora agáchate! conejo? conejo fino!

8 Vá - mo - nos ching - au!
let's go, damn it!
vámonos chingau!

Ñá lo'o kwé'e

This is a stand-alone song which tells the story of a lost love. It is sung from the perspective of a man waiting for his lover, Lucila, who does not return.

Figure 2.6: *Ñá lo'o kwé'e*

The musical score consists of six systems, each with a staff of music and corresponding lyrics. The lyrics are provided in Spanish and English. The music features a complex rhythmic structure with various time signatures (8/8, 7/8, 5/8) and includes triplets and slurs. The lyrics are as follows:

1. Ndá'-vì kú - -ì xá - ku-ì Táá tá--ká
 poor me I - cry how like
 pobre me estoy llorando como igual

6. nùún xí - kà-ún ká - -yà Ndá'-vì kú - -ì
 when you - were around everything continues poor me
 cuando estabas - tú todo - sigue pobre me

9. Tá tà tá-ká - -ví tu' - un ti - ka - -ún xí' - in ká-yà
 how like the-words you said to - me continue
 como eran los-palabras dijiste a - mi sigue

12. Yó' - o ñá kwé'e koó nù'un ini - -ún xa'-á-yà
 you ungrateful wench don't remember inside about-this
 tú malagradecida no te acuerdas dentro de - esto

15. ini - -ra vi - ti - taàn va koó
 about - this man every - day don't
 de - este hombre todos los - días no

17. ndi - ga - ní - ni-ún kú-sú - chí ini-ì xá - ku-ì xa'-ún
 remember sad I feel I - cry for-you
 te acuerdas triste mi siento estoy llorando por - ti

20

ñá lo'o kwé'e Rrú rrú ká - chi yó'o
 ungrateful small wench [sound of - leaving] said you
 malagradecida [sonido de - irse] dijiste tú

24

nùún tá - ká - ì xa'á tù - ndí - kă
 where I hang at the base of the banana grove
 donde estoy columpiándome al pie del platanar

26

sì - sì - kí Lu - cí - la Á koó nda - kú' - ùn xa' -
 on there Lucila don't remember - you about -
 encima Lucila no te acuerdas de -

30

-í tá - ká - ì xa'á tùn - dí - kă sísì - kí
 me hanging at the base of the banana grove on - there
 mi columpiándome al pie del platanar encima

33

Lu - cí - la
 Lucila
 Lucila

35

Ñà' - ká ndó' - ì xá - ku-ì ñá lo'o kwé'e
 this - is what I - experience I - cry ungrateful small wench
 eso - es lo que me - pasa estoy - llorando malagradecida

Musical features

Structurally, these three songs share a common theme and variation form, with each section building on the last and the end of the piece signaled by a new, unrelated theme. *Lálú* *Lálú* and *Conéjo la kò'onchí* both show an [A A A_i B] form: they open with an A theme, repeat that theme verbatim once, and follow up with a variation of the same before ending with a new B section. In *Ñá lo'o kwé'e* – the longest of the three songs – the melodic and rhythmic motifs of the opening A section are carried forward through a series of increasingly longer, denser variations that shift through several time signature changes, before ending with a key change and accompanying B theme: [A A_i A_{ii} A_{iii} A_{iv} A_v A_{vi} A_{vii} B].

Along with these broad structural similarities, these three Tlahuapa Tù'un Sàví songs show other shared musical elements. *Lálú Lálú* and *Conéjo la kò'onchí* both make use of recitativo (spoken speech rhythms) to some extent in their finales, for instance. In fact, *Conéjo la kò'onchí's* A_i and B sections are performed entirely in this spoken style, indicated by percussive noteheads (signaling relative as opposed to absolute intervals) in the example below:

(5)

Co - né - jo? Co - né - jo fi - no! Vá - mo - nos ching - au!
 rabbit? rabbit dapper! let's go, damn it!
 conejo? conejo fino! vámonos chingau!

(Tlhp-039-Song_Conejo_La_Ko'onchi-MTS; 6)

This musical style ties into the song's function; *Conéjo la kò'onchí* is part of a longer, spoken narrative where a rabbit tricks children into letting him out of his cage so that he can dance for them, and then runs away. The melodic opening to the song (measures 1-5) represents the rabbit mocking the children singing to him earlier, and the last three measures in recitativo represent the rabbit's (spoken) reply, transitioning both thematically and stylistically into the spoken closing and moral of the story.

Rhythmically, the three songs show a broad preference for compound over simple meters; though *Lálú Lálú* is in simple meter (4/4 and 2/4), *Conéjo la kò'onchí* and *Ñá lo'o kwé'e* are set entirely and primarily, respectively, in 6/8, with *Ñá lo'o kwé'e* approaching mixed-meter in its alternating excursions to 2/4, 5/8, and 7/8, as shown below:

(6)

9

Tá tà tá--ká - -ví tu' - un ti - ka - -ún xí - in ká-yà
 how like the-words you said to - me continue
 como eran los-palabras dijiste a - mi sigue

12

Yó' - o ñá kwé'e koó ñú'un ini - -ún xa'-á-yà
 you ungrateful wench don't remember inside about-this
 tú malagradecida no te acuerdas dentro de - esto

(Tlhp-039-Song_Ña_lo'o_kwe'e-MTS)

With the music and linguistic data combined, we can now turn to examining the relationship between musical tune and lexical tone in these three Tlahuapa Tù'un Sàví songs.

2.5 Results

2.5.1 Melody

Examining the relationship between musical tune and lexical tone reveals that in all three songs, there is a strong preference for the melody line to move in parallel with the lexical tone melody of the lyrics; i.e. for a two-word, four-syllable phrase with a lexical tone pattern of LH MM, the sung musical pitch will rise between the first and second syllables (L → H), fall between the second and third syllables (H → M), and stay the same between the third and fourth syllables (M → M).

This pattern can be seen in the combination of linguistic transcription and musical notation, and examples (7)-(9) show a simplified schematic for each song. The lexical tone is shown orthographically on the first line, while the arrows below indicate the relative change of musical (sung) pitch from the preceding syllable. An upward arrow indicates a rise, a level arrow indicates no change, and a downward arrow indicates a fall. Bolded and underlined segments indicate where the pattern of parallel correspondence holds.

(7) *Lálú Lálú*

lá-lú lá-lú tà-tún ñúun⁷
→ → → ↘ ↗ ↘ ↗ ↘

lá-lú lá-lú tà-tún ñúun
↗ → → → ↘ ↗ ↘ ↗ ↘

tá-ná tà-tún ñúun
↗ → ↘ ↗ ↘ ↗ ↘

ka-nì yo'ò
↘ ↘ ↗ ↘

7 N.B.: *Núun* 'night' has a tone melody of MHM, despite its orthographic representation

(8) *Conéjo la kò'onchí*⁸

co-né-jo la kò-'on-chí áá ka-ndi-ta
 ↗↘ → ↘↗↗ ↘ →→→
co-né-jo la kò-'on-chí áá ka-ndee
 →↗↘ → ↘↗↗ ↘ →→

(9) *Ñá lo'o kwé'e*

ndá'-vi kú-ì xá-ku-ì táá tá-ká nùún xí-kà-ún ká-yà
 ↘↗↘ ↗↘↘ ↗ ↗↗↗ ↘ ↗↘↗ →↘↘
ndá'-vi kú-ì tá tà tá-ká-ví tu'-un ti-ka-ún xí-in ká-yà
 ↗ ↘↗↘ ↗↘ ↗↗↗ → ↘ → →↗ ↘ ↘↗↘
yó'-o ñá⁹ kwé'e koo nú'un ini-ún xa'-á-yà
 ↗↘ ↘ ↗ ↘ ↗↗↘ ↘↗↘ ↘↗↘↘
ini-ra vi-ti-taàn va koó ndi-ga-ní-ni kú-sú-chí ini-ì
 ↗↗ →→↘ ↗ ↗ ↗↗↘↘ ↗↘↘ ↘↘↘↘
xá-ku-ì xa'-ún ñá lo'o kwé'e
 ↗↘ →↗↘ ↘ → ↗↗↘
rrú rrú ká-chi yó'-o nùún tá-ká-ì xa'-á
 ↗ → →↘↘ ↗↘↘ → ↗↘↘↘ ↘↗↘
tù-ndí-kă sì-sì-kí Lu-cí-la
 ↘↗ → ↘↗↘ ↘↗↘↘
á koó nda-kú'-ún xa'-í tá-ká-ì xa'-á
 ↗ ↘ ↗↘↘ ↘↗↘ →↘↘ ↗↗↘
tù-ndí-kă sì-sì-kí Lu-cí-la
 ↘↗ → ↘↗↘ ↘↗↘↘
ñà'-ká ndó'-i xá-ku-ì ñá lo'o kwé'e
 ↗→ →↘↘ ↗↘↘ → ↗↗↘↘

8 Only the first four measures of *Conéjo la kò'onchí* are included, as the last three measures are in Spanish (a non-tonal language)

9 In this schematic, the written feminine singular classifier *ñá* is treated as a low tone, as it is sung as the masculine singular classifier *tà* on the recording.

Examining this correspondence in aggregate, the pattern of musical melody and lexical tone moving in parallel holds over 95% of *Lálú Lálú*, 90% of *Conéjo la Kò'onchí*, and 84% of *Ñá lo'o kwé'e*:

Table 2.3: Parallel tone-tune correspondences by song

	Segments with pattern	Total segments	% correspondence
Lálú Lálú	20	21	95%
Conéjo la kò'onchí	16	20	90%
Ñá lo'o kwé'e	99	118	84%

Notably, these results are for the strictest criteria for tone-tune correspondence, where both musical tune and lexical tone move in parallel. As mentioned above, other tone-tune studies have also considered a less strict form correspondence when musical melody and lexical tone simply do not move in opposite directions, called 'non-opposing' (cf. Schellenberg 2012) correspondence. In this system, a descending musical tune on a MM lexical tone melody would still count as a correspondence, while a descending musical tune on a MH tone melody would not; likewise, a HL lexical tone melody sung with a level musical tune would count as correspondence, while the same HL tone pattern sung with an ascending musical melody would not. If we consider these three Tlahuapa Tù'un Sàví songs within the more lenient framework of non-opposing correspondence, the results are even stronger:

Table 2.4: Non-opposing tone-tune correspondences by song

	Segments with pattern	Total segments	% correspondence
Lálú Lálú	21	21	100%
Conéjo la kò'onchí	20	20	100%
Ñá lo'o kwé'e	112	118	95%

In addition, there is evidence that this pattern is based specifically on individual tone targets rather than syllables. One example is the musical and tonal melody on the word *ñúun* 'night' in *Lálú Lálú*. *Ñúun* is a monosyllabic word with three tone targets and a MHM melody, and its prall ornament (described in detail in section 2.5.2 below) means that its single syllable is realized with a three-note alternation from the primary note (M) to a note a half-step above (H) and back to the primary note (M):

(10)

tà - tún ñúun
 don't go to- the bathroom at night
 no - hagas del baño por la noche

(Tlhp-039-Song_Lalu_Lalu-MTS; 2)

Similarly, in *Ñá lo'o kwé'e*, the monosyllabic negation marker *koó* preserves its MH lexical tone melody by being sung across two notes: a rapid lower grace note (M) and the higher primary note (H):

(11)

ini - -ra vi - ti - taàn va koó
 about - this man every - day don't
 de - este hombre todos los - días no

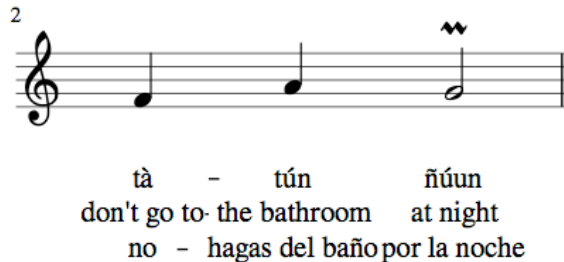
(Tlhp-039-Song_Ña_lo'o_kwe'e-MTS; 15)

2.5.2 Ornamentation

In addition to this correspondence between musical tune and lexical tone in the melodies of these three songs, there are also patterns linking various musical ornamentation types to specific lexical tones. Ornaments are musical flourishes or embellishments added to melody notes, and include techniques such as trills on a piano, hammer-ons and pull-offs on guitar strings, and *meend* glides in North Indian classical music.

In these Tlahuapa Tù'un Sàví songs, three notable types of ornamentation can be seen. The first of these is a prall, or upper mordent, which consists of a single alternation between a principal note, the note a half-step above, and the principal note again. It is represented by the (♯) symbol (or in ABC, a 'P' before the note being ornamented), and is used in the excerpt from *Lálú Lálú* below:

(12)



tà - tún ñúun
don't go to- the bathroom at night
no - hagas del baño por la noche

(Tlhp-039-Song_Lalu_Lalu-MTS; 2)

Another type of ornament used in the Tlahuapa Tù'un Sàví songs is the upper acciaccatura – a rapid move from the note a half-step above to the principal note. It is represented by a grace note with a strike through the stem (♯) (or in ABC, '{/x}' before the principal note, where 'x' represents the pitch of the ornament note), and can be seen in the following example from *Ñá lo'o kwé'e*:

(13)



Rrú rrú
[sound of-leaving]
[sonido de - irse]

(Tlhp-039-Song_Ña_lo'o_kwe'e-MTS; 20)

Finally, the third ornamentation type used is a fall, a prolonged descent to a non-specified pitch target. It is represented by a fall line following the ornamented note (\frown) (or in ABC, by a user-defined ';' following the note), and is used throughout *Ñá lo'o kwé'e*:

(14)

Musical notation for example (14) showing a treble clef, a key signature of three flats (B-flat, E-flat, A-flat), and a 6/8 time signature. The melody starts with a quarter rest, followed by a quarter note G4, a quarter note F4, and a quarter note E4. The notes G4 and F4 are beamed together. The note E4 has a fall line (a small downward curve) above it. The melody continues with a quarter note D4, a quarter note C4, and a quarter note B3. The notes D4, C4, and B3 are beamed together and have a '3' below them, indicating a triplet. The melody ends with a quarter rest.

sì - sì - kí Lu - cí - la
on there Lucila
encima Lucila

(Tlhp-039-Song_Ña_lo'o_kwe'e-MTS; 26)

Using the combined musical and linguistic data, we can examine how these ornaments co-occur with various lexical tones by searching for their ABC symbols in the ELAN corpus. From this analysis, two interesting patterns emerge. First, both the prall and the upper acciaccatura – ornaments which involve an accent tone situated above the principal note – only occur on notes where the sung syllable has a lexical high tone. Second, in 11 out of the 13 cases in which the fall ornament is used, it occurs either 1.) on a note with a lower lexical tone than the preceding note (i.e. a low tone following a mid tone), as in (15):

(15)



Ndá'-vì	kú - -ì	xá - ku-ì
poor	me	I - cry
pobre	me	estoy llorando

(Tlhp-039-Song_Ña_lo'o_kwe'e-MTS; 1)

Or 2.) on a note which itself encompasses a falling lexical tone melody in a single syllable (i.e. HL on a single note), as in (16), where the final *káyà* is pronounced [káà]:

(16)



Tá tà tá-ká - -ví	tu' - un	ti - ka - -ún	xí' - in	ká-yà
how like	the-words	you said	to - me	continue
como eran	los-palabras	dijiste	a - mi	sigue

(Tlhp-039-Song_Ña_lo'o_kwe'e-MTS; 9)

Further, of the two falls which do not fit into one of these categories, one is on a level tonal melody (*ini* 'inside', measure 15), and the single fall ornament on a rising lexical tonal melody (*xa'-í* 'about me', measure 30) ends in the first person clitic, which also appears elsewhere (both in *Ñá lo'o kwé'e* and elsewhere in the Tlahuapa Tù'un Sàví corpus) as a low tone.

Taken together, the patterns of use of these ornamentation types show the two ornaments which utilize a pitch above the principal note (the prall and upper acciaccatura) to be linked to lexical high tones, and the fall to be linked to falling lexical tone melodies. As with musical melody, then, the use of these ornamentations in Tlahuapa Tù'un Sàví songs

seems to be linked to lexical tone, with specific tones or tone melodies licensing the use of certain ornamentation types. As the first treatment of musical ornamentation in terms of lexical tone, this result provides new evidence for how linguistic features of tonal languages can interact with musical features in song.

2.6 Discussion:

Correspondence of tone and tune

Observing the relationship of tone and tune in these Tlahuapa Tù'un Sàví songs reveals a strong correlation between the two; lexical tone and musical melody move in parallel at rates of 84%-95%, depending on the song, for an average of 90%. If we take correspondence to mean non-opposing movement, those rates increase to 95%-100%, for an average of 98%. Situating these results within the previous literature on tone-tune relationships reveals that Tlahuapa Tù'un Sàví sits on the higher end of the typology of correspondences, as seen in Figure 2.7 and Table 2.5 below:

Figure 2.7: Comparative cross-linguistic results for tone-tune correspondence

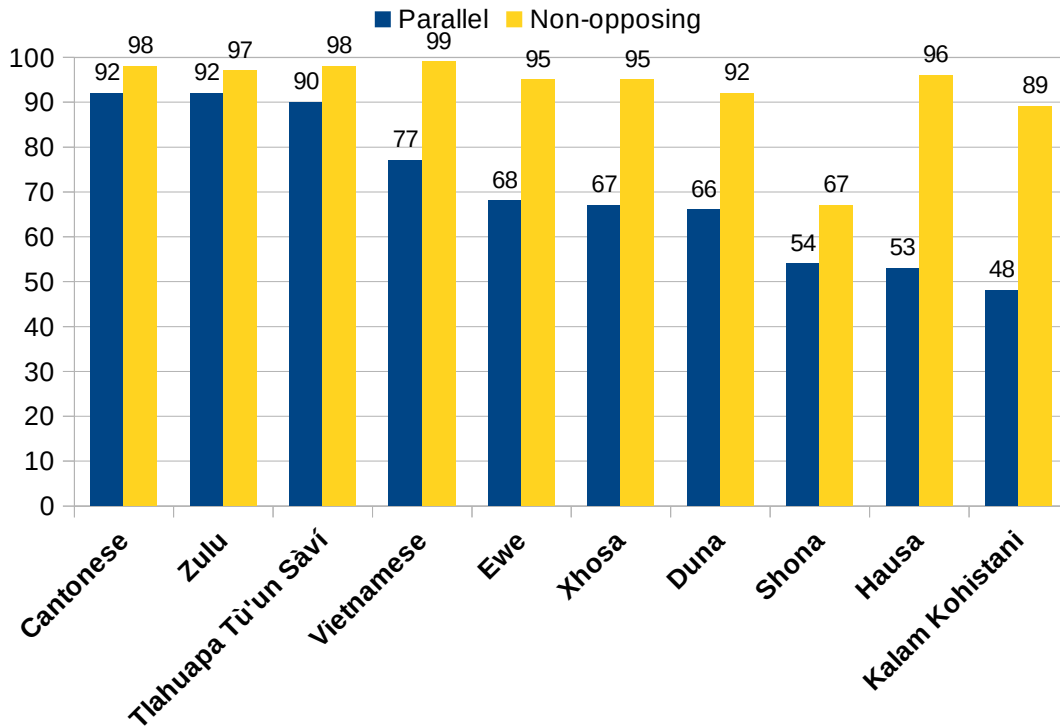


Table 2.5: Comparative cross-linguistic results for tone-tune correspondence

Language	Reference	Parallel	Non-opposing
Cantonese	Wong and Diehl (2002)	92%	98%
Zulu	Rycroft (1959, 1979), cited in Schellenberg (2012)	92%	97%
Tlhuapa Tù'un Sàví	(present study)	90%	98%
Vietnamese	Kirby and Ladd (2016)	77%	99%
Ewe	Jones (1959)	68%	95%
Xhosa	Starke (1930), cited in Schellenberg (2012)	67%	95%
Duna	Sollis (2010)	66%	92%
Shona	Schellenberg (2009)	54%	67%
Hausa	Richards (1972)	53%	96%
Kalam Kohistani	Baart (2004)	48%	89%

As the first tone-tune correspondence study of a Mesoamerican language, these results help place Tlahuapa Tù'un Sàví – and by extension, Mesoamerican languages – in the typological picture for how musical melody and lexical tone interact in tonal languages around the world.

