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Title: The Phonetics-Phonology Interface of the Paiwan Dialects: Establishing the Voice Corpus (II)

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Abstract

The project investigates the Phonetics-Phonology interface of the Paiwan dialects, based on the under construction voice corpus and the varieties from Sandimen, Majia, Taiwu, Gulou, Shimen, and Mudan villages in Pingtung County, as well as Dawu and Taimali dialects in Taitung County. The majority of field reports on Formosan languages give rather minimal details on their phonetic, phonological, and prosodic properties, usually one or two lines of vague description, not to mention the number of field reports on Formosan languages is rather small. The project addresses questions related to the innovation of the language within the Paiwan speech communities and the development of the language among the Paiwan speakers. In the present project, the interaction between phonetic variation and phonological distinctive features has been dealt with, and the principles and the methodology in Laboratory Phonology and Acoustic Phonetics were used to verify the existing field notes and the phonological theories.

    Eight dialects of Paiwan have been studied. Spoken data such as word elicitation, phrases, sentences, stories, narratives and discourses have been collected in the field and served as the voice corpus in the phonetic laboratory for measurements and further empirical studies. On the other hand, the project has harnessed the professional software of acoustic analysis and speech technologies to aid in the collection of field data.

The most significant contribution of the current project is the construction of the voice corpus and the interface study of the segments and suprasegmentals in the Paiwan dialects, which has never been done in any earlier field report or project. The present project draws evidence from the field data and proposes an account for the interaction between phonetic variance and phonological invariance among the Paiwan dialects. The preservation of the phonetic voice data of the Paiwan dialects would help researchers understand more about the dialects and the language.

計劃名稱: 臺灣排灣語方言語音音韻之介面研究: 語音資料庫的建立(二)
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摘要

面對臺灣原住民語言急速流失的現狀,語言學界對於臺灣排灣語語音及音韻描述或分析的研究相對地稀少。至於語音現象如何影響音韻系統、音韻系統如何在語音層次上被驗證,語音及音韻的介面研究,迄今仍相當匱乏。 然而,語音音韻的介面研究,對於語音保存、田野調查的實務性,及語言學的專業學術研究,都有其存在的必要性。若無基礎語音音韻系統研究的探討, 對於所紀錄的語音資料,是否能成為忠實的田野調查紀錄,可以存疑。本研究聚焦於排灣語方言,以聲學語音學(Acoustics Phonetics)及實驗音韻學(Laboratory Phonology)的理論與方法提供一些科學的証據,瞭解更多語音音韻介面的現象,這些現象又反過來修正或重新詮釋描述語言學(Descriptive Linguistics)及音韻學理論(Phonological Theories)的研究成果。

本計劃整合語音實驗室與田野調查所建構的語音資料庫, 一方面忠實紀錄並補充方音的差異,一方面探討語音資料庫建立過程中語音音韻的互動現象。建立排灣語語音資料庫及整合語音資料庫與語音實驗室不僅能彙整與驗證語音差異、進行各方言的區別音位建構,更能提供語言學田野調查方法上新的蒐集語料模式; 語音資料庫在學術上,亦可作為進一步語言學研究的題材。

1. INTRODUCTION

The project investigates the Phonetics-Phonology interface of the Paiwan dialects, based on the sound files, under construction voice corpus and the varieties from eight dialects in two counties (Sandimen, Majia, Taiwu, Gulou, Shimen, and Mudan village dialects in Pingtung County, as well as Dawu and Taimali village dialects in Taitung County). Paiwan is an Austronesian language spoken in Southern Taiwan, with around 66,000 speakers. The majority of field reports on Formosan (Austronesian) languages give rather minimal details on their phonetic, phonological, and prosodic properties, usually one or two lines of vague description. The paper addresses questions related to the innovation of language within the Paiwan speech communities and the development of language among the speakers. In the current project, the interaction between phonetic variation and phonological distinctive features were dealt with, and the principles and the methodology in Laboratory Phonology and Acoustic Phonetics were used to verify the existing field notes and phonological theories. The project report presents the collection and the compilation of the sound files of the Paiwan dialects and the use of the voice corpus in language documentation. Corpus-based analyses and empirical studies on sound files are needed to verify the phonological representations in a speech community with varieties.