Of course, within these average percentage of 90% parallel and 98% non-opposing correspondences in Tlahuapa Tù'un Sàví, there are also individual differences among the three songs examined. While the range of difference (11% for parallel and 5% for non-opposing) is not as great as in many other tone-tune studies, the more fine-grained results for individual songs do reflect a specific trend seen in the tone-tune typology, where musical genres closer to speech on the speech-song continuum (List 1963) tend to show relatively higher degrees of correspondence, and genres closer to pure song tend to show relatively lower correspondence (Schellenberg 2012). All three Tlahuapa Tù'un Sàví songs in this study are situated relatively further towards the 'song' end of the continuum, but there are still slight differences in their use that could order them along the speech-song cline. *Lálú Lálú* (which exhibits the highest percentage of correspondence) is a children's nursery rhyme, for instance, and *Conéjo la kò'onchí* is a sung interlude connected to a longer prosaic, non-musical story; these could both be thought of as further towards the “speech” side of the cline than *Ñá lo'o kwé'e*, a self-contained adult love song with the lowest percentage of correspondence. Situating these songs alongside other work on tone-tune relationships that examines genre in Table 2.6 (adapted from Schellenberg (2012)) shows that the relationship between genre (in terms of the speech-song continuum) and relative tone-tune correspondence in Tlahuapa Tù'un Sàví mirrors those seen in other languages:

Table 2.6: Language-specific continua of tone-tune correspondence (Schellenberg 2012)

Language	higher correspondence ←————→ lower correspondence			
Nguni (Rycroft 1979)	War cries; praise-poetry	Personal solo songs	Traditional dance-songs	Modern church, school, and popular music
Chinese (Chao 1956)	Children's songs, street vendors' cries	Chanting: traditional (learned) reading style	Recitative in traditional Chinese drama	Traditional, “stereotyped” melodies Modern songs
Thai (List 1961)	Mnemonic recitation (multiplication tables)	Traditional literary recitation	Classical songs	Popular songs
Tlahuapa Tù'un Sàví (present study)	Children's nursery rhyme (<i>Lálú Lálú</i>)	Song within story (<i>Conéjo la kò'onchî</i>)	Traditional self-contained song (<i>Ñá lo'o kwé'e</i>)	

This is not necessarily to imply that there is a consistent cross-linguistic relationship between specific genres and tone-tune correspondence (i.e. “nursery rhymes have higher levels of tone-tune correspondence”) – though with more data this may prove to be the case – but rather to support the idea that genre can play a role in within-language tone-tune correspondence. Diachronic change could also provide another explanation for the pattern observed in the Tlahuapa Tù'un Sàví songs; *Ñá lo'o kwé'e* is likely to be the oldest of the three songs in the data, and it could be that its relatively lower level of correspondence is a result of certain lexical tones shifting over time while the musical tune has remained the same.

Non-correspondence

Because the correspondence of musical tune and lexical tone is so high in Tlahuapa Tù'un Sàví, it is also worthwhile to examine those places where tune and tone do not

correspond. Of course, not all instances of non-correspondence need be motivated, but there are two specific examples which warrant particular consideration from a functional perspective.

First is the last line of *Ñá lo'o kwé'e*, reproduced with the previous measure for context below in both staff notation and the schematic for examining tone-tune correspondences:

(17)

33

Lu - cí - la
Lucila
Lucila

35

Ñà' - ká ndó' - i xá - ku-ì ñá lo'o kwé'e
this - is what I - experience I - cry ungrateful small wench
eso - es lo que me - pasa estoy - llorando malagradecida

sìsì-kí Lu-cí-la
 ↘ ↗ ↘ ↗ ↘

ñà'-ká ndó'-i xá-ku-ì ñá lo'o kwé'e
 ↗ → → ↘ ↗ ↘ → ↗ ↗

(Tlhp-039-Song_Ña_lo'o_kwe'e-MTS; 33)

The opening segment of this last line – the inanimate classifier *ñà* in *ñà'-ká* 'this is' – represents one of the relatively few instances of oppositional alignment between tone and tune in these songs: the musical melody ascends from the preceding pitch, while the lexical tone descends, from the previous M to an L. Crucially, however, this transition occurs at a significant musical juncture – not only is this a new musical phrase (which in itself may provide an opportunity for the relative relations for melody and lexical tones to 'reset'), it is

also the point where the song modulates from Ab-minor to A-major for the final phrase. This key change on a final phrase represents a departure from the previous musical melody, and thus a point at which the tone-tune relationship could plausibly be reset – on analogy with the 'pitch reset' of a new Intonation Unit in linguistic discourse (Du Bois et al. 1993) – and where we might expect non-correspondence with respect to the previous musical pitch and lexical tone.

The second instance in which tone-tune non-correspondence may be functionally motivated is in measure 5 of *Ñá lo'o kwé'e*, the last measure of the first line shown here in staff notation and in schematic form:

(18)

Ndá'-vi	kú - ì	xá - ku-ì	Táá tá--ká
poor	me	I - cry	how like
pobre	me	estoy llorando	como igual

<u>ndá'-bì</u>	<u>kú-ì</u>	<u>xá-ku-ì</u>	<u>táá</u>	<u>tá-ká</u>
↘ ↗	↗ ↘	↗ ↘	↗ ↗	↗ ↗

(Tlhp-039-Song_Ñá_lo'o_kwe'e-MTS; 1)

While the tone-tune relationship on *tá-ká* 'similar' represents a correspondence in the non-opposing system (the lexical tone stays the same, while the musical melody rises), it is not a parallel correspondence, and there is a particular process of tone sandhi in Tlahuapa Tù'un Sàví phonology which may explain why.

Tone sandhi refers to any process through which the linguistic tone for a given lexeme changes, often due to surrounding words or tonemes (Yip 2002). Tlahuapa Tù'un Sàví has at

least one process of tone sandhi called upstep, which involves the phonetic raising of a phonological tone, and can occur when two H tones come into contact across word boundaries (Sims 2016). For example, in (19), when the H tone at the end of *komí* 'four' occurs directly before the H tone on the first syllable of *skóva* 'broom', the H tone in *skóva* is realized phonetically higher ([ó]) than the H tone before it:

- (19) *komí* 'four'
skóva 'broom'
komí skóva [komí skó^óba] 'four brooms'

This same process could account for the tone-tune relationship here; if upstep were applied in this situation, for instance, it would be realized with the following lexical tones, and a parallel tone-tune correspondence:

- (20) táá tá-ká
 ↗ ↗ ↗

(Tlhp-039-Song_Ña_lo'o_kwe'e-MTS; 5)

Upstep does not appear to be an obligatory process in Tlahuapa Tù'un Sàví – it does not occur every time two H tones meet across word boundaries, and the same speaker may produce the same H-#H sequences both with or without upstep – but it could certainly account for the realization of the particular tone-tune correspondence in this instance.

Other considerations

Examining music and language data together in these three songs also illuminates other features of the interaction between music and language in Tlahuapa Tù'un Sàví, including temporal correspondences and phonetic processes involved in their performance.

In terms of temporal correspondence, the data show a correlation between vowel length and note length in *Lálú Lálú* and *Conéjo la kò'onchí*. In both these songs, (C)VV sequences are categorically realized on longer notes than (C)V sequences. In *Lálú Lálú*, (C)V sequences are on quarter notes, and (C)VV sequences (*ñúun* 'night') are on half notes, which are twice as long. In *Conéjo la kò'onchí*, (C)V sequences are sung as eighth notes, while (C)VV sequences (*áá* 'now', *kandee* 'get down') take either quarter (twice as long) or dotted quarter (three times as long) notes.

While this temporal correspondence is limited to *Lálú Lálú* and *Conéjo la kò'onchí*, *Ñá lo'o kwé'e* shows interesting phonetic processes in the interaction of music and language. One of these is the collapsing of (C)V?V sequences to (C)VV on phrase-final long notes. In example (21), for instance, *kwé'e* 'ungrateful (one)' in measure 12 is realized as [kwée], and *ñú'un* 'remember' in measure 13 as [ñúun]:

(21)

Yó' - o ñá kwé'e koo ñú'un
 you ungrateful wench don't remember
 tú malagradecida no te acuerdas

(Tlhp-039-Song_Ñá_lo'o_kwe'e-MTS; 12)

Both of the (C)V?V to (C)VV sequences above occur on relatively long notes (half notes here), and this is true of all four cases of this phenomenon. It also appears to be categorical in this song; all musical phrase-final (C)V?V sequences in *Ñá lo'o kwé'e* are realized as (C)VV, and no non-final (C)V?V sequences are.

A similar process in *Ñá lo'o kwé'e* sees CVCV sequences ending in the inanimate classifier =yà realized as CVV̂. In example (22), *xa'á-yà* 'about this' in measure 14 is pronounced [xa'àà]:

(22)

12

Yó' - o ñá kwé'e koo ñú'un ini - -ún xa' - a-yà
 you ungrateful wench don't remember inside about-this
 tú malagradecida no te acuerdas dentro de - esto

(Tlhp-039-Song_Ña_lo'o_kwe'e-MTS; 12)

and in example (23), *ká-yà* 'it continues' in measure 11 is pronounced [káà]:

(23)

9

Tá tà tá-ká - -ví tu' - un tí - ka - -ún xí' - in ká-yà
 how like the-words you said to - me continue
 como eran los-palabras dijiste a - mi sigue

(Tlhp-039-Song_Ña_lo'o_kwe'e-MTS; 9)

This is not always the case however; in example (24), *ká-yà* 'it continues' in measure 7 realized as [káyà]:

(24)

6

nùún xí - kà-ún ká - -yà
 when you - were around everything continues
 cuando estabas - tú todo - sigue

(Tlhp-039-Song_Ña_lo'o_kwe'e-MTS; 6)

Though more data is needed to draw any conclusions, this difference could be related to rhythmic weight. In examples (22) and (23), where the clitic is realized as a long vowel with a low second tone target, the CV́V̀ sequences are on long notes (half or dotted half) following runs of shorter notes (eighth notes or eighth note triplets). In example (24), however, the CV́CV̀ sequence is on a quarter note following a longer note (dotted quarter). Given the other interactions between note length and position and vowel realization in Tlahupan Tù'un Sàví songs, it could be that this distinction in rhythmic context affects the realization of these sequences as either CV́CV̀ or CV́V̀.

Applications

Finally, while the methodology used to combine musical and linguistic data here is useful for academic linguistic research, such as studying the relationship between tone and tune, it is also equally well-suited for the creation of community materials. In the case of these three Tlahuapa Tù'un Sàví songs, for instance, we were able to use the data already present in the ELAN corpus files to easily create a songbook for community use. This involved exporting the tier with ABC notation into a plain text file using ELAN's built-in export function, which was then converted to MusicXML using EasyABC (Liberg 2012). The MusicXML file could then be opened and edited in any music notation and layout software, such as MuseScore. Once the music was imported into MuseScore, the Tlahuapa Tù'un Sàví transcription, English free translation, and Spanish free translation tiers were exported into text files from ELAN, and then each imported as a lyrics tier into MuseScore. Finally, we included a short explanatory text about each song in Tlahuapa Tù'un Sàví, English, and Spanish – these were recorded and transcribed in the same ELAN files, and


exported to plain text to be added to the score page in MuseScore. The result of this process can be seen in the example page for *Lálú Lálú* below:

Figure 2.8: *Lálú Lálú* songbook page


Lálú Lálú

Sung by: Griselda Reyes Basurto, 11.12.2015


Transcription: Griselda Reyes Basurto & Morgan Sleeper



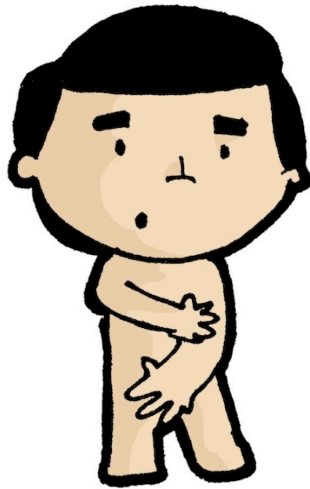
 Lá - lú lálú lálú tà - tún ñúun
 belly - button belly - button, don't go to - the bathroom at night
 ombligo ombligo no - hagas del baño por la noche



 lá - lú lálú lálú tà - tún ñúun
 belly button belly button don't go to - the bathroom at night
 ombligo ombligo no - hagas del baño por la noche



 tá - ná tà - tún ñúun ka - nì yo - 'ò
 if you go to - the bathroom at night I'll - hit you!
 si hagas - del baño por la noche voy a - pegarte!



**Ñà yaa yó'o xa'á-na vâlí kw'àn-yà ná
chindeé ña'á-yà-nà ná tatakà-nà ñúun.**

*This song is for the children, to help
them not go to the bathroom at night.*

*Esta canción es dedicada para los niños,
para que no hagan del baño por la noche.*

Integrating musical and linguistic data, then, not only allows for the kinds of musicolinguistic analysis seen above, but also for the easy creation of community materials like this songbook – materials which ensure the data we collect can be useful for the speech and musicking communities from which it emerges as well as for academic linguists.

Conclusions

This chapter has presented a new methodology for integrating musical and linguistic data in language documentation, through the use of ELAN and ABC notation, and demonstrated the application of this method to the study of tone-tune correspondence in Tlahuapa Tù'un Sàví. The results add to our understanding of the typology of tone-tune relationships by situating Tlahuapa Tù'un Sàví – the first Mesoamerican language in which this phenomenon has been studied – as a language with high correspondence between musical melody and lexical tone in both parallel and non-opposing systems, as well as showing the importance of ornamentation in tone-tune correspondence. Finally, this chapter has aimed to show the potential and value of integrating musical data into language documentation projects more broadly, both for structural linguistic analyses and for the creation of community materials.

Chapter 3: Code-switching and Identity in Welsh Rock Music

This chapter aims to highlight the importance of combining musical and linguistic data in sociocultural linguistics. It introduces a new multimodal methodology based in discourse analysis, and uses this method to show how musical style-shifting and linguistic code-switching combine to create emergent identities in Welsh rock music. It begins with background information on Welsh and the development of the modern Welsh-language music scene in section 3.1, and then describes previous research on code-switching and music and identity in sections 3.2 and 3.3, respectively. Section 3.4 introduces the methodology used, and section 3.5 presents the analysis of music and language used to explore the musicolinguistic enactment of identity by three Welsh rock artists.

3.1 Welsh and Welsh-language Music

Welsh (*Cymraeg*) is a Brythonic Celtic language, closely related to Breton and Cornish, and more distantly to Irish, Manx, and Scottish Gaelic (Simons and Fennig 2018). It is spoken by approximately 562,000 people in Wales (ONS 2012) – 19% of the country's population – as well as by several thousand people in Welsh Patagonia (*Y Wladfa*) (Ó Néill 2005:429), following the establishment of a presence in what is now Chubut, Argentina in 1865 specifically to preserve Welsh language and culture away from English influence (Johnson 2009; Birt 2005). Typologically, Welsh is notable for having a series of voiceless nasals (/m̥ n̥ ŋ̊/) and for its system of three distinct initial consonant mutations, shown in Table 3.1:

Table 3.1: Welsh Initial Consonant Mutations

Soft Mutation			Nasal Mutation			Aspirate Mutation		
Radical		Mutation	Radical		Mutation	Radical		Mutation
/p/	→	/b/	/p/	→	/m̥/	/p/	→	/f/
/t/	→	/d/	/t/	→	/n̥/	/t/	→	/θ/
/k/	→	/g/	/k/	→	/ŋ̥/	/k/	→	/x/
/b/	→	/f/	/b/	→	/m/			
/d/	→	/ð/	/d/	→	/n/			
/g/	→	∅	/g/	→	/ŋ/			
/m/	→	/f/						
/l/	→	/l/						
/r̥/	→	/r/						

Each of these mutation types apply in different morphosyntactic and morphophonological environments, and affect words following various lexical or grammatical triggers; when affected, the initial (radical) consonant of the word mutates accordingly. The noun *cath* 'cat', for instance, undergoes a different mutation when preceded by each of the following possessive pronouns (King 2003; Hannahs 2013; Willis 1986):

- (25) Radical form: *cath* [kaθ] 'cat'
 Nasal mutation: *fy nghath* [ŋ̥aθ] 'my cat'
 Aspirate mutation: *ei chath* [xaθ] 'her cat'
 Soft mutation: *ei gath* [gaθ] 'his cat'

In terms of language endangerment, Welsh is classified by UNESCO as 'vulnerable' (Moseley 2010), but it is important to note that in spite of raw speaker numbers, Welsh language revitalization efforts are strong and varied. Welsh-language education is increasingly common and more accessible, and vibrant cultural institutions like *Eisteddfodau* (music-and-language festivals with competitions in music, literature, poetry, and dance held in Welsh from the local to national level) and *Yr Urdd* (a Welsh-language youth organization) give the language a significant presence in many speakers' social lives. Welsh is also well-

represented in media, with a Welsh-language public television channel S4C (*Sianel Pedwar Cymru* 'Channel 4 Wales') and a national Welsh-language radio station (BBC Radio Cymru), in addition to a significant number of books, movies, and even video games published in the language. Perhaps the most important media sector for the Welsh language, however, is popular music.

Modern popular music in Welsh began to develop, first as a scene and then as an industry, in the 1960s. Not coincidentally, this was also the time when the modern Welsh language revitalization movement is generally understood to have begun, galvanized by the poet Saunders Lewis's radio speech *Tynged yr Iaith* (Fate of the Language), broadcast live on BBC Wales, 13 February 1962 (Phillips 2005). In the speech, Lewis called for saving the Welsh language to take precedent over obtaining Welsh sovereignty, warning that if Wales were to obtain self-government before Welsh became an official language, "its demise would be quicker than under English rule". The speech has been called "the most influential action by any one individual in the Welsh language's fortunes during the last half-century" (Phillips 2005:100), and in particular because it spearheaded the formation of *Y Cymdeithas yr Iaith Gymraeg* (The Welsh Language Society). Founded by Welsh youth in direct response to Lewis' broadcast, *Cymdeithas* uses civil disobedience to fight for Welsh language rights; notable successes of their campaigns include developments such as bilingual road-signs, BBC Radio Cymru, and S4C.

Along with *Cymdeithas yr Iaith Gymraeg*, young enthusiasts poured their energy into the development of a popular music in their own idiom, and the two causes have been linked since their inception: "Though Welsh-language light entertainment and popular songs existed

in the years before 1963, the emergence of Welsh-language popular music as structure of feeling was inextricably bound with the emergence of *Cymdeithas yr Iaith*, itself a new structure of feeling" (Hill 2007:43).

In fact, the Welsh-language pop scene was tightly linked with *Cymdeithas yr Iaith* and the language movement in logistics as well as spirit. Within the Welsh-speaking community, *Cymdeithas yr Iaith* quickly became "the most effective agency for promoting live music" (Llewellyn 1998). The emerging music scene in turn was able to help bolster the Welsh language movement directly; when *Urdd Gobaith Cymru* (a Welsh-language youth group movement similar to *Cymdeithas yr Iaith*) recognized the interest that the younger generation had in Welsh-language popular music they were able to turn to pop music concerts and events as an effective fundraising tool (Hill 2007:74).

Young people were central to the emergence of Welsh popular music, then, as well as to the survival of the language revival movement. Overtly politicized from the beginning, Welsh popular music "existed in part to engage the younger audience with the language movement" (Griffiths & Hill 2005:219). Once they became engaged in its preservation, Welsh-language pop music also gave young Welsh speakers a way to modernize the image of their language, and to make it explicitly relevant to their generation (Hill 2007:60). This constant evolution of the language through music helped keep Welsh-language pop "linked to the growth of an increasingly confident and assertive attitude to the use of the language itself" (Llewellyn 1998; Llewellyn 2000), and resulted in a government-sponsored, export-friendly explosion of popular music in the 1990's referred to as the 'Cool Cymru' ("Cool Wales") phenomenon (Harris 2007).

In 2018, Welsh-language music remains a significant force in Wales' cultural landscape; along with long-standing labels such as Ankst and Sain Records, dozens of smaller independent labels have emerged – including Peski, Recordiau Lliwgar, Recordiau Neb, Aderyn Papur, and many more – releasing new Welsh-language music both digitally and on physical media, including vinyl and cassette. An initiative started by the Welsh Government in 2015 called *Dydd Miwsig Cymru* / Welsh Language Music Day also brings annual attention to music in Welsh every February. Fronted by Welsh-speaking BBC Radio 1 DJ Huw Stephens, the event promotes new Welsh music with playlists, resources, a hashtag social media campaign and new releases leading up a day of free concerts of across Wales and beyond, with the intention of raising the profile of Welsh-language pop music both in Wales and abroad (Llywodraeth Cymru 2018).

3.2 Code-switching

Code-switching – the use of two or more languages within the same sentence, conversation, or interaction – has been an important research topic in several different sub-fields of linguistics since the 1970's. A canonical instance of intra-sentential code-switching is exemplified by the sentence “Sometimes I start a sentence in English y termino en español” ('Sometimes I start a sentence in English and finish in Spanish') (Poplack 1980), but code-switching can take many different forms, from speakers switching back and forth fluidly between two languages in a conversation, to a child using different languages to address different parents in turn, or a student writing her to-do lists in multiple languages.

There are many reasons that speakers code-switch, including topic-conditioned switches based on changes in conversational topic, style-shifts where speakers change

language – consciously or unconsciously – for stylistic effect, and single-word switches, where speakers bring in a word from another language either because it is the 'right word' for something, or because of cultural salience or past experience with the term in another language (Auer 1984; Gumperz 1982; Poplack 1988; Zentella 1997).

Initially, linguists such as Labov (1971) and Lance (1975) judged code-switching in Spanish-English discourse to be an unrestricted and unregulated side-effect of community bilingualism. Further investigation revealed more complicated processes at work, however, and several subsequent studies focused on defining regular rules for code-switching, positing specific syntactic environments in which code-switches can or cannot occur. Poplack (1980) proposes two influential syntactic rules in Spanish-English code-switching: the “Free Morpheme Constraint” that speakers will not switch at a bound morpheme (or within an idiomatic expression), and the “Equivalence Constraint” that code-switches tend to occur where the juxtaposition of the two codes does not violate the syntax of either individual language. These ideas have since been refined in further work (Poplack & Sankoff 1988) and expanded by other linguists working in various bilingual communities (Moyer 1992, Muysken 2000, Myers-Scotton 1993).

Many other studies examine the sociolinguistic and discourse functions of code-switching. Gumperz (1982) introduced the concept of “semantic” code-switching – that a bilingual speaker's choice of language is inherently meaningful – as well as the distinction between “situational” code-switching, associated with changes in speakers, context, or topic, and “conversational” code-switching, in which speakers switch for (conscious or unconscious) stylistic motivations. Building off of this concept, Gardner-Chloros (1985) employs a Labovian methodology to determine when and why shopkeepers and customers

code-switch between Alsatian & French in three different department stores, Poplack (1988) compares the discourse functions of code-switching in New York Puerto Ricans and French-English bilinguals on the Ontario/Quebec border, and Auer (1984) uses data from the speech of Italian children living in West Germany to outline a typology of interactional uses of code-switching in conversation.

Importantly, code-switching is also a major way in which bilingual speakers create and enact their identities. In addition to the idea of semantic code-switching, for instance, Gumperz (1982) also introduces the notion of a “we-code” minority language used in informal, in-group domains and activities, and a “they-code” majority language for formal, out-group situations, and the relational identity building that these designations imply. Zentella's (1981, 1997) study of Spanish-English code-switching among New York Puerto Ricans focuses on identity and discourse functions, finding that the use of code-switching itself constitutes a mode which defines the community's bilingual identity, and proposing three types of factors which govern code-switching: “on the spot” (analogous to Gumperz's “situational” switching), “in the head” (similar to Gumperz's “conversational” code-switching) and “out of the mouth” (phonological and syntactic restrictions on switching). In addition to the linguistic work which goes into identity building in any one language, then, the act of code-switching itself creates social meaning which is integral to the formation of bilingual identities.

3.3 Music and identity

Along with language, another powerful way in which people can create identities is musicking. Because of its rich semiotic potential, multimodality, and place in social life,

music is particularly important to identity work (Stokes 1994; Firth 1996), and much ethnomusicological research has shown how music creates and enacts diverse identities.

A large body of this work examines the construction and contestation of national identities through music. Daughtry (2003) shows how Russian national identity has been negotiated and renegotiated through responses to a changing national anthem; in 2000, the previous anthem was replaced by newly composed lyrics set to the tune of 'Unbreakable Union', the anthem of Stalin-era USSR. On the one hand, condemnation of the move among artists and “cultural intelligentsia” led to strong critique of the Soviet past, and on the other, popular support for the new anthem among the general populace was interpreted as nostalgia for the Soviet period and a mandate for the government which reinstated the older melody. Valley (2008) examines the relationship between Traditional (i.e. Celtic) music and identity in Northern Ireland, focusing especially on the complicated ways in which this music is claimed and refuted as part of an authentic Protestant nationalist identity in urban and rural Northern Ireland. Langlois (2009) considers the three genres of *andalus*, *g'nâwa* music, and *raï* in the Maghreb states of Morocco, Algeria, and Tunisia, showing how the prestigious *andalus* came to be seen as an enactment of national identity in each state, in part in relational opposition to both the racialized *g'nâwa*, and *raï*, associated with the urban poor.

Another particularly productive area of research focuses on music and ethnic and affinity group identities. Waterman (1990), for instance, explores how hegemonic values enacted in popular music have helped create a modern pan-Yoruba identity as a new imagined community (Anderson 1983). Cooley's (2005) study of musicking in the Polish Tatras shows how an influx of nineteenth-century tourism to this diverse, mountainous region led to changing self-conceptions of identity, and how the making of a local 'mountain music'

was an integral part of building the Górale ethnicity. Teves (2011) examines the production of a modern Kānaka Maoli (Native Hawaiian) identity through Hawaiian hip-hop, Hnaraki (2011:183) traces music (both for tourism and for local consumption) as a “unifying force in the construction and maintenance of a pan-Cretan identity”, and Sparling (2011) shows how Cape Breton islanders build a local identity around the authenticity of their musical traditions in comparison to modern Scottish equivalents.

In terms of affinity groups, Laušević (2007) focuses on the musical creation of the “Balkanites” – American musicians who “construct a large part of their musical and social lives around [Balkan music]” (18) and identify with the affinity group as a kind of 'adopted ethnicity' (21). Baulch (2007) explores the punk, metal, and reggae scenes of 1990's Bali, and finds that youth in each of these subcultures negotiate their identities musically in opposition to both global and local cultural flows. Cooley (2014) examines the musicking practices of surfers, showing the importance of perceived homologies between music and surfing (including sound waves and water waves and the importance of rhythm) as well as how, as an inherently shared activity, musicking plays a large role in creating a surfing community around the otherwise often solitary practice.

In addition to group identities, music can also construct very personal identities. Waterman (1982), for instance, presents a study of one particular leader of a *jùjú* group, who uses the social importance of his music and performance to negotiate a liminal identity for himself that affords entrance into the elite social class while still maintaining solidarity with his lower-status employed musicians.

Throughout all these case studies, a unifying factor is that music creates, enacts, and performs – rather than simply reflects – identity. As Turino (1984:253) states, music “is not

merely a reflection of a particular value orientation or social context. Rather, it is a public articulation of the sociocultural, economic, ideological and political makeup of an individual or group's identity, made patent through musical performance”.

Music and language are both independently important sites of identity creation, then, but are particularly powerful when they function in concert as part of semiotic bundles (cf. Turino 1999, 2004; Eckert 2004; Bucholtz 2011) to create social meaning. In this chapter, I examine this phenomenon in the context of Welsh rock music, and look specifically at moments in which cotemporal musical and linguistic shifts in performance – shifts between different semiotic bundles of music and language – work together to enact identity. In particular, I look at how three different Welsh rock artists – Super Furry Animals, Gorky's Zygotic Myncci, and MC Mabon – use different types of shifts in music and language to create three different identities: a Welsh-language band succeeding in the musical mainstream while actively resisting globalization, a bilingual, bi-stylistic band which adopts ironic aspects of English identity to accentuate their Welshness, and a global-citizen Welsh MC with cultural links and audiences in Wales, Patagonia, and beyond.

3.4 Method: combining music and language in discourse analysis

The methodology used for this study is adapted from the framework of discourse analysis. Transcription is a central component of discourse analysis (Du Bois et al. 1993); by representing conversations and other forms of naturally occurring discourse in text, the researcher can use this representation – in itself a theoretical framing of the data (Ochs 1979) – to study language use, linguistic structure beyond the sentence or clause, and social

meaning, practices, and ideologies that are embedded within and enacted through language (Schiffrin et al. 2001).

With the rise of interest in multimodal communication and embodiment in sociocultural linguistics, as well as the pervasive use of video, the tools of discourse analysis have also been adapted to transcribe and analyze important aspects of multimodal interactions (Ochs 1979), including gesture (Kendon 1995), body language and gaze (Goodwin and Goodwin 2004), cinematography (O'Halloran 2011), and more. These studies employ transcription of (often) conversation, but with additional tiers or columns to mark separate semiotic modes in temporal alignment.

The methodology proposed in this study adapts the same concept to examine the interaction between music and language, by featuring both semiotic systems in time-aligned columns anchored to either lyrical transcriptions (for analysis focusing on a single song) or sections of a musical work or collection (for analyses of albums or multi-piece performances). The amount and scope of musical and linguistic information included can scale to suit the analysis: relevant musical data could include everything from stylistic markers ('ballad') and structural information (such as key, meter, or instrumentation) to particulars of performance (i.e. the use of vibrato or a specific effects pedal) and ABC transcriptions of specific melodies; relevant linguistic information could range from the variety used ('Northern Welsh') to details of phonetic production (including voice quality and specific realizations of phonemes).

This method allows us to study both music and language – as well as other relevant semiotic dimensions, such as video information or movement in performance – simultaneously as they interact and overlap. In the case of this chapter, examining language

and music together using this methodology illuminates how the cotemporal shifts in both language (through code-switching) and music (through musical style-shifting) are used by three Welsh rock artists (Super Furry Animals, Gorky's Zygotic Mynci, and MC Mabon) to enact social meaning and build three distinct identities.

3.5 Results and Discussion

3.5.1 Super Furry Animals

The first artists in the data, Super Furry Animals, are one of the most prominent groups in the Welsh rock world, and also perhaps “the most successful Welsh export into the Anglo-American dominant culture” (Hill 2007:200). Though now well-known as Super Furry Animals, the group's story begins with the founding of Ffa Coffi Pawb, a punk/rock band from Cardiff embodying the spirit of late-1980s and early 1990s Welsh rock. Ffa Coffi Pawb achieved widespread popularity within the Welsh rock scene, but were quickly banned from U.K. radio because of their name (in Welsh, literally "Everybody's coffee beans", but homophonically *Ffyc off i pawb* "Fuck off everybody"). They disbanded in 1993, and then reformed with two of the original members in 1994 as Super Furry Animals.

Super Furry Animals' early recordings for Ankst – an influential Welsh independent label – were almost entirely in the Welsh language; in fact, one of the conditions of their initial record contract was that they be able to record in both Welsh and English (Hill 2007:200). Though they have since gone on to enjoy mainstream UK pop-chart success in English – starting with the release of their major label debut album *Radiator* in 1996 – they have continued to return to Welsh-language songwriting over the years. This language choice is significant, because throughout their career, Super Furry Animals have used code-

switching both within and across albums to create a changing identity as a Welsh-speaking band navigating success in an English-speaking mainstream music industry.

While linguists usually talk about code-switching in the context of conversations or interactions, it can also take place within recorded albums. Albums are as much cohesive acts of musicking as performances are – not only in the recording and production, but also in the listening and reproduction (Berger & Del Negro 2004:122) – and thus, as interactions, they can be sites of code-switching as well. Super Furry Animals code-switch in Welsh and English both in and between albums, and we can see the way in which they code-switch change alongside shifts in musical style over three of their early albums – *Fuzzy Logic* (1996), *Radiator* (1997), and *Mwng* (2000) – creating their identity as Welsh-speaking musicians navigating English-language success.

Released in 1996, Super Furry Animals' first major label record for Creation – *Fuzzy Logic* – is sung entirely in English, with no code-switching into Welsh. Musically, the album embodies Super Furry Animals' signature blend of psychedelic Britpop, and features mostly short, radio-friendly songs with melodic choruses.

Table 3.2: *Fuzzy Logic*

	Song	Languages	Musical style
1.	God! Show Me Magic	English	-Psychedelic Britpop -Shorter songs -Distorted electric guitars -Driving 4/4 rhythmic keyboards
2.	Fuzzy Birds	English	
3.	Something For The Weekend	English	
4.	Frisbee	English	
5.	Hometown Unicorn	English	
6.	Gathering Moss	English	
7.	If You Don't Want Me To Destroy You	English	
8.	Bad Behaviour	English	
9.	Mario Man	English	
10.	Hangin' with Howard Marks	English	
11.	Long Gone	English	
12.	For Now and Ever	English	

In *Fuzzy Logic*, this semiotic bundle of music and language indexes Super Furry Animals as aligned with this sector of the mainstream UK music industry, singing in English and producing music suited for the popular charts.

Their next album, *Radiator*, released a year later in 1997, shows a different pattern. Though it is still sung mostly in English, there is one Welsh song on the album: *Torra Fy Ngwallt Yn Hir*. Musically, *Radiator* is slightly more experimental than its predecessor, with instrumental songs, longer song lengths (of up to 6:14), and salient techno influences. Significantly, the sole Welsh-language song on the album calls back to the poppier, radio-friendly sound of *Fuzzy Logic*.

Table 3.3: Radiator

	Song	Languages	Musical Style
1.	Furryvision™	(instrumental)	-Psychedelic Britpop, power pop, rock -Range of song lengths -Techno-influenced synths -Mix of more experimental songs and more radio-friendly songs (including <i>Torra Fy Ngwallt Yn Hir</i>)
2.	The Placid Casual	English	
3.	The International Language of Screaming	English	
4.	Demons	English	
5.	Short Painkiller	(instrumental)	
6.	She's Got Spies	English	
7.	Play It Cool	English	
8.	Hermann ♥'s Pauline	English	
9.	Chupacabras	English	
10.	Torra Fy Ngwallt Yn Hir	Welsh	
11.	Bass Tuned to D.E.A.D	English	
12.	Down a Different River	English	
13.	Download	English	
14.	Mountain People	English	

The semiotic bundle of music and language on *Radiator* helps to shift Super Furry Animals' identity; building on the mainstream success they'd achieved in English on *Fuzzy Logic*, they were able to branch out both musically, with more experimental sounds, and linguistically, with a code-switch into Welsh for a song which musically recalls the sound of their first album.

In 1999, after the release of *Fuzzy Logic*, *Radiator*, and an additional all-English album called *Guerrilla* on Creation, the label folded, leaving Super Furry Animals with a collection of unrecorded music written (mostly in Welsh) during their tenure with the company (Hill 2007:203). What they decided to do with these songs would have an enormous impact on both Welsh popular music and the Welsh language; in 2000, armed with

these tracks, they recorded and independently released the entirely Welsh-language album *Mwng* to unforeseen and unprecedented critical acclaim.

The importance of *Mwng* to the Welsh language movement is difficult to overestimate. In associating the Welsh language with one of Wales' most popular musical exports (Super Furry Animals), *Mwng* boosted the international profile of Welsh significantly. It garnered favorable reviews in both the Welsh and broader British press – including being named Record of the Week in London-based *The Sunday Times* – and "the fact that the British press paid any notice whatsoever to a Welsh-language release was itself an enormous milestone" (Griffiths & Hill 2005:228). Super Furry Animals had "achieved the one thing which was deemed impossible in the early days of Welsh popular music: succeeding in the Anglo-American market while singing in the Welsh language" (Hill 2007:205). The release of *Mwng* to near-unanimous praise marked a turning point in the fate of the Welsh language in popular music, and by extension, popular culture, as expressed in Parliament by MP Elfyn Llwyd on 6 June 2000, in Early Day Motion 800, signed by 17 MP's:

"That this House congratulates Super Furry Animals on their chart topping new album, *Mwng*; notes that *Mwng* is the best selling Welsh language album of all time; and notes that the Welsh language is re-establishing itself as a central part of popular youth culture and that this album is a celebration of Welsh culture embracing the new wave of confidence in the Welsh nation." (Llwyd 2000)

As important as the release of *Mwng* was in terms of language, it was equally important in terms of music. *Mwng* represents a much more experimental sound for Super Furry Animals, featuring sparse instrumentation along with darker themes and melodies.