It has been widely agreed that without some knowledge of the sounds, one cannot describe the phonology of a language (cf. Ladefoged 2003). Phonemes are the sounds that contrast in words, while allophones are the realizations or the contextual variants of phonemes. In this project, phonemes in Paiwan were constructed by means of minimal pairs, and allophones were attested among the Paiwan speakers. Earlier documentation about the Paiwan language relied on the perception of the field researchers (Ho 1977, 1978, Chang 2000, and Pulaluyan 2002), and Ladefoged (2003) warned field workers of never fully trusting anyone else's description of the sounds of a language. Many factors may have been involved in the documentation of a language, such as different dialects, ages, gender, or language fluency of the speakers. The language under investigation might have changed since earlier accounts of it. As a result, recordings have become a prerequisite for the investigation of sounds in a language. Sets of minimal contrasts are always the best resource for the construction of consonantal and vowel inventories.

More recent field reports (Chen 2004, 2006) have shown the preservation of bilabial, alveolar, palatal, velar and uvular stops in Southern Paiwan, whereas palatal and uvular stops were absent in Northern Paiwan. In the present project, Voice Onset Time (VOT) measures were taken for the voiceless non-aspirated stops of Paiwan. On the other hand, non-stress prosodic features in Paiwan have not been well studied yet. Non-stress prosodic patterns have generally been analyzed in terms of phonetic pitch. Interpreting pitch curves has been a difficult task for fieldworkers, and analyzing the pitch of an utterance is a complicated process. In this project, the description of the prosodic patterns is given in a paradigm, and

the issues in documenting non-stress patterns have been tackled. High pitch prominence in Paiwan second person pronouns and address forms provides direct evidence for the importance of prosody in face-to-face interaction.

The most significant contribution of the current study lies in the presentation of segmental and prosodic features of the Paiwan phonology, the phonetics-phonology interface issues of the dialects, and the empirical analyses of the indigenous language.

2. SOUNDS FILES

Eight dialects of Paiwan, including Northern, Central, Southern, and Eastern varieties of Paiwan, were studied. The sound files such as word lists, phrases, sentences, stories, and spontaneous speech were collected in the field and served as the voice corpus in the phonetic laboratory for measurements and further empirical studies. The goal of project is also to harness the professional software of acoustic analysis and speech technologies to aid in the collection of field data. In the current project, it has been made that a portable phonetic laboratory is accessible to the recording and analyzing tasks. The present project draws evidence from the field data and proposes an account for the interaction between phonetic variance and phonological invariance among the Paiwan dialects.

Sound files or spoken corpora differ from written texts in a few aspects. Oral corpora contain prosodic information (Vizcaíno 2007). Jefferson (1985) has noted that in the study of conversational interaction it was crucial to record all audible aspects of the speech and not just the plain text. Her system included non-speech vocalizations such as laughter, paralinguistic effects such as lengthening of syllables and emphatic stress, and segmental features of pronunciation. Wichmann (2007) has noted that Jefferson's work is "of vital importance in showing that in an interactional setting prosodic, paralinguistic and non-linguistic features have a role to play in negotiating meaning" (p.76). Recent work on the interface between phonetics and conversation such as Ford and Couper-Kuhlen's (2004) study shows that there is far more in the speech signal to be accounted for than that could ever be captured in an orthographic transcription. Wichmann (2007) argues that sound files are of crucial importance, as sounds are not just an additional resource for the study of prosody but an integral part of the message. As far as fieldworkers are concerned, the compilation of sound files is the prerequisite for the documentation of prosody in any indigenous language. For the study of phonetics-phonology interface in Paiwan, an indigenous language with regional variation, a collection of sound files has become a necessity.

Ten male and ten female Paiwan speakers ages 50-75 participated in the study. All of them were fluent speakers of the Paiwan language and considered the most typical in the Paiwan villages. They were recommended by either the village members or the chieftains. Paiwan has twenty-three consonant phonemes and one loan consonant phoneme /h/. Northern

Paiwan has twenty consonant phonemes, in which palatal sounds /c/, /ɟ/, and /ʎ/ are absent, and one loan phoneme /h/ is attested. Uvular /q/ is also absent. Southern and Eastern Paiwan dialects have shown consistent consonantal phonemes, though allophones were also attested among village dialects.