Table 3.4: *Mwng*

	Song	Languages	Musical Style
1.	Drygioni	Welsh	-Psychedelic Britpop, rock, folk rock, ballad, techno -Longer songs (up to 7:55) -Sparse and varied instrumentation, including many acoustic instruments -More minor-key songs and melodies
2.	Ymaelodi Â'r Ymylon	Welsh	
3.	Y Gwyneb Iau	Welsh	
4.	Dacw Hi	Welsh	
5.	Nythod Cacwn	Welsh	
6.	Pan Ddaw'r Wawr	Welsh	
7.	Ysbeidiau Heulog	Welsh	
8.	Y Teimlad	Welsh	
9.	Sarn Helen	Welsh	
10.	Gwreiddiau Dwfn/Mawrth Oer Ar y Blaned Neifion	Welsh	

Together, the shift in language – from English to Welsh – and the shift in musical style – from psychedelic Britpop to mellower, more experimental rock – work to create a new identity for Super Furry Animals, using their previous success in the mainstream UK music industry to experiment both linguistically and musically, and to bring the Welsh language into focus from the conceptual periphery. That this was a deliberate choice can be seen in the following quote from lead singer/songwriter Gruff Rhys on the recording of *Mwng*:

“As a band we speak a language that is virtually an invisible language. Welsh doesn't feature in the Webster's list of world languages, because there are fewer than a million people who speak it. Therefore it doesn't exist in the corporate world. When they build new roads through Wales, the government sells the contract to multi-national oil companies so they can open garages. The last thing on their mind is to make concessions to a local language. That's happening on a global scale to all small cultures. So, when we record a Welsh language album, it is a stand against globalisation, even if indirectly.” (Select editors 2000)

For Super Furry Animals, standing against globalization, and navigating their identity within the UK music industry, depends not just on language, and not just on musical style, but on the shifting semiotic bundling of both, which creates these multilayered meanings.

3.5.2 Gorky's Zygotic Mynci

The next artists in the data are Gorky's Zygotic Mynci, formed in Camarthen in 1991 and active in various forms until disbanding officially in 2006. Gorky's Zygotic Mynci got their start on Ankst, and released three albums on the Welsh label before signing to international label Fontana in 1996. Like Super Furry Animals, Gorky's Zygotic Mynci also code-switch across their albums; their first three releases on Ankst (1992's *Patio*, 1994's *Tatay*, and 1995's *Bwyd Time*) as well as their Fontana debut (1997's *Barafundle*) all feature both Welsh and English songs. This analysis, however, will focus on their intra-song code-switching, in which they switch between English and Welsh within the same song. Using shifting semiotic bundles of language, musical style, lyrical content, and video signifiers, Gorky's Zygotic Mynci evoke two complimentary identities within their songs: a Welsh-speaking identity which is psychedelic, playful, and modern, and an English-speaking identity which is nostalgic, innocent, wistful, and ultimately ironic.

These two shifting semiotic bundles can be seen clearly in two of their songs: *Mae Merched yn Neud Gwallt eu Gilydd*, their first (1994) single, and *Patio Song*, a 1996 single released ahead of 1997's *Barafundle* which peaked at No. 41 in the UK (Roberts 2006).

The first of these songs, *Mae Merched yn Neud Gwallt eu Gilydd*, is presented in schematic form of its music video – showing semiotic bundles of language, music, and visual signs – below, in Table 3.5¹:

1 All lyric translations are my own

Table 3.5: Merched yn Neud Gwallt eu Gilydd

Lyrics	Semiotic Bundle
<p>Intro: [English school rhyme]</p>	<p>Intro: <i>Music:</i> School choir with piano <i>Language:</i> English language Nasal voice quality (nerdiness) <i>Lyrical content:</i> nostalgia, irony <i>Video content:</i> English schoolboy uniforms, Cricket bat</p>
<p>Section 1: Wel mae merched yn neud gwallt eu gilydd trwy'r nos <i>Well girls are doing each others' hair through the night</i></p> <p>Yn clywed y gan ond yn chwarae 'mlaen <i>Hearing the song just playing on</i></p> <p>Mae merched yn neud gwallt eu gilydd trwy'r nos <i>Girls are doing each others' hair through the night</i></p> <p>Dy croen fel y lloer 'neud fi teimlo'n oer <i>Your skin like the moon makes me feel cold</i></p>	<p>Section 1: <i>Music:</i> Psychedelic Distorted guitar Fast tempo Driving drums (tom/snare) <i>Language:</i> Welsh language Modal (non-nasal) voice quality <i>Lyrical content:</i> Surreal, abstract <i>Video content:</i> Spinning camera, jumping around</p>
<p>Section 2: (There's no need to worry! Why's that Stevie?)</p> <p>'Cos we ain't got school in the morning baby no, no, no, no</p> <p>Ain't got school in the morning baby no, no, no, no</p> <p>Ain't got school in the morning</p> <p>Well you can try, try, try</p> <p>Baby cry, cry, cry</p> <p>But what you'll never know</p>	<p>Section 2: <i>Music:</i> Britpop Harpsichord Clean guitar Slower tempo Pop drums (hi-hat/snare) <i>Language:</i> English language Nasal voice quality (nerdiness) <i>Lyrical content:</i> Wistful, nostalgic, ironic <i>Video content:</i> English schoolboy uniforms, Beatles-style body movements, funny faces, knowing glances at camera, tongue-in-cheek</p>

The video for *Mae Merched yn Neud Gwallt eu Gilydd* opens with an introduction in the English-language bundle, with a school choir and piano playing an English school rhyme, sung with a nasal voice quality – an index of nerdiness. Notably, during this section, the band members are dressed as English schoolboys, carrying a cricket bat – indexing a distinctly English sport, as opposed to the traditionally Welsh sport of rugby – making funny faces, and picking their noses, indicating that this identity is being presented ironically.

At the end of this section, a band member jumps in front of the camera, screams, and the song moves into its A section in the Welsh-language semiotic bundle. Here, the music changes to psychedelic rock, with a quick tempo, driving drum beat alternating between the tom and snare, and fuzzy, distorted guitar. The lyrics are all in Welsh, and are abstract and almost surreal, sung in a modal voice quality. In the video, the camera spins around quickly and constantly while focused on the lead singer lying in the grass, setting a disorienting, vertiginous scene.

Then, at the end of this section, the camera steadies and the song switches into a B section in the English-language semiotic bundle: after a spoken-word transition delivered in nasal English by the schoolboys from the introduction, the instrumentation changes to classic Britpop – harpsichord, clean guitar, and pop hi-hat/snare drumming – and the lyrics switch to English, with words and themes evoking schoolday nostalgia of *Village Green*-era Kinks or early Beatles. Notably, the video frame remains as ironic as in the introduction, with the band members making knowing glances at the camera, moving their bodies in exaggerated back-and-forth Beatles-style movements while playing their instruments, and making faces at each other. At the end of this section, the song switches back into the Welsh bundle, as the A section repeats and the band members thrash around laughing with their instruments.

A similar pattern of these two bundles can be seen in a second Gorky's Zygotic Mynci song, *Patio Song*, schematized in Table 3.6:

Table 3.6: *Patio Song*

Language	Semiotic Bundle
<p>Section 1: <i>Verse 1:</i> Well isn't it a lovely day Oh, I'm feeling all brand new Well isn't it a lovely day Oh, boating on Sunday with you</p> <p><i>Chorus:</i> And if you really want to kiss her Just go right up and tell her Oh, isn't it a lovely day for love</p> <p><i>Verse 2:</i> Well isn't it a lovely day Oh, my patio's on fire Well isn't it a lovely day? Oh no words or wisdoms from liars</p> <p><i>(Chorus)</i></p>	<p>Section 1: <i>Music:</i> Soft pop 6/8 ballad beat Clean, arpeggiated guitar Violin riff Soft rock drums (ride cymbal)</p> <p><i>Language:</i> English language <i>Lyrical content:</i> Nostalgic, innocent, ironic</p>
<p>Section 2: Mae'n bwrw glaw, so dal fy llaw <i>It's raining, so take my hand</i></p> <p>Ond mae'r gaeaf mor hir <i>But the winter's so long</i></p> <p>Mae'n cymryd gormod o tir <i>It takes too much from the land</i></p> <p>Dal fy llaw, mae'n bwrw glaw <i>Take my hand, it's raining</i></p> <p>Ond mae'r gaeaf mor hir <i>But the winter's so long</i></p> <p>Mae'n cymryd gormod o tir <i>It takes too much from the land</i></p>	<p>Section 2: <i>Music:</i> Power pop 4/4 rock beat Full chords replace arpeggios Electric guitar replaces violin riff Rock drums (hi-hat)</p> <p><i>Language:</i> Welsh language <i>Lyrical content:</i> Sombre, abstract</p>

Patio Song opens with English language singing over soft pop, with a 6/8 ballad beat played on the ride cymbal, clean, arpeggiated guitar, and a wistful violin riff playing in the background. The lyrics in the first verse evoke nostalgia, innocence, and even tweeness (“isn't it a lovely day / boating on Sunday with you”). At the chorus, horns join in the background of the instrumentation, calling to mind a brass band (an institution associated strongly with Englishness), and the lyrical content remains both innocent (“if you really want to kiss her / just go right up and tell her”) and twee (“isn't it a lovely day for love”). The verse then repeats, again in English, but with a disquieting lyrical change (“Well isn't it a lovely day / oh, my patio's on fire”) that indicates the innocence in this section is presented ironically.

At the end of the second chorus, instead of completing the line “isn't it a lovely day for love”, the song shifts into its second semantic bundling; the line pauses before “love”, and the lyrics code-switch into Welsh. Musically, the song undergoes a complete shift here as well, to power pop; the 6/8 soft pop ballad beat is turned into a 4/4 rock beat played on the hi-hat, full strummed guitar chords replace the arpeggios from the first section, and a distorted electric guitar takes over the riff played earlier on the violin. The lyrical content changes theme as well, moving from innocence and tweeness to become somber (“it's raining / so take my hand”) and abstract (“the winter's so long / it takes too much from the land”). The song continues with this bundling until its end.

In both *Patio Song* and *Mae Merched yn Neud Gwallt Eu Gilydd*, then, Gorky's Zygotic Mynchi use these two distinct semiotic bundlings of music and language to create a bilingual, bistylistic identity, aligning the Welsh language with psychedelic rock, playfulness,

abstractness, and their modern lives, and the English language with Britpop, ironic innocence, tweeness and nostalgia. The ironic frame of the English-language identity, shown through both the lyrical content and (in *Mae Merched yn Neud Gwallt Eu Gilydd*) video signifiers, lets Gorky's Zygotic Myncci 'play with' this English identity to enhance their Welshness by opposition; by showing what an 'English identity' looks like ironically, they emphasize the authenticity of the identity enacted by the Welsh-language semiotic bundle.

3.5.3 MC Mabon

Finally, the third artist in the data is Gruff Meredith or MC Mabon, formerly of the Welsh-language hip-hop group Tystion ('Witnesses' in Welsh). Tystion was formed in Cardiff in 1996, and self-released two cassettes (1995's *Dyma'r Dystiolaeth* and 1996's *Tystion vs Allfa Un*) and an album on CD (1997's *Rhaid i Rhywbeth Ddigwydd*) before signing with Ankstmusic in 1999 to release the album *Shrug Off Ya Complex*. Shortly after the release of *Shrug Off Ya Complex*, Meredith left the group to become the one-man band MC Mabon. Though he is from and still lives in Wales, MC Mabon travelled to Gaiman, Argentina, in the Welsh-speaking area of Patagonia known as *Y Wladfa*, to record his 2007 album *Jonez Williamz*. Like Super Furry Animals and Gorky's Zygotic Myncci, MC Mabon also uses code-switching and musical shifts to enact his identity, as can be seen especially in two songs from *Jonez Williamz: Lawr i Comodoro* and *Perros Locos*.

These two songs are important because they represent multimodal shifts in music and language with respect to the musical and linguistic content of the album as a whole. In terms of music, the majority of *Jonez Williamz* consists of relatively standard rock instrumentation:

prominent distorted electric guitar, bass, and drums. Four songs, however, feature additional instrumentation, including a charango (a small, Andean lute with a resonator traditionally fashioned from an armadillo) and siku (or *zampoña*, Andean pan pipes). In terms of language, the album is mostly sung and rapped in Welsh, but includes code-switches of Spanish lexemes and phonology in two songs:

Table 3.7: *Jonez Williamz*

	Song	Languages	Additional instrumentation
1.	Pethe Gwell	Welsh	
2.	Llund Bola	Welsh	
3.	Gloi Boi Heb Gar	Welsh	
4.	Lawr i Comodoro	Welsh & Spanish	Charango Siku (pan pipes)
5.	Be Di Be	Welsh	
6.	Perros Locos	Welsh & Spanish	Charango
7.	Gwynt A Glaw	Welsh	Charango Siku (pan pipes)
8.	O Ffrind	Welsh	
9.	Pwdin	Welsh	
10.	Dau Gam Ymlaen	Welsh	Charango Welsh pibgorn Bagpipes

The two songs in which these musical and linguistic shifts coincide – *Lawr i Comodoro* and *Perros Locos* – show how MC Mabon uses these semiotic bundles to enact his identity. Specifically, he uses Welsh-Spanish code-switching alongside shifts in musical signification to create an identity as a global Welsh speaker, at home in and knowledgeable about both Patagonia and Wales.

The first of these two songs, *Lawr i Comodoro* ('Down to Comodoro'), lyrically references the city of Comodoro Rivadavia, the largest city in the province of Chubut in which Gaiman and other important Welsh-speaking centers of Patagonia are also located:

(26) Excerpted lyrics from *Lawr i Comodoro*

Verse 1:

Dwi'n trio gweld fy nghysgod, ond dwi'm yn gwbod lle mae'r haul,
I'm trying to see my shadow, but I don't know where the sun is

Ma'n anodd dweud lle mae y gorwel, ond mae o fel petae'n nesau
It's hard to say where the horizon is, but it seems like it's near

Chorus:

Dwi yn mynd drwy'r storm, meddwl mynd lawr i Comodoro
I'm going through the storm, thinking of going down to Comodoro

Dw i angen mynd i rwle, angen symud symud symud fy nhraed!
I need to go somewhere, need to move move move my feet!

In the chorus, MC Mabon sings “Dwi yn mynd drwy'r storm, meddwl mynd lawr i Comodoro” (‘I’m going through the storm, thinking of going down to Comodoro’). Though this initially looks to be entirely in Welsh, the use of ‘Comodoro’ here actually represents a subtle, single-word code-switch into Spanish. While it would normally be ambiguous, a specific feature of Welsh morphosyntax – initial consonant mutation – shows this to be a switch into Spanish phonology.

As described in section 3.1, initial consonant mutation in Welsh causes the first consonant of words to change following certain particles, including the *i* ‘to’ of *Lawr i Comodoro*. This *i* ‘to’ in Welsh triggers a soft mutation, which would normally change an orthographic <c> (IPA: /k/) into <g> (IPA: /g/); “down to California” in Welsh would be *lawr i Galifornia*, for example. Likewise, if MC Mabon were to sing the lyric in Welsh, we would expect to hear “Lawr i [g]omodoro” – the fact that he says “[k]omodoro” instead

represents a switch into Spanish phonology, indexing his familiarity with the city, the Spanish language, and with the linguistic geography of Welsh Patagonia.

Importantly, this Welsh-Spanish code-switching is also accompanied by a shift in musical signifiers; in *Lawr i Comodoro*, both the siku and a charango (neither of which were present in the previous songs) play prominently throughout – the charango replacing the role of the rhythm guitar and the siku playing behind and inbetween vocal lines in the verses – and serve as musical indexes of the Patagonian recording context. The linguistic code-switching and shift in instrumentation work together as a semiotic bundle to create MC Mabon's identity as a Welsh-speaker at home in both Wales and Patagonia.

The second of these two songs, *Perros Locos* ('Crazy Dogs'), is a hybrid rap-psychedelic rock song in which both the title and the prominent lyrical theme of its chorus represent code-switching into Spanish:

(27) Excerpted lyrics from *Perros Locos*

Chorus:

Perros locos yn bob man, perros locos yn fy nghan
Perros locos everywhere, perros locos in my song

Perros locos yn fy mhen, perros locos ar fy nghefn
Perros locos in my head, perros locos on my back

Perros locos yn cyfarth, perros locos yn y bath,
Perros locos barking, perros locos on the path

Perros locos ryw fath o gwn, stopiwch neud eich fflupun swm!
Perros locos some kind of dogs, stop making your flippin' noise!

The recurring chant of “perros locos” in the chorus is an example of what has been called a *mot juste* switch – often single words or short phrases, these code-switches occur when a

speaker switches because the L2 contains “what is perceived to be the best way of saying a thing” (Poplack 1988:228).

Of course, Welsh has various ways of expressing the concept of 'crazy dogs', but using the Spanish instead allows MC Mabon to specifically index the locally salient phenomenon of noisy, roaming dogs in Welsh Patagonia: “perros locos”. In Gaiman – where *Jonez Williamz* was recorded – as well as other towns in the region, these free-roaming dogs are an omnipresent feature of daily life, and the noise they make as they socialize throughout the day is an unmistakable part of the local soundscape. The dogs “yn cyfarth” ('barking'), “yn y bath” ('on the path'), “yn bob man” ('everywhere') and even “yn fy nghan” ('in my song' – likely a reference to their interrupting the recording process) aren't crazy dogs in general, but the local “perros locos” of Gaiman, and code-switching allows MC Mabon to “say it better” (Zentella 1997:101).

As with *Lawr i Comodoro*, the code-switching in *Perros Locos* is importantly accompanied by a shift in musical signification as well; the charango which was absent from the previous track is brought back for *Perros Locos*, and is featured prominently as the sole instrumentation behind the rapped introduction and continuing throughout as the dominant rhythm instrument. The charango serves as a musical index of the recording context in Welsh Patagonia, and this shift in musical instrumentation works with the linguistic shifts into Spanish to actively create the identity of MC Mabon as an artist authentically tied to both Welsh and Patagonian contexts.

Finally, in addition to the shifting musical and linguistic signs in the songs themselves, it is worth noting that *Jonez Williamz* features trilingual liner notes – a tangible component of the cohesive act of musicking of the album – which list recording credits in

Welsh, English, and Spanish, along with unique acknowledgements in each language: a full page in Welsh, half a page in Spanish, and a short paragraph in English. Notably, the “perros locos” are referenced as such in both the Spanish:

- (28) “Gracias a los perros locos sueltos por tenernos a los corridas y por interrumpirnos el sueño!”²

'Thanks to the loose perros locos for keeping us on the run and interrupting our sleep!'

and the Welsh:

- (29) “Diolch i'r *perros locos* am gadw ni ar flaenau ein traed ac am y diffyg cwsg–mwncis (cŵn) bach drwg.”

'Thanks to the perros locos for keeping us on the run and for the lack of sleep – bad little monkeys (dogs).'

reinforcing the specific local cultural connotations of code-switching into Spanish in the song rather than using the Welsh equivalent.

The addition of English in the liner notes – brief though they may be – adds further meaning to the identity created by the music and language, casting MC Mabon as a global Welsh citizen-musician, comfortable in Welsh, Spanish, or English, and by extension one with audiences in Welsh-, Spanish-, and English-speaking countries.

Conclusions

This chapter has presented a new methodology for studying music and language together in song, and shows that for all three Welsh rock artists in the data – Super Furry Animals, Gorky's Zygotic Myncci, and MC Mabon – music and language work together as part of semiotic bundles to create identity. For each artist, the shifts between these semiotic

² Orthography is left as it appears in the printed liner notes; translations into English are my own.

bundles – as cotemporal switches between both linguistic and musical elements – work in different ways, to construct three very different identities: a Welsh-language band navigating success and resisting globalization in an English-language musical mainstream, a bilingual, bistylistic band which uses an ironic English identity to emphasize their Welshness, and a global Welsh citizen at home in both Wales, Patagonia, and beyond.

Most importantly, none of these identities are reducible to either musical or linguistic performance alone; rather, it is the combination of music and language, working together in shifting semiotic bundles that creates the relevant social meaning and enacts these diverse identities. As the first study of code-switching in song which examines the musical elements together with lyrics in a holistic sense, these results show the importance of integrating musical data into future sociocultural linguistic studies of song.

Chapter 4: Virtual Voices: Using UTAUloid for Language Revitalization

This chapter will highlight the potential of music in language revitalization efforts, focusing on one concrete method in which linguists and speakers (or learners) can produce a tool for musical creation through the development and use of UTAUloids, anthropomorphized 'singing synthesizers'. The chapter will present the methodology through a case-study in creating a Cherokee UTAUloid, and begins with a brief introduction to Cherokee in section 4.1. Section 4.2 then provides an overview of different ways that music has been used to help facilitate language revitalization efforts in various revival contexts. Sections 4.3 and 4.4 introduce the concept of Vocaloid and UTAUloid, respectively, and section 4.5 details the step-by-step method for creating an UTAUloid in Cherokee. Finally, section 4.6 discusses the potential for UTAUloid in language revival work, and specific features that make it particularly well-suited for language revitalization contexts.

4.1 Cherokee

Cherokee (*GWY Tsalagi*) is an Iroquoian language, and the sole member of the Southern Iroquoian branch, with the related Northern Iroquoian branch including languages such as Mohawk, Wendat/Wyandot, Seneca, Tuscarora, and Cayuga (Mithun 1999). As of the 2010 census, Cherokee counted 12,300 speakers, including approximately 10,000 in and around the Cherokee Nation in Oklahoma, approximately 1,000 in North Carolina (where the Eastern Band of Cherokee Indians are located), and an undetermined number of members of

the United Keetoowah Band of Oklahoma and Arkansas (Golla 2007). The present-day geographical distribution of Cherokee speakers is a result of the US government's 1838 forced removal of the Cherokee people from their original territory in the US Southeast to eastern Oklahoma, commonly known as the Trail of Tears. The majority of surviving Cherokee settled in Oklahoma, while groups who escaped the initial removal and took refuge in the Appalachian mountains eventually settled in western North Carolina, the territory of today's Eastern Band of Cherokee Indians.

Typologically, Cherokee is a polysynthetic language, and distinguishes itself from its fellow Iroquoian languages as the only variety in the family with lexical tone. Cherokee has six tones – low, high, high-low, low-high, lowfall, and superhigh – demonstrated in the following examples from Uchihara (2016:2):

(30)	Low:	ama	'water'
	High:	á:ma	'salt'
	High-low:	kiyû:ga	'chipmunk'
	Low-high:	kawǒ:nu	'duck'
	Lowfall:	nṽ:ya	'rock'
	Superhigh:	akũ:gí:sdi	'dipper'

Culturally, the Cherokee language is strongly associated with its syllabic orthography, developed by ᏍᏏᏉᏍᏏ (also known as Sequoyah or George Guest) in the 1820s for use in printing and literacy development. The syllabary consists of 85 symbols, each of which represents a CV or V syllable of Cherokee; the sole exception is the glyph <Ꮝ>, which represents the single segment /s/, commonly used to form initial consonant clusters. The syllabary is shown with romanized orthographic equivalents¹ in Table 4.1:

1 The symbol <v> in romanized Cherokee represents a nasalized schwa /ə̃/

Table 4.1: Cherokee Syllabary

D 'a'		R 'e'	T 'i'	Ꭰ 'o'	Ꭱ 'u'	i 'v'
Ꭶ 'ga'	Ꭷ 'ka'	Ꭸ 'ge'	Ꭹ 'gi'	Ꭺ 'go'	Ꭻ 'gu'	Ꭼ 'gv'
Ꭽ 'ha'		Ꭾ 'he'	Ꭿ 'hi'	Ꮀ 'ho'	Ꮁ 'hu'	Ꮂ 'hv'
Ꮃ 'la'		Ꮄ 'le'	Ꮅ 'li'	Ꮆ 'lo'	Ꮇ 'lu'	Ꮈ 'lv'
Ꮉ 'ma'		Ꮊ 'me'	Ꮋ 'mi'	Ꮌ 'mo'	Ꮍ 'mu'	
Ꮎ 'na'	Ꮏ 'hna'	Ꮐ 'nah'	Ꮑ 'ne'	Ꮒ 'ni'	Ꮓ 'nu'	Ꮔ 'nv'
Ꮖ 'qua'		Ꮗ 'que'	Ꮘ 'qui'	Ꮙ 'quo'	Ꮚ 'quu'	Ꮛ 'quv'
Ꮝ 's'	Ꮞ 'sa'	Ꮟ 'se'	Ꮠ 'si'	Ꮡ 'so'	Ꮢ 'su'	Ꮣ 'sv'
Ꮥ 'da'	Ꮦ 'ta'	Ꮧ 'de'	Ꮨ 'te'	Ꮩ 'di'	Ꮪ 'ti'	Ꮫ 'do'
Ꮬ 'dla'	Ꮭ 'tla'	Ꮮ 'tle'	Ꮯ 'tli'	Ꮰ 'tlo'	Ꮱ 'tlu'	Ꮲ 'tlv'
Ꮳ 'tsa'		Ꮴ 'tse'	Ꮵ 'tsi'	Ꮶ 'tso'	Ꮷ 'tsu'	Ꮸ 'tsv'
Ꮹ 'wa'		Ꮺ 'we'	Ꮻ 'wi'	Ꮼ 'wo'	Ꮽ 'wu'	Ꮾ 'wv'
Ꮿ 'ya'		Ᏸ 'ye'	Ᏹ 'yi'	Ᏺ 'yo'	Ᏻ 'yu'	Ᏼ 'yv'

The syllabary was quickly adopted by Cherokee speakers, and remains widely used among speakers and learners today; it has also been incorporated into Unicode since 1999 and is available by default on Apple's Mac OS and iOS and Microsoft's Windows operating systems.

In terms of vitality, Cherokee is considered 'definitely endangered' by UNESCO (Moseley 2010), and though usage by speakers under 40 is low, with most children no longer learning it as a home language (Cherokee Nation 2003, cited in Uchihara 2016), Cherokee people and the Cherokee Nation are committed to revitalizing the language. Revitalization efforts for Cherokee are multifaceted and wide-reaching, including the popular **ᏍᏆᏳᏍᏏᏗᏚᏗ** (*Tsalagi Tsunadeloquasdi*) immersion schooling from pre-school through sixth grade, master/apprentice programs, and language classes both at the University of Oklahoma and Northeastern Oklahoma University in Tahlequah. Media also plays an important role, with radio broadcasts from the Cherokee Nation and the monthly bilingual Cherokee Phoenix

newspaper providing news and features in the language. The Cherokee National Youth Choir, founded in 2000 with the intention of helping keep young learners involved with the language, also performs exclusively in Cherokee (Cherokee Nation 2015).

One particularly important aspect of Cherokee language revitalization is that there has been a focus on reaching and drawing in heritage speakers and tribal members who are physically removed from the Cherokee Nation and its speech community. The Cherokee Nation offers several online language classes (at three skill levels) taught by native speaker Ed Fields throughout the year, for instance, as well as the option for remote learners to call in to teleconference with native speakers. In addition, the Cherokee Nation organizes annual outreach events to more than 20 'At-Large' communities with significant populations of tribal members, from the Puget Sound and many areas of California to Central Florida. Along with voter registration, information on tribal health care and other forms of cultural education, these annual events include Cherokee language resources, materials, and taster classes intended to garner interest and participation in language preservation from at-large members as well.

4.2 Music in language revitalization

This section will provide an overview of some of the different ways music has been used to aid in language revitalization. While music plays many different roles in language revival efforts, this brief sketch will focus on three specific ways in which music can make a difference: attracting learners and retaining speakers, creating opportunities for speech community, and supporting language learning.

Attracting learners and engaging interest in the language movement among speakers is an important contribution music can make in revival movements. As seen in chapter 3, this has been a particularly important aspect of Welsh popular music, and Griffiths & Hill (2005:219) trace one of Welsh pop music's major functions as the ability “to engage the younger audience with the language movement”. Hill (2007:60) similarly shows that Welsh-language music simultaneously acts as a way for young people to continually (re-)modernize the language, and as a cornerstone of pop culture that helps make and keep Welsh relevant for their generation.

Music also helps attract learners to revitalizing languages, by serving as many potential speakers' first introduction to the language. In the town of Gaiman in Welsh Patagonia, for instance, the primary music school is the Ysgol Gerdd Gaiman ('Gaiman Music School'), whose choir performs a Welsh-language repertoire. Students who join with an interest in music then gain exposure to the Welsh language, with many going on to study the language formally from there. The Cherokee Nation's Cherokee National Youth Choir described above follows a similar model, with an all-Cherokee-language repertoire designed to both introduce young learners to the language and keep immersion school students engaged with the language movement (Cherokee Nation 2015). Winick (1995) explores a more formalized example of this concept discussed in the Breton *bagadoù*: youth pipe bands in which young Bretons are given training in every aspect of their culture, with a central focus on the Breton language. A founding member of the movement has said that the goal is “not just to make Breton music but, especially, to make pipers into true Bretons... [A piper] must train himself to know as well as possible the Breton language” (Winick 1995:344).

Of course, attracting learners is not a phenomenon limited to traditionally participatory acts of musicking, such as performing in choirs and bands, and can apply equally to audiences listening to music in revitalizing languages. MacKinnon (2005:226) notes that the music produced during the Cornish-language folk revival of the 1970s introduced the Cornish language “to a wider and more popular audience ... and was an important factor in incentivizing more people to learn it”. Johnson (2011:115) describes how Jèrriais language activists on Jersey have used “song as a tool that can help popularize the language”, and musical performances “as one way of continuing to publicly promote an endangered language”, by drawing on Jèrriais translations of already popular tunes to engage their (predominately non-speaker) audiences with the language.

A related way in which music can be instrumental in language revitalization is in creating opportunities for speech community. In many minoritized language situations, a prevailing issue is that shift has resulted in another language (or set of languages) being the medium of everyday communication; even with a sizable number of fluent speakers in the revitalizing language, this can make it difficult for speakers to find natural domains of use for the language in daily public life (Fishman 1991; Hinton 2001). Music can help provide this space – both physical and conceptual – for speakers to come together as a speech community. MacKinnon (2005:249), for instance, notes how Cornish concerts and music festivals have been important as “opportunities for Cornish speakers and learners to come together and use the language”. Similar results have been observed from the Eisteddfodau music festivals in Welsh Patagonia, which – even as they have incorporated Spanish-language and bilingual

music performances – remain a primary locus for Welsh-speaking and -learning community members to interact naturally in the language (Williams 1991; Birt 2005).

In addition to physical gatherings of speech community, music can also play a part in linking speech community through distributed media, such as radio and podcasts. *Radyo an Gernewegva* (literally 'radio of the Cornish-language area'), for instance, is a Cornish-language, podcast-format radio show produced weekly since 2007, with the goals of providing Cornish immersion, showcasing Cornish-language music, culture, and talent, and giving Cornish musicians exposure (Matthew Clarke, p.c. Feb. 2012). Its listeners are often language learners, and an active, online community forum encourages participation and engagement with the music in Cornish, even when participants are geographically isolated from other Cornish speakers.

Importantly, while *Radyo an Gernewegva* plays music mostly in Cornish and other Celtic languages, music doesn't necessarily have to be in the revitalizing language in order to help foster a speech community for revival. Cotter (2001) shows how the Dublin-based radio station Raidió na Life – which broadcasts in Irish and operates under an all-Irish policy for staff on- and off-air – has helped expand Irish into important new domains among urban young people by playing mostly English-language popular music, but introducing and discussing the music in Irish. In this case, the perceived modernity of the English-language musical content (especially in relation to the more traditional Irish music on Irish-language state broadcaster Raidió na Gaeltachta) is interpreted by listeners as proof that “the language can adjust to modern life – that one can talk about anything through the medium of Irish” (Cotter 2001:308).

Finally, perhaps one of the most immediately obvious ways in which music can contribute to language revitalization efforts is in supporting language learning. Of course, this is not restricted to revitalizing languages, and much of the research in this area – predominately from education studies – is based on commonly taught languages; but the central place of language teaching and learning in revitalization efforts makes this especially relevant for language revival.

A large portion of previous research on music in language teaching focuses on the use of songs in classroom pedagogy. Jolly (1975), for instance, is a case study in the use of songs as part of Japanese conversation classes taught by the author,. She found that songs were particularly helpful (and rated as such by students) for teaching natural pronunciation, new grammatical structures, specialized vocabulary and idioms, and cultural context. Abrate (1983) explores the use of French popular songs in French language classes, finding that music helped capture students' attention and introduce mnemonic devices, as well as introducing colloquial uses of language in context. Schmidt (2003) gives specific recommendations for integrating German rap music into language curricula, arguing that the genre is helpful for introducing students to vocabulary domains and situations not commonly found in textbooks, such as the xenophobia and racialized violence faced by non-white German speakers in modern Germany.

Of course, many revitalizing languages are not taught in classroom settings. Music can help support language learning in these situations as well, especially in terms of indigenous methodologies. Antoine (2015:17) is a study of Lakota song texts with a focus on building language and cultural pedagogy, which finds that songs can teach “language and culture from the Native perspective, reinforce culturally appropriate ways of behavior, and

teach the tribe's social structure as well as history and spirituality”. Tuttle and Lundström (2015:38) presents a case study of a young composer learning potlatch singing in Interior Athabaskan languages of Alaska, and shows how “gaining proficiency in song, through indigenous channels, can further proficiency in language”.

Each of these three areas – attracting and engaging learners and speakers, fostering speech communities, and supporting language learning – are important ways in which music can aid in language revitalization efforts. Notably however, the necessary labor components which enable these effects – composing, producing, and performing music, organizing concerts and festivals – are not endeavors that linguists are trained specifically to help with. To that end, the primary goal of this chapter is to introduce one concrete way in which linguists can use their specialized skills to support musical efforts in language revival, by helping to create vocal music production tools known as UTAUloids.

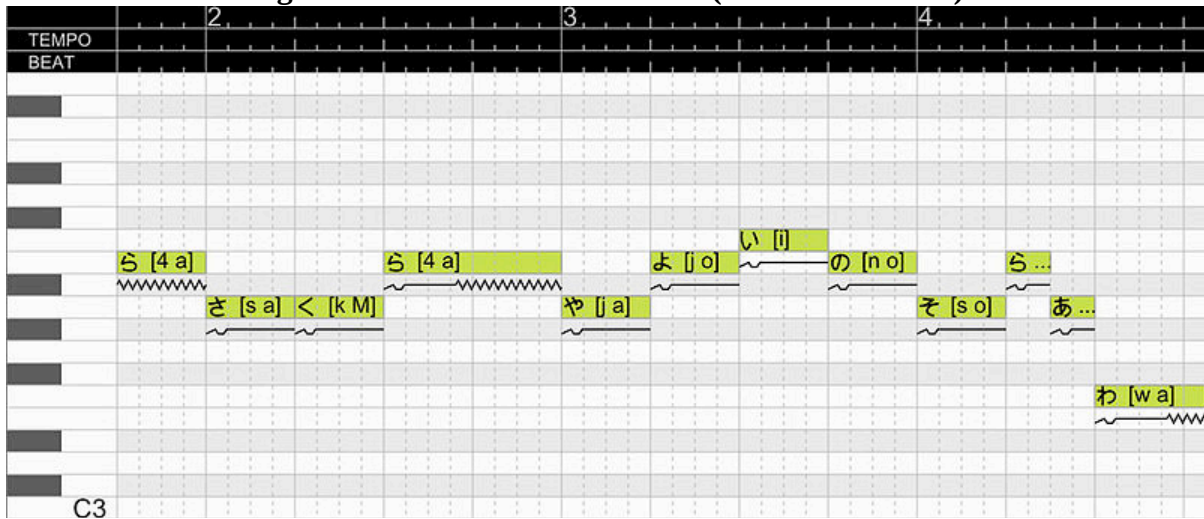
4.3 Vocaloid

In order to understand UTAUloid, it is first necessary to introduce its predecessor and inspiration: Vocaloid. Perhaps best described as anthropomorphized singing synthesizers, Vocaloids were developed as a joint project by Yamaha and the Music Technology Group at Universitari Pompeu Fabra, Barcelona in 2004 (Kenmochi and Oshita 2007). At the most basic level, a Vocaloid is a piece of computer software that uses a library of human speech samples (called a 'voicebank') and combines them with musical information in order to output digitally 'sung' melodies. Voicebanks are created by recording a voice donor (usually a singer or voice actor/actress) singing all possible syllables (or morae) in a language at a

constant pitch with a sustained syllabic (or moraic) nucleus, at several different pitches, so that each individual syllable sample can be arranged and manipulated by the Vocaloid synthesizer to approximate a singing voice. The first Vocaloids were developed to sing in English and Japanese, but subsequent releases have since expanded to include languages like Mandarin, Korean, and Spanish.