The surface distribution of the Paiwan consonants is given in Table 1.

Table 1. Surface distribution[1] of the Paiwan consonants

Consonants	Word-Initial				Word Internal	Word Final
	#___i	#___u	#___a	#___ə	V__V	___#
p	**pitsuɭ** 'muscle of arm'	**puɖu** 'kidney'	**padaj** 'rice'	**pədi** 'portion'	**sapuj** 'fire'	**kurap** 'skin disease'
b	**bibi** 'duck'	**buniq** 'mud'	**bakits** 'bucket'	**bəruŋ** 'hole'	**bubuŋ** 'bubble'	**qubqub** 'frog'
t	**titsa** 'rake'	**tutu** 'breasts'	**taqəd** 'to sleep'	**təquŋ** 'horn'	**putut** 'drill'	**parut** 'true'
d	**dimpuŋ** 'flour'	**duku** 'poison'	**daʟiʎ** 'bottle'	**dəməs** 'glutton'	**gadu** 'mountain'	**taqəd** 'to sleep'
c	**cimiz** 'chin'	**cuʎur** 'angle'	**cababaŋ** 'blister'	**cəbək** 'lake'	**pacəz** 'wood chisel'	**səmuc** 'choking'
ɟ	**ɟiɟi** 'buttocks'	**ɟurits** 'paste'	**ɟaɭan** 'road'	**ɟəkap** 'footprint'	**suɟu** 'lover'	**qaʎuɟ** 'to lose'
k	**kiʟiʎ** 'cricket'	**kupu** 'cup'	**kasuj** 'trousers'	**kəʎa** 'torso'	**səkəz** 'to stop'	**vaik** 'to go'
g	**gidi** 'side'	**gusam** 'weed'	**gaŋ** 'crab'	**gəmgəm** 'fist'	**sagi** 'file'	**səgsəg** 'tabu field'
q	**qipu** 'earth'	**quzu** 'leaf'	**qaʎup** 'to hunt'	**qətsəv** 'counter-part'	**biqu** 'curve'	**tidəq** 'interval'
ʔ[2]	**ʔiʎa** 'to hide'	**ʔuqaʎaj** 'man'	**ʔaʔa** 'crow'	**ʔəɭuz** 'pillar'	**vituʔan** 'star'	**umaʔ** 'house'
v	**vikiŋ** 'curve'	**vukid** 'forest'	**vasa** 'taro'	**vəku** 'wart'	**kuvaʎ** 'blanket'	**qətsəv** 'counter-part'
s		**suʎa** 'ice'	**saŋas** 'first'	**sənaj** 'song'	**sasaw** 'outdoors'	**qurəpus** 'cloud'

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[1] Words in parentheses were attested in Taiwu Paiwan only.

[2] Words presented in this row were collected from Northern Paiwan.