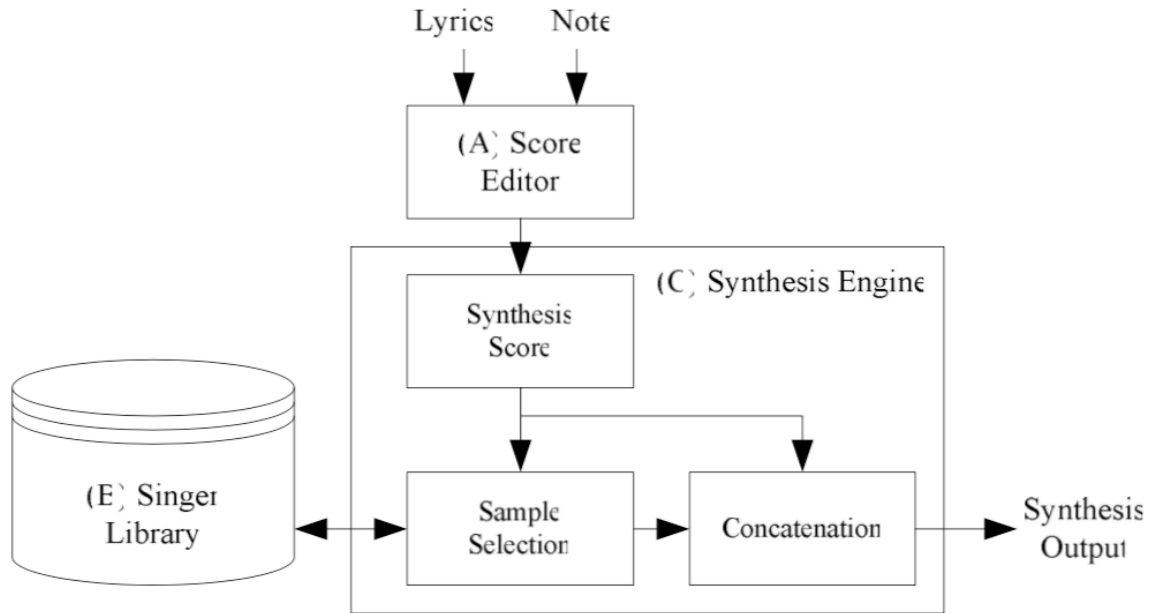
Users of the Vocaloid software input both the notes and syllables that they would like sung in the Vocaloid Editor, using a piano roll-style score editing interface shown in Figure 4.1 (through an excerpt from the Japanese folk song *Sakura, Sakura*):

Figure 4.1: Vocaloid Score Editor (Clusternote 2014)



The Vocaloid software then takes the resulting score as input into its synthesis engine, which chooses appropriate samples from its voicebank (i.e. the linguistic syllables to be sung, at the nearest pitch to the target note) and concatenates and alters these samples based on musical information in the score (including pitch, dynamics, timbre, attack, decay, reverb, and vibrato) to produce the synthesized output: a sung melody. This synthesis engine is represented graphically in Figure 4.2, reproduced from Kenmochi and Oshita (2007):

Figure 4.2: Vocaloid system diagram (Kenmochi and Oshita 2007)



This is the basic synthesis process behind Vocaloid, but another main component of the Vocaloid concept is that the individual packages are anthropomorphized; they are not just 'singing synthesizers', in other words, but 'synthesized singers'. There have been dozens of different Vocaloids introduced since the technology's debut in 2004 – companies license the core technology from Yamaha and then release their own Vocaloid packages – but by far the most popular has been Hatsune Miku, a Vocaloid designed by Crypton Future Media in Japan.

Hatsune Miku (初音ミク, meaning 'first sound of the future') made her debut in 2007, and is stylized as a perennially 16-year old 'virtual idol', with long turquoise twintails and design features on her costume which recall the interface of her software components. Her dark grey and turquoise clothing is modeled after the colours of the Vocaloid editing interface, for instance, and her armbands feature panels based on various Yamaha keyboard models. Since her debut, she has proved enormously successful; over 100,000 songs have

been created using her voicebank, and she counts over 170,000 uploaded YouTube videos, dozens of which are in the Vocaloid “Hall of Legend” for having over 1,000,000 views (Crypton Future Media; Vocaloid Wikia contributors). She has starred in video games and car commercials, performed (via hologram) as an opener for Lady Gaga on a US tour and in her own sold-out concerts around the world, and had her first chart-topping album in Japan in 2010 (Oricon 2010). Her appeal among Vocaloid fans and her rise to become something of an international icon illustrates how the creative culture which has arisen around Vocaloids makes them much more than just instruments for the producers, musicians, and fans who use them.

One of the key pieces of Vocaloid's appeal is the fact that Vocaloid encourages iterative creation by multiple users over the internet. The specific combination of format (easily exportable so that users can download and edit notes, lyrics, and other parameters on existing tracks) and licensing (which varies by product, but in general allows for the free personal and commercial use of the Vocaloid's voice and likeness in music videos, art, and other adaptations) has made Vocaloid especially conducive to what has been called “massive collaboration” (De Sousa 2014).

This 'massive collaboration' – initially facilitated through the Japanese video-sharing site ニコニコ動画/Nico Nico Douga, and now additionally through YouTube and other content-sharing services – means that users can interact with and iterate on Vocaloid content in a myriad of ways (cf. Kenmochi 2010:3). One person might upload an original melody; a second person could then download it, add drum and bass tracks behind it, and re-upload it, perhaps with a video to accompany the music. A third person could remix the music, change the lyrics, and then re-upload the result. A fourth person could record themselves singing the

tune over the instrumental backing tracks, and a fifth person could create a video compiling and ranking different interpretations of the song.

This phenomenon is a central component of Vocaloid culture, and one result is that the boundary between 'fan' and 'creator' in Vocaloid is substantially blurred, if not altogether erased. Rather than an audience passively consuming musical texts, Vocaloid users are “a distributed group of fan-producers” (Condry 2011), who “advance from video to video, appropriate new materials, and make new meanings in their reproductions” (Lam 2016:1109). Another result of massive collaboration is that Vocaloid musicking is often accomplished by many different people working together asynchronously, rather than collaborating in real-time (or space) – a “self-generating network of interactivity in a purely online environment” (Lam 2016:1109). One popular Hatsune Miku song, *Weekender Girl*, for instance – with over 3 million YouTube views – is the result of an internet collaboration between four different producers – *kz* (lyrics and vocals), *Hachiouji-P* (music), *TSNK* (costume design), and *wakamuraP* (choreography and video) – and this is far from atypical. Vocaloid has become “a catalyst for collective, grassroots, and multidisciplinary creation” (De Sousa 2014) spanning music, lyrics, art, animation, costume design, choreography, writing, and more.

The potential for 'massive collaboration' is a large part of Vocaloid's appeal to its users and fans, along with the inherent creative control it provides; Vocaloid producers can change and control almost every part of a performance, from (virtual) settings and costumes to vocal delivery, intonation, and microtiming. The only limitation to what can be customized in a Vocaloid performance comes from the voicebank itself – the voice donor's initial recordings. This is where UTAUloid comes into play.

4.4 UTAUloid

UTAUloid² (From 歌 う *utau* meaning 'to sing' in Japanese), developed by Ameya/Ayame in 2008, is a freeware implementation of the Vocaloid concept. Like Vocaloid, UTAUloid uses a piano roll-style interface and allows users to key in scores with notes and lyrics, which it in turn relays to a synthesis engine to produce synthesized singing output. Designed as an alternative to relatively expensive Vocaloid software, the main difference between Vocaloid and UTAUloid is that while Vocaloid products come with a pre-recorded, non-modifiable voicebank, UTAUloid instead allows users to record and use their own voicebanks, which then act as a sample library for the synthesis. Importantly, this means that not only can UTAUloids sing in any voice, they can also sing in any language.

The UTAUloid community was quick to take advantage of this fact. In addition to UTAUloids who sing in Japanese and English, users quickly created UTAUloids singing in Spanish, Mandarin, and Korean, but also languages without any Vocaloid representation, including Croatian, Catalan, Tagalog, Indonesian, Basque, Irish, Latin, and even Esperanto. As of May 2018, the UTAU Wikia (a central source for information in the UTAUloid community) lists over 90 actively updated UTAUloids with voicebanks in languages other than Japanese or English, all created by hobbyist UTAUloid fan-producers.

This is perhaps all the more impressive because creating an UTAUloid requires a significant amount of specialized linguistic knowledge about a given language, and this is reflected in the linguistic proficiency of the wider community. UTAUloid fans on the UTAU Wikia, UTAU Wiki, and UtaForum.net websites create linguistic tutorials, curate threads on relevant phonetic and phonological issues for specific languages, recommend scholarly

² Formally, the software framework itself is known as 'UTAU', and the derived synthesizers are known as 'UTAUloids', but 'UTAUloid' is used here as a convenient term (also used by the community) for the combined concept, on analogy with Vocaloid.

linguistic work as references, and synthesize academic articles into advice for creators to use when recording their 'reclists' of potential phonemic combinations.

Along with this impressive linguistic knowledge, it is notable that the linguistic plurality of UTAUloids available includes a number of creations which sing in minoritized and marginalized languages. As one example, we can turn to Sachi Eika (詠歌サチ), the first Irish-language UTAUloid (Launders 2009). Created in Ireland by Jade Launders (also known as *Jadii*) in 2009, Sachi Eika is a multilingual UTAUloid with support for Irish, English, Japanese, and other languages. Figure 4.3 shows Sachi Eika's design, in both the key art and a 3D model for use in music videos:

Figure 4.3: Sachi Eika key art and model (Launders 2009)

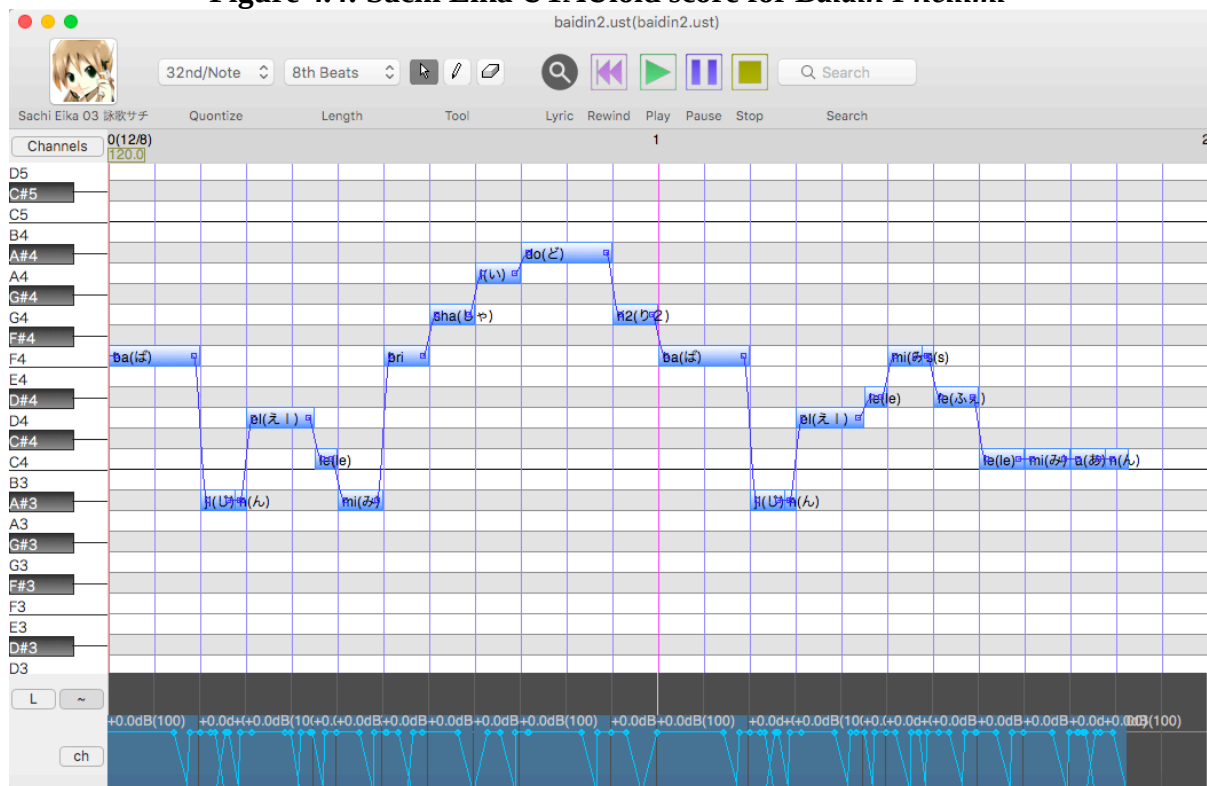


As with Vocaloids, UTAUloids like Sachi Eika exist within the same framework of massive collaboration and collective creation (Le 2014); once made available online, UTAUloid fans were able to write and produce music with Sachi Eika, re-record existing Vocaloid and

UTAUloid songs with her voice, download and modify others' Sachi Eika songs, and create art, videos, and other examples of “Nth fanfiction” (Kenmochi 2010) featuring the character. As of May 2018, YouTube hosts over 143 videos tagged for Sachi Eika, while Japanese video site ニコニコ動画/Nico Nico Douga lists 75; the fan-art community website DeviantArt lists 111 works of the character, and similar Japanese site Pixiv hosts 42; Sachi Eika also appeared as a character in an Irish manga magazine in 2010 (UTAU Wikia contributors).

Additionally, while the majority of these works were created in the years directly following Sachi Eika's debut, the nature of UTAUloid means that in 2018, it is possible to load Sachi Eika's voicebank onto any computer and have her sing, within a matter of minutes, an Irish-language song, such as *Báidín Fheilimí*, shown in Figure 4.4 below:

Figure 4.4: Sachi Eika UTAUloid score for *Báidín Fheilimí*



It is in this vein that UTAUloids can be used as literal and figurative instruments for language revitalization, and the remainder of this chapter provides a step-by-step guide for producing an UTAUloid for revitalization, illustrated through the creation of a Cherokee UTAUloid as an example.

4.5 Method: building a Cherokee UTAUloid

This section will demonstrate the procedure for creating an UTAUloid, illustrating the process through the creation of a Cherokee UTAUloid. An UTAUloid can be broadly conceptualized into three parts: the synthesis engine, the sample library ('voicebank'), and the set of instructions (called 'tunings') unique to each UTAUloid that specify how the synthesis engine should interpret, blend, and concatenate individual samples into synthesized singing. The three main components of creating an UTAUloid, then, are to install the synthesis engine, to record a voicebank, and to tune those samples for synthesis.

The synthesis engine comes in two different pieces of software, depending on the operating system used: UTAU for Windows³, and UTAU-Synth for Mac OS⁴. Voicebanks and files are fully cross-compatible, and while the examples in this chapter will use screenshots from UTAU-Synth, user interfaces for the two versions are largely the same. UTAU and UTAU-Synth both come with Japanese language interfaces by default, but users have created freely downloadable English (and other) translations patches for each⁵.

3 Available at <<http://utau2008.web.fc2.com/>>

4 Available at <<http://utau-synth.com/>>

5 The UTAU English translation patch for PC is available at <http://utau.wikia.com/wiki/UTAU_gui_Translation>; UTAU-Synth English translation patches for Mac OS are available at <<http://utaforum.net/threads/utau-synth-english-translation-project.1432/>>, <<http://utaforum.net/threads/new-utau-synth-translation-project.11202/>> and

4.5.1 Recording a voicebank

Recording a voicebank of samples from the UTAUloid's voice donor is a process that both involves a certain amount of linguistic knowledge about the target UTAUloid language, and will feel familiar to linguists, as it closely resembles collecting wordlist data for phonetics experiments.

The first step is to assemble the list of sounds to be recorded, into what the UTAUloid community calls a 'reclist'. The reclist should consist of all possible combinations of phonemes needed to reproduce any syllable (or mora) in the target language. This requires a linguistic understanding of the phonetic inventory, phonotactics, and syllabic (or moraic) structure of the language, as well as an understanding of how UTAUloid works in order to know exactly what phoneme combinations need to be recorded.

The phonetic inventory of Cherokee (Pulte and Feeling 1975, Scancarelli 2005; Montgomery-Anderson 2008; Uchihara 2016) is presented in Tables 4.2 and 4.3 below, based on Montgomery-Anderson (2008) and Uchihara (2016):

Table 4.2: Cherokee consonant inventory

		BILABIAL	ALVEOLAR	PALATAL	VELAR	LABIO-VELAR	GLOTTAL
PLOSIVES			t		k	k ^w	ʔ
AFFRICATES	CENTRAL		tʃ				
	LATERAL		tɬ				
FRICATIVES			s				h
NASALS		m	n				
APPROXIMANTS	CENTRAL			j		w	
	LATERAL		l				

<<https://dantedesigns.net/nib.html>>.

Table 4.3: Cherokee vowel inventory

	FRONT		CENTRAL		BACK	
HIGH	i	i:			u	u:
MID	e	e:	ẽ	ẽ:	o	o:
LOW					a	a:

Using this inventory, the basic syllable structure (before various morphophonological processes) is as follows (adapted from Uchihara 2016:122):

Table 4.4: Cherokee syllable structure

ONSET			NUCLEUS	CODA
(s)	(t tʃ tɬ l k kʷ)	(h)	V(V)	(ʔ h)
	(n j w)			
	(s m h ʔ)			

Even with Cherokee's relatively small phonetic inventory, this maximal syllable structure would make recording each possible potential syllable for sampling a considerable task. Thankfully, however, the architecture of UTAUloid allows for combining samples on a single note, so that a smaller number of samples can approximate the entire syllabic inventory of a language. CVC syllables, for instance, can be produced by a combination of two appropriate CV and VC segments, and in languages with phonemic vowel length (such as Cherokee), it is not necessary to record separate samples for V and V: (or CV and CV:) syllables; vowels can be lengthened either by note length or with the addition of a following sample of the same vowel quality. Likewise, complex onsets and codas can be 'cropped' via volume manipulation in the score, so that a C₁C₂V segment could also be rendered as C₂V.

Of course, because of the effects of co-articulation and gestural timing, the more an UTAUloid voicebank relies on 'shortcuts' such as syllable cropping, the less 'natural' it will sound; in general, recording more unique segments will result in a more natural sound. It is

worth noting, however, that 'natural' is not necessarily the goal of UTAUloid, and many UTAUloids and Vocaloids are not made with voicebanks that take every phonetic process of a language into account. Hatsune Miku, for instance, does not produce the vowel devoicing between voiceless consonants characteristic of much spoken Japanese (Okada 1999).

Taking the above factors into account, the relict for the Cherokee UTAUloid consists of the following segments:

Table 4.5: Segments for Cherokee relict, by syllable type

	Category:	Examples:	Number:
1.	CV: all initial consonants + all vowels	/tʰo/ /se/ /ʔa/	78
2.	CCV: /s/ + {/k k ^w t tʰ l/} + all vowels	/sk ^w a/ /stʰ/ /stli/	36
3.	CCV: {/k k ^w t tʰ l n j w/} + /h/ + all vowels	/khi/ /tho/ /nhe/	54
4.	V: all vowels	/a/ /e/ /i/	6
5.	VC: all vowels + final /h/	/eh/ /oh/ /uh/	6
6.	VC: all vowels + final /ʔ/	/aʔ / /iʔ / /əʔ/	6
		Total:	186

Once the relict is complete, it can then be recorded. The choice of voice donor is an important one, and will have the most significant impact on the sound of the finished UTAUloid. In language revitalization contexts – particularly for speech communities in advanced stages of language shift – older speakers and/or skilled language users (as recognized by the community) may have the phonetic pronunciations considered most representative or most desirable by the community. On the other hand, the act of recording for an UTAUloid voicebank can be a powerful act of language reclamation for heritage speakers and learners – an equally valid consideration. Ultimately, any speaker or learner of a language can voice an UTAUloid⁶, with the 'best' choice differing by community; recording

⁶ One important exception to this is that UTAU usage guidelines forbid the creation of a voicebank from a donor without their express consent. This includes (specifically) deceased persons, which in language

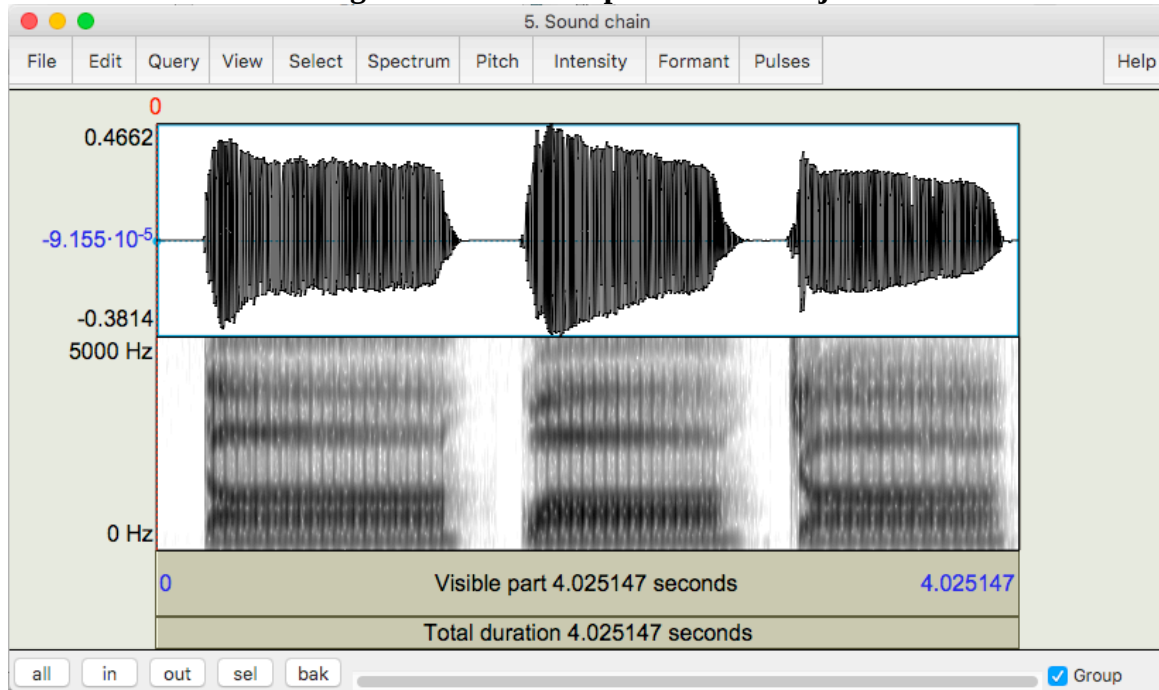
multiple UTAUoids in a given language is also, of course, both feasible and desirable. For the purposes of this Cherokee UTAUoid example, I acted as the voice donor to be recorded, as part of my own language reclamation process as a heritage learner of Cherokee.

For recording, UTAU requires samples to be in WAV format, but these can come from any source. They can be recorded directly onto a computer using software like Praat (Boersma & Weenink 2018) or Audacity (Audacity Team 2018), or on a dedicated recording device and copied to the computer for use in UTAU after the fact. For this Cherokee UTAUoid, the reelist was recorded as a single WAV file in Praat, at 44.1 kHz in 16bit, using an Audio-Technica ATR2100-USB dynamic cardioid microphone, and then split into individual samples using Audacity.

Aside from a quiet environment and the use of a windscreen – to cut down on high frequencies which can make it difficult for the UTAU synthesis engine to blend sibilants smoothly – the main considerations when recording specifically for UTAUoid is that the recordings should be at as close to a constant pitch as possible, and that nucleus of the syllable or mora should be held long enough to ensure that the synthesis engine has enough steady state of the nucleus to adjust as needed. Figure 4.9 illustrates the raw samples for the sequences /ta k^wa tʃa/ of the Cherokee UTAUoid:

revitalization contexts, means that archival recordings of speakers who have passed away should not serve as voicebank sources (UTAU Software Usage Policy).

Figure 4.5: Raw samples for /ta k^wa tʃa/



After all raw audio files are recorded, they should be placed in a single directory, and can then be 'tuned' for synthesis.

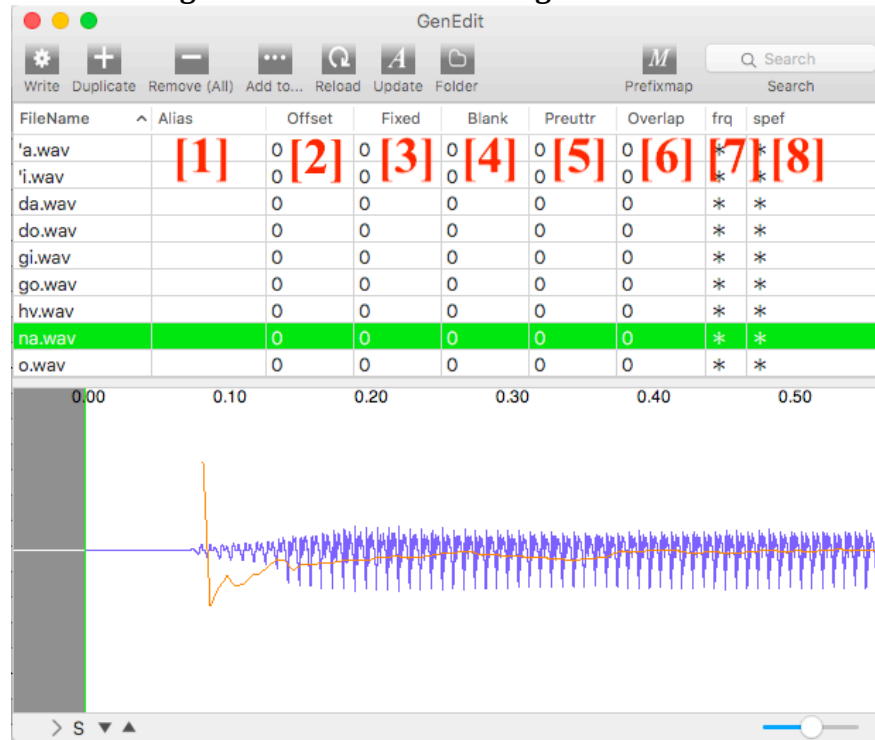
4.5.2 Tuning samples for synthesis

Once the raw audio has been recorded, the next step in turning these samples into a viable UTAUoid voicebank is to 'tune' them for use in UTAU, by demarcating specific regions of time in each individual sound file that are relevant for manipulation by the synthesis engine.

Tuning is most easily done within the UTAU or UTAU-Synth application, by clicking on the voicebank icon in the top-left of the window, choosing "Select...", and then choosing the directory which contains the raw audio samples to be tuned. This will create the voicebank and load it into the program. Once the voicebank is loaded, it can be edited and tuned via the Voicebank Configuration Editor, accessible from the 'Tool' menu.

The Voicebank Configuration Editor, shown in Figure 4.6, lists each individual .wav file present in the voicebank, along with a series of editable attributes used in tuning: [1] alias, [2] offset, [3] fixed, [4] blank, [5] preutt(ernace), [6] overlap, [7] frq and [8] spf.

Figure 4.6: Voicebank Configuration Editor



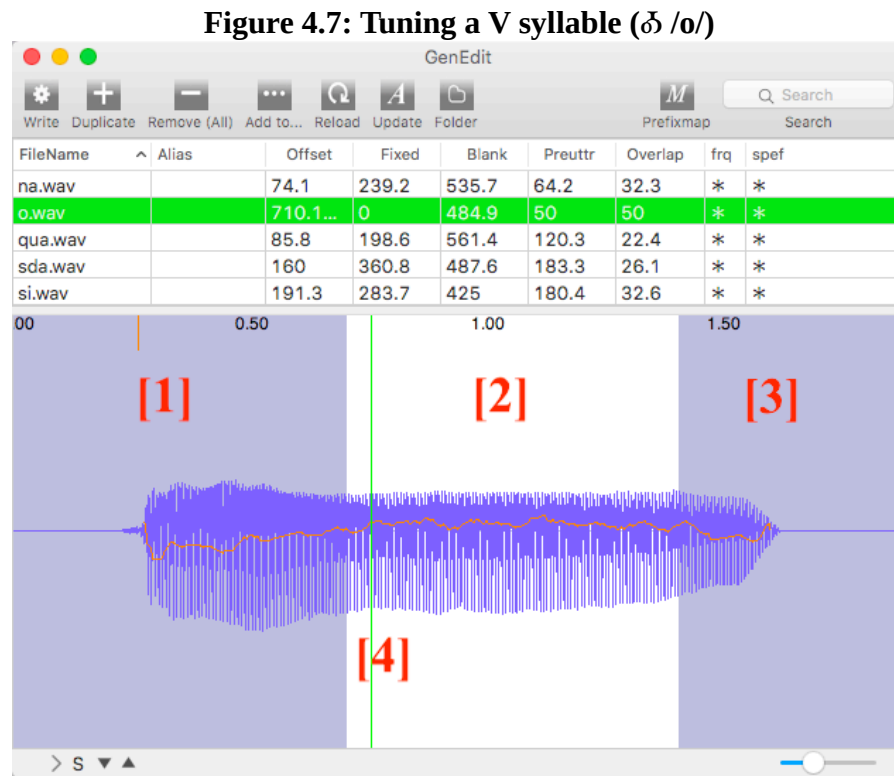
Alias ([1]) allows users to specify one or more alternate names for a given sound⁷, while frq ([7]) and spf ([8]) indicate that the synthesis engine has successfully read the frequency map and spectral frequency map, respectively, of a sample on import, and that it is ready to use.

The rest of these attributes variously come into play while tuning, as the tuning process varies slightly depending on the structure of the syllable or mora being tuned, with one method for V syllables and another for any syllable or mora containing any number of consonants. The next subsections will detail the tuning process for each of these in turn.

⁷ For example, this field is commonly used in Japanese UTAUloids to allow samples to be referenced using either *hiragana* or *rōmaji*, so that a sample *a.wav* could be called with either 'a' (the file name before .wav) or 'あ' (entered in the 'Alias' field) in the score.

Vowels:

Figure 4.7 shows an example of tuning of a syllable consisting of only vowels (whether V, V:, VV, etc.), illustrated with the Cherokee syllable δ /o/:



For vowels like δ /o/, the relevant attributes which can be edited in tuning are the offset (indicated by the blue-shaded region on the left [1]), the steady state (the central white region [2]), the blank (the blue-shaded region on the right [3]), and the overlap (indicated by the green line [4]). The offset [1] is measured in time in milliseconds relative to the start of the file, and indicates where the sample will begin to be played from in synthesis, in order to omit any preceding silence and the initial, volatile state of the vowel. For vowels, the offset should be positioned at the beginning of a periodic cycle in the steady state.

The next modifiable attribute is the blank [3], measured in milliseconds from the end of the file, which indicates where the playback will end in synthesis, and is used to exclude

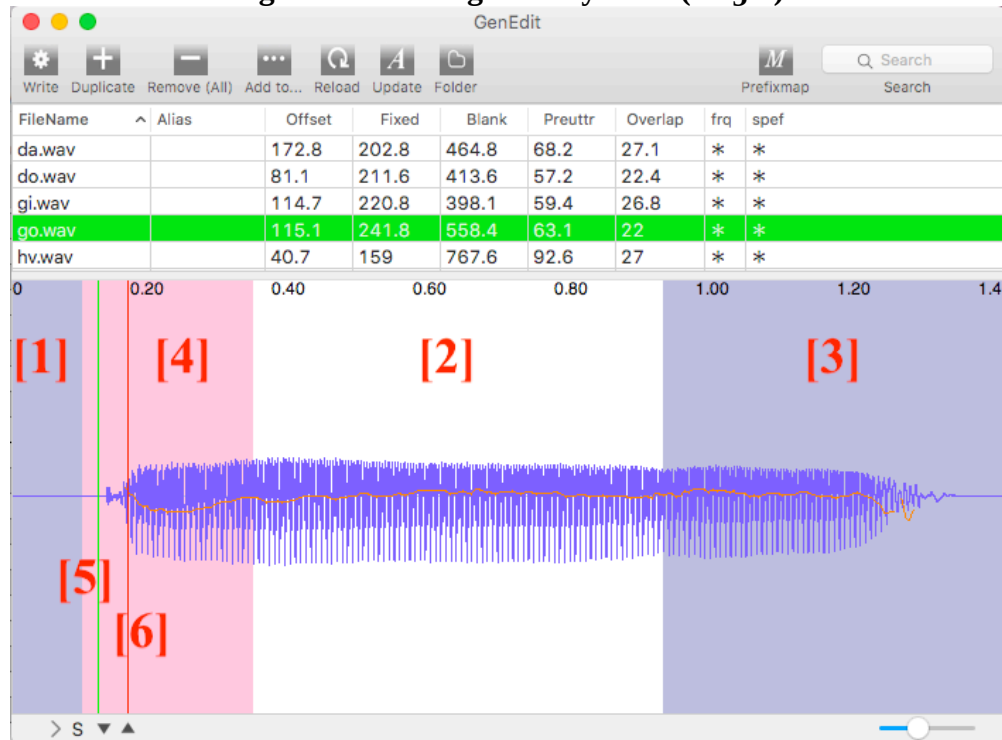
the end/decay of the sound as well as any following silence. For vowels, this should be placed at the end of a periodic cycle in the steady state, with the result that the steady state [2] – the region of the sample the synthesis engine will stretch or shrink to fit the required note length – should represent a loopable, periodic series of cycles.

The final attribute for tuning vowels is the overlap [4]. Measured in milliseconds relative to the offset, it indicates how far the synthesis engine should cross-fade the previous note into a sample; the portion of the sample to the left of the overlap will be mixed with the previous sample, while the portion to the right will not. There is no specific point of the vowel that the overlap needs to be anchored to, but 50ms after the offset in the Cherokee UTAUloid tuning results in a blending sound consistent with popular Vocaloid and UTAUloid voicebanks.

Consonants:

For segments containing any number of consonants (whether C_0V , VC_0 , C_0VC_0 , etc.), the same attributes apply, with the additional considerations of a 'fixed' region and a pre-utterance point. Figure 4.8 shows the tuned Cherokee syllable A /go/:

Figure 4.8: Tuning a CV syllable (A /go/)



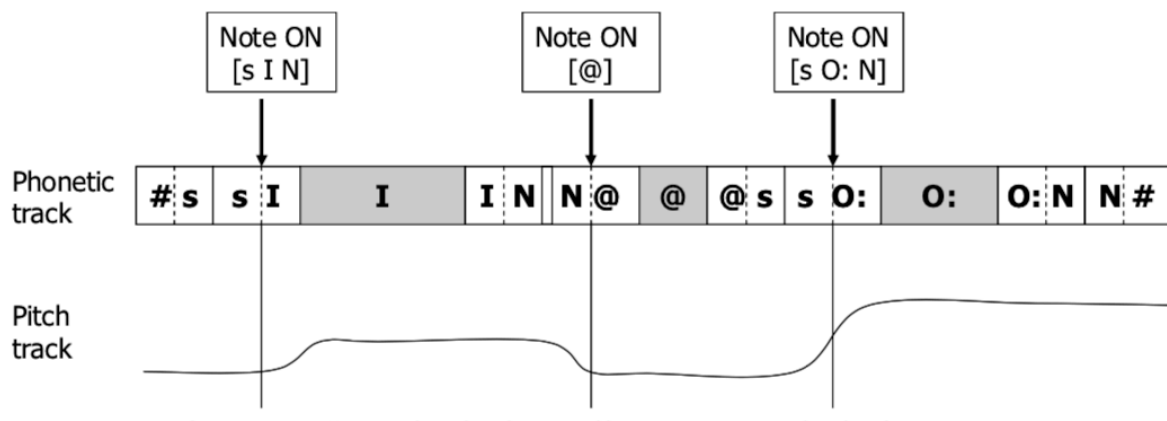
The offset [1] performs the same function here as in the V example above: marking where the sample will begin to play, excluding the region shaded in blue from synthesis. The blank [3] again does the same for marking the end of the sample, by excluding the blue region, and should extend to the end of a periodic cycle of the vowel, so that the steady state [2] represents a loopable periodic vowel sound.

The difference for syllables with consonants is that instead of being bound by the blank ([3]) and offset ([1]) points, the steady state ([2]) is here bound by blank ([3]) and fixed ([4]). The length of the fixed region [4] is measured in milliseconds relative to the offset, and the region indicates the portion of the sound file that will be played in synthesis, but not manipulated in terms of length. The entire fixed region will always be played, without being either stretched or shrunk to account for note length, as the steady state [2] is. In tuning consonant syllables, then, the fixed region should include both the consonant itself and the

initial portion of the vowel affected by formant transitions – both perceptual cues which should be unaltered by synthesis for best results. For the same reason, the overlap [5], which determines how far into a sample any cross-fade with a previous sample should extend to, should be placed before the consonant information, so that relevant consonant cues (such as the stop burst in A /go/ above) are not obscured or lost in blending with the previous sample.