		zuma 'other'	zaman 'torch'	zələt 'bow-string'	imaza 'here'	kuraz 'rake'
z						
ts		tsuvuq 'bamboo sprout'	tsaḷa 'to fry'	tsədas 'sunlight'	patsaj 'to die'	kurits 'millet'
(h)[3]	hikuki 'airplane'	huni 'ship'	haku 'box'		kuhugan 'five minutes'	
tʃ	tʃima 'nail'	(tʃuru) 'tip'	(tʃaviʎ) 'year'		(matʃa) 'eye'	(qaʎitʃ) 'skin'
ʃ	ʃiḷi 'pillow'				ḷiʃi 'bride price'	
ʒ	ʒitsu 'this'				ʃiʒi 'goat'	
n	niqaj 'newly-born monkey'	nuḷi 'glue'	namaqar 'weak'	nəka 'not exist'	nana 'sweet potato'	pakan 'to feed'
m	mimi 'calf'	muka 'papaya'	matsam 'piquant'	məkuj 'cucumber'	qimi 'cheeks'	sələm 'the dark'
ŋ	ŋiḷu 'pain'	ŋuɟus 'nose'	ŋadan 'name'	ŋəɖuq 'segment'	kuŋaj 'dirt'	qiʎaŋ 'dirt'
r	rigi 'horse'	rugus 'twig'	ragəd 'pebble'	rəŋeaŋ 'obstacle'	parut 'true'	maqipər 'unlucky'
ʎ	ʎisuk 'to pull out'	ʎunaj 'small knife'	ʎatu 'to boil (meat)'	ʎəḷəy 'lip'	riʎaj 'skinny person'	kuriʎ 'dried food'
ɖ	ɖimuḷ 'fist'	ɖukuŋ 'bend'	ɖaqa 'branch'	ɖəkan 'straw rope'	ɖaɖaj 'toy'	piaɖ 'dish'
ḷ	ḷigu 'glory'	ḷuqəm 'luck'	ḷaḷaja 'flag'	ḷədəp 'to dive'	ʃiḷi 'pillow'	ɖaquḷ 'goiter'
w	wi 'yes'	wuvaj 'feminine name'	wara 'dried rice-straw'		sawni 'short while'	ʃiaw 'soup'
j	jisu 'Jesus'	jui 'feminine name'	jaʃi 'coconut'		vavajan 'woman'	quzəmaj 'dim'

Paiwan has four native vowels /a/, /ə/, /i/, and /u/. The back mid-high vowel /o/ is a loan vowel, with relatively lower frequency of occurrence. Blust (1988) has noted that almost all Austronesian specialists admit just four Proto-Austronesian vowels: /a/, /ə/, /i/, and /u/. Many of the words with the phoneme /o/ are associated with Japanese, Taiwanese, or Mandarin

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[3] The loan consonant /h/ is put in the parenthesis here.

loanwords. Therefore, /o/ is included in the vowel inventory as a loan vowel.

3. EMPIRICAL STUDIES

Voice Onset Time (VOT) measures were taken for the voiceless non-aspirated stops. The purpose of the investigation of the Voice Onset Times (VOTs) is to support the status of consonantal phonemes and the variation among the dialects. The VOTs of voiceless stops in the word-initial position were examined in an effort to see how VOTs vary according to places of articulation and the different dialects.

VOTs have been known to vary with different places of articulation, and it has been found that the further back the closure, the longer the VOT (Fischer-Jørgensen 1954 and Peterson and Lehiste 1960), and that the more extended the contact area, the longer the VOT (Stevens, Keyser, and Kawasaki 1986). The relative size of the supra-glottal cavity behind the point of constriction has been suggested to contribute to VOT differences (Maddieson 1997). In general, stops with a more extended articulatory contact have a longer VOT. The differences of the VOT have become parameters for the distinction of voiceless stops in laboratories and fieldwork.

There is a general tendency for the VOT to be longer when the closure for a stop is articulated further back in the vocal tract (Fischer-Jørgensen 1954, Cho and Ladefoged 1999, and Taff et al. 2001). If a VOT is affected by the distance between the open end of the vocal tract and the source of the compression, the VOT for a velar stop will tend to be longer than that for a bilabial stop, and the VOT for a uvular stop will tend to be longer than that for a velar stop. In other words, the VOT for a Paiwan uvular stop will be the longest among the voiceless stops as follows: uvular > velar > palatal > alveolar, given that the parameter of the VOT is straightforward. Cho and Ladefoged (1999), however, have pointed out that the factors influencing the VOT vary from language to language. Although some differences in the VOT may be determined by aerodynamic factors, others simply reflect the behavior associated with a particular language, as studies on VOTs have revealed the inconsistent variation between the stops (Cho and Ladefoged 1999 and Taff et al. 2001).

Paiwan has bilabial, alveolar, palatal, velar and uvular stops. Words were recorded in isolation form, one repetition per item, with about 3 seconds of pause in between. Only tokens without background noise were taken for VOT measures. The results are summarized in Figure 1 and Figure 2. Northern Paiwan tokens were separated from Southern and Eastern Paiwan tokens in the figures, due to the merger of voiceless stops in Northern