The other new attribute for consonant syllables is the red pre-utterance line [6]. Measured in milliseconds relative to the offset, the pre-utterance indicates which point in the sample should be aligned with the beginning of the sung musical note in terms of rhythm. The feature is useful because when speakers sing, rhythmic timing is organized around the nucleus of the syllable (or mora), rather than the onset; the pre-utterance allows users to align the start of the nucleus with the start of the note. The following diagram from Kenmochi (2010) illustrates how this system works in Vocaloid for the sample phrase “sing a song” (rendered as sIN @ sO:N), and the concept is the same in UTAU as well, with the points marked as “Note ON” corresponding to pre-utterance lines in UTAUoid:

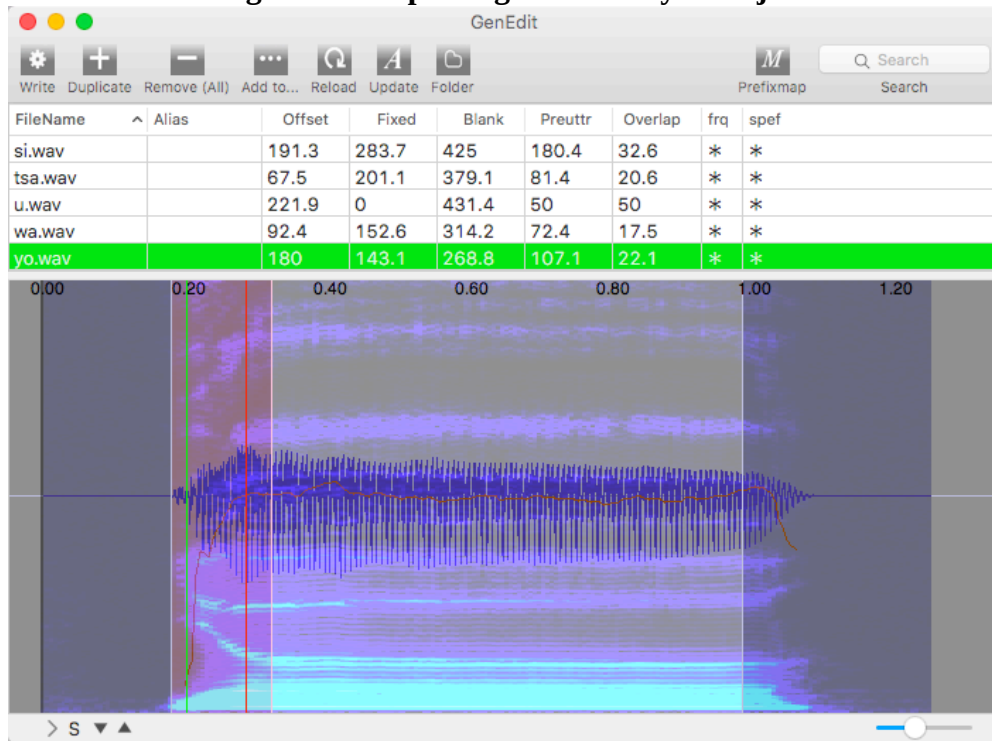
Figure 4.9: Nucleus-note alignment system in Vocaloid (Kenmochi 2010)



In a CV syllable like A /go/ above, then, the pre-utterance should be positioned at the onset of the vowel. In some cases, such as when the preceding consonant is a liquid or glide,

it can be difficult to determine the exact onset of a vowel from the waveform alone. To tune these samples more accurately, a simple spectrogram view can be overlaid by pressing the 's' button in the bottom-left of the window, as in Figure 4.10 showing the Cherokee syllable ɥ /jo/:

Figure 4.10: Spectrogram overlay in ɥ /jo/



After adjusting each of the tuning parameters for a given sample, selecting the 'Write' option will save the configuration to a plain text file in the voicebank directory named 'oto.ini' (音 *oto* meaning 'sound' in Japanese). This file contains all the tuning information for a given voicebank, in the format of [filename]=[alias],[offset],[fixed],[blank],[pre-utterance],[overlap], with values in milliseconds. The first five lines of the Cherokee UTAUloid oto.ini after tuning, for example, are given in (31):

```
(31) 'i.wav=?i, 24.6, 86.5, 336.0, 40.3, 11.2
do.wav=, 81.1, 211.6, 413.6, 57.2, 22.4
o.wav=, 438.9, 0.0, 484.9, 50.0, 50.0
qua.wav=gwa, 85.8, 198.6, 561.4, 120.3, 22.4
wa.wav=, 92.4, 152.6, 314.2, 72.4, 17.5
```

Since the oto.ini file is plain text and user-editable, this also means it is possible to tune the samples for an UTAUloid without using the UTAU or UTAU-Synth software, by determining the positions for each attribute in any audio editing program such as Praat or Audacity and manually entering the values into a plain text file named 'oto.ini'. This can be helpful when creating an UTAUloid collaboratively, as tunings from different sources (such as multiple collaborators working simultaneously on different computers) can be copied and pasted into the same oto.ini file without issue; it can also be useful if tuning a particular sample requires more detailed spectrogram manipulation (e.g. window length) than the non-adjustable view within UTAU or UTAU-Synth provides.

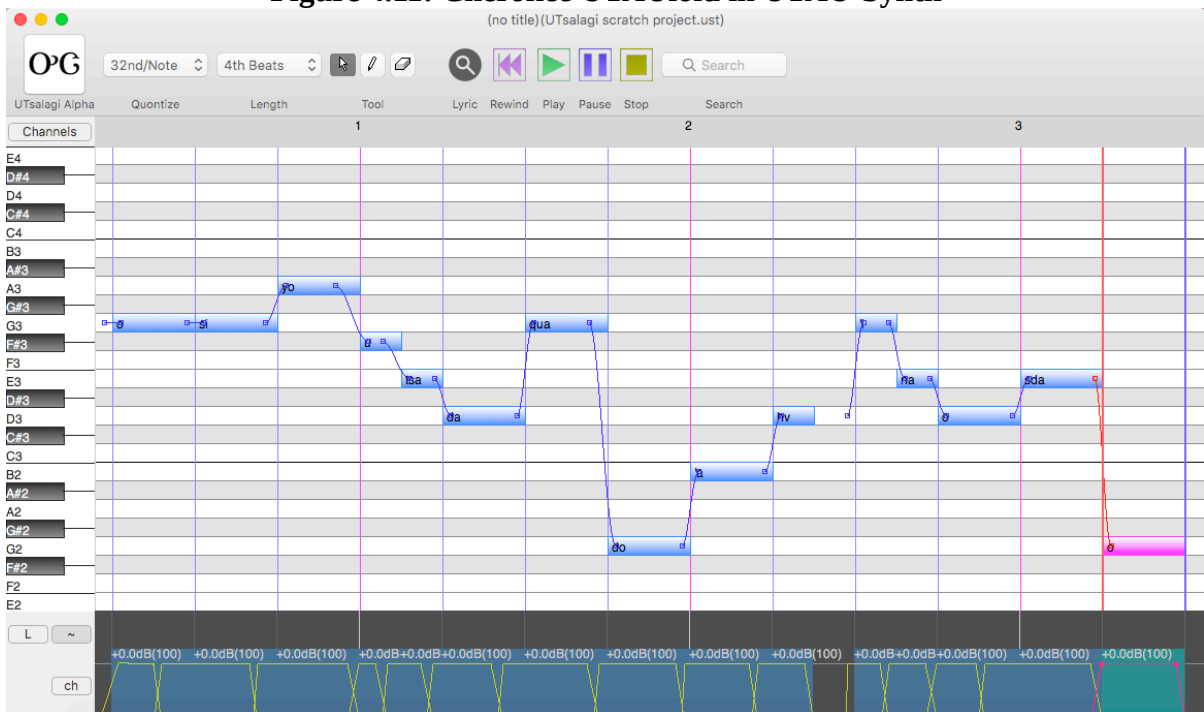
With the audio samples and an oto.ini file specifying the tunings in the same directory, the UTAUloid is complete. Metadata about the UTAUloid (including voice donors, tuners, illustrators, contributors, and contact information), can be specified in text files called 'readme.txt' and 'character.txt', which are read by UTAU and UTAU-Synth software to provide metadata in-application, and a picture can optionally be set for the voicebank by including it as 'image.png' in the same directory. The directory can then be compressed (into a .zip file, for example) and distributed; anyone with the UTAU or UTAU-Synth software installed can then easily load in the .zip file and use the enclosed UTAUloid.

4.6 Results and Discussion

The result of the above method is a complete Cherokee UTAUloid, which can then be used by anyone to simply and easily create vocal melodies in the language. Once the

UTAUloid is loaded into the UTAU or UTAU-Synth software, users place musical pitches on the piano roll-style score, with vertical height indicating pitch and width indicating length; clicking on a placed note allows users to specify the syllable or mora to be sung, based on the file labels and aliases specified when creating the voicebank. Figure 4.11 shows a simple melody composed and sung in Cherokee in the UTAU-Synth interface:

Figure 4.11: Cherokee UTAUloid in UTAU-Synth



As a tool for music creation, UTAUloids have several characteristics which make them appealing to music producers. Many of these same features also help make them uniquely useful as tools for language revitalization.

The first of these features is that UTAUloid is a very versatile format for music-making; melodies composed in the framework are both portable and exportable in a variety of formats. The sung audio can be exported into a .wav file, for instance, and the resulting 'vocal track' can be added to any digital audio workstation, including open-source systems such as Audacity, Aurdor (Davis et al. 2018), or LMMS (LMMS developers 2018), and

combined with additional tracks to create a complete song. UTAUloid creations can also be shared in their native UST format, which means that vocal melodies composed or started by one user can be edited, tweaked, and/or finished by any other user that they share the .ust file with. Finally, UTAUloid melodies can be exported natively to MIDI, providing for easy importing into graphical music editors (like MuseScore), as well as conversion into ABC through ABCmidi.

This (ex)portability makes UTAUloid particularly well-suited to collaborative work, and that, combined with the culture of 'massive collaboration' around UTAUloid and Vocaloid, creates unique potential in terms of revitalization work. In the context of language revival, massive collaboration means that speakers, learners, and community members of all different language and musical skill levels can all participate collaboratively in the same musicolinguistic project, of creating and using UTAUloids. Speakers who may not consider themselves 'musical' could contribute lyrics or voice samples; learners who may not feel comfortable writing lyrical songs in the language could contribute melodies or take on lyric-writing as part of the language learning process; musicians could contribute melodies or backing tracks without any specific interest in or knowledge of the language; and other community members could contribute with any of the other elements of UTAUloid's inherent "multidisciplinary creation" (De Sousa 2014), including art, writing, and character and costume design.

This distributed model of musicolinguistic work is especially advantageous in languages with large, engaged digital diasporas, as is the case with Cherokee. With around 10,000 speakers in the Cherokee Nation, but 122,000 registered tribal members spread out across Oklahoma and the 23 recognized 'At-Large' communities throughout the United States

– many of whom are strongly engaged with the Cherokee Nation and the language revival movement through the internet and social media – this digital diaspora represents tremendous creative potential for musicolinguistic projects like UTAUloid. The massive collaboration inherent in making music with UTAUloid is a particularly participatory way to engage the benefits of music for language revival.

In addition to multidisciplinary collaboration, another of the primary reasons users turn to UTAUloid in any context is also an advantage for language revitalization contexts: low-resource music making. Once an UTAUloid has been created, anyone with a computer can use it to make music in the UTAUloid's language for free. Combining the vocal tracks created by UTAUloid with free and open-source digital audio workstations (such as LMMS or Ardour) and their integrated instrument synthesizers then allows users to create full, commercial quality vocal songs without any monetary investment beyond a computer. UTAUloid is also an example of truly low-resource music making in terms of physical space; in contrast to traditional vocal music, without the need for studio recording equipment or a low-noise environment, UTAUloid songs can be composed in their entirety in any space with a computer – including quiet public spaces such as libraries and community centers.

Perhaps most importantly in terms of language revival, UTAUloid also represents an excellent avenue to bolster youth involvement with language revitalization. The UTAUloid community is overwhelmingly a community of youth; many popular UTAUloids have been created by teenagers, as is the case for most of the minoritized language UTAUloids mentioned above. And crucially, rather than introducing a new concept to young people for the purposes of language revitalization, UTAUloid represents a concept, platform, and community (through both UTAUloid and Vocaloid) that is already incredibly popular with

young people (Condry 2011; Le 2014; Lam 2016). Furthermore, the countries in which UTAUloid and Vocaloid are most popular – apart from Japan, these include the United States, Mexico, Canada, China, Taiwan, Malaysia, Indonesia⁸, among others – are countries with countless active language revitalization projects and minoritized and indigenous languages (Simons and Fennig 2018). As one example of this worldwide appeal, Figure 4.12 shows a sold-out 2016 live concert by Hatsune Miku (projected via hologram and accompanied by a live band) in San Francisco's 2,300-seat Warfield Theatre, packed completely full of young people swinging glowsticks in time to the music – music composed and created by their peers, fellow Vocaloid and UTAUloid fan-producers:

8 These countries have all hosted the Hatsune Miku Expo Vocaloid concert series – a concert tour presented by Crypton Future Media featuring their Vocaloids singing as holographs, accompanied by live band

Figure 4.12: Hatsune Miku concert in San Francisco, 2016



Finally, while the creation of an UTAUloid in a given language is very much a project for community use, it is worth noting that the use of UTAUloid can lead to new avenues in potential linguistic research as well. A growing body of research, especially in Australia, has shown how newly composed music can be fruitful sites of linguistic research (i.e. Ford 2007; Marett 2007; Morey 2010), and though the synthesized nature of UTAUloid means this would be difficult (or at least non-traditional) in terms of phonetic work, issues of (for example) morphosyntax, discourse analysis, genre, style and style-shifting could all be explored in music composed using UTAU. While creating an UTAUloid is absolutely a community-focused project, the effects of having a tool available to easily create new music

– and thus new data – in a given language can be equally helpful for the academic linguistic community.

Conclusions

This chapter has aimed to introduce and explain the creation of UTAUoids, as an example of one way in which linguists can contribute directly, using specialist skills, to the musical side of language revitalization. As the first in-depth treatment of UTAUoid in the scholarly literature, it also aims to show that through their focus on 'massive collaboration' (De Sousa 2014) (allowing interested speakers, learners, and community members of all linguistic skill levels to collaborate on the same musicological project), low-resource music making (the creation of vocal music in a revitalizing language without the normally-necessary physical space or monetary investment), and youth involvement (through UTAUoid's existing status in youth culture in many countries with revitalizing languages), UTAUoids are particularly well-suited for language revitalization contexts. Music made with UTAUoids can then provide new avenues for academic linguistic research, as well as all of the benefits music brings to language revival efforts: attracting learners and engaging speakers, creating opportunities for speech community, and supporting language learning.

Chapter 5: Conclusions

5.1 Summary

This dissertation has aimed to introduce new methodologies allowing linguists to integrate musical data into their work across structural linguistics, sociocultural linguistics, and language revitalization, as well as demonstrate, through case studies in each subfield, the importance and potential of music in linguistic research. These frameworks and studies represent examples of musicolinguistics – a linguistics that takes music as an essential and inseparable component of linguistic analysis in musical contexts.

Chapter 2, focusing on structural linguistics, presented a new method for integrating ABC musical notation and linguistic data in ELAN to show that Tlahuapa Tù'un Sàví songs exhibit a strong preference for the melody line to move in parallel with the lexical tone melody of the lyrics, as well as an association between certain types of musical ornamentation and specific lexical tones. As the first tone-tune study on a Mesoamerican language, these results place Tlahuapa Tù'un Sàví on the higher end of correspondence rates seen in the tone-tune typology (in both parallel and non-opposing systems), and also highlight the importance of ornamentation and genre in studies of tone-tune correspondence.

Turning to sociocultural linguistics, Chapter 3 introduced a new multimodal discourse analytic method to show how each of three Welsh rock artists – Super Furry Animals, Gorky's Zygotic Myncci, and MC Mabon – use co-temporal musical and linguistic shifts to enact three different identities: a Welsh-language group navigating an English-language musical mainstream, a bistylistic band using ironic Englishness to emphasize their Welshness, and a global-Welsh citizen at home in Wales, Patagonia, and beyond. Crucially,

none of these identities are reducible to either musical or linguistic performance alone. The results of this chapter show that it is the combination of music and language, working together in shifting semiotic bundles, that creates the relevant social meaning and each of these diverse identities.

For language revitalization, Chapter 4 demonstrated a new method for creating a tool for vocal musical production in revitalizing languages through UTAUloid. Drawing on previous literature showing the importance of music in language revitalization contexts, this chapter situates UTAUloid as one way in which linguists can use their specialized knowledge and skills to contribute to musical language revival efforts. As the first treatment of UTAUloid in the academic literature, it also outlines specific features of the UTAUloid framework and culture that are particularly well-suited for language revival efforts, including a focus on 'massive collaboration', low-resource music making, and youth involvement.

5.2 Implications for future research

In terms of directions for future musicolinguistic research, each of these three methodological frameworks offers much to pursue. The combination of language and musical data in documentation facilitated by ABC notation in ELAN from Chapter 2, for instance, could be used to explore tone-tune relationships in a wider variety of languages, and in particular to expand our understanding of this phenomenon in languages outside of Asia and Africa. Tlhuapa Tù'un Sàví indicates the potential for Mesoamerican languages to exhibit tone-tune correspondence, but there are countless tonal languages linked to unique musical traditions and forms in the Americas that could contribute significantly to this typology; previous research (including the present dissertation, Rycroft (1979), Chao (1956),

and List (1961), among others) indicates that genre and specific musical styles can play an important role in these correspondences, and more examples and larger corpora can help illuminate that relationship.

In addition to lexical tone and musical melody, combining musical and language data in Tlahuapa Tù'un Sàví revealed other patterns that could also be investigated in other (tonal and non-tonal) languages, including rhythmic correspondences (in terms of vowel length or syllable weight, for example), phonetic realizations unique to song, and musical dimensions of discourse structure. While the present study of Tlahuapa Tù'un Sàví focuses on phonetic aspects of language in song, the method could be equally useful in exploring musically-based variation in syntax, morphology, or semantics (cf. 'song language' in Australian languages (Apted 2010; Ford 2005; Ford 2007; Garde 2007; O'Keeffe 2007)).

For sociocultural linguistics, music is an important part of the sociocultural context of language, and the method of combined musicolinguistic discourse analysis presented in Chapter 3 can be used to explore how music and language function together to create social meaning through any lens of sociocultural linguistic inquiry. While the analysis of code-switching and identity in Welsh rock music here focuses on published, commercially-available music, the same methodology could also be applied to ethnographic sociocultural linguistic research which includes musical performance, evaluation, or consumption. In fact, an initial version of this method has already been used in ethnographic work on identity performance in dance by Mexican K-Pop fan groups (Yoo Garza 2016), in documenting musical and linguistic moral-making in Kisii folktales (Hieber 2016), and to explore chronotopes of spatiotemporal nostalgia in country music videos (Love-Nichols 2016). It is also not restricted to juxtaposing only lyrics and music in musical performance; sociocultural

linguists could use this method to study discourses around music (such as evaluation, identity work, perceived authenticity, pedagogical practice, etc.) with the music itself as a central component of the data.

For language revitalization, creating an UTAUloid as described in Chapter 4 has the potential to lead to many avenues of future linguistic research; on new vocal music composed in the language, for instance, or on the phonetic features and voice qualities a community chooses to include in a voicebank. It also opens up the possibility of linguistic contribution to the nascent study of Vocaloid and UTAUloid in general, and – especially from the perspective of minoritized and revitalizing languages – linguistics has much to offer in terms of language use, variation, and style in Vocaloid and UTAUloid. Of course, creating an UTAUloid is only one method that linguists can use specialized skills to help with the musical side of language revitalization, and the benefits of music in language revival described in Chapter 4 indicate that it is worth seeking out other ways linguists can help develop tools for music in revitalization contexts. These could include projects like rhyming dictionaries (taking into account linguistic and cultural considerations for what constitutes 'rhyme' in a given language – itself an interesting avenue of linguistic research), or documenting vocabulary and grammatical structures used in musical pedagogy, performance, and evaluation – which can in turn bring new linguistic knowledge as well as benefit musical revitalization efforts.

Taken together, the main implication for all of these linguistic subfields, and the major finding of this dissertation, is that music is an important part of linguistic analysis in musical contexts, and can yield unique insights not possible by examining language alone,

from multimodal tone correspondences to the musicolinguistic construction of identity. Through the preceding examples in structural linguistics, sociocultural linguistics, and language revitalization, I hope to have shown the value of including musical data in linguistic research across subfields, and to have provided methods which are accessible for linguists to use in their own work, whether in collaboration with communities, (ethno)musicologists, or both. Above all, I see this musicolinguistic approach as a natural consequence of a discourse functional linguistics; just as discourse functional work has shown us that we cannot remove language from its sociocultural, historical, discursive, or prosodic contexts and still expect to reach a full understanding of its form and function, I hope to have shown that the same is true for language in its musical context.

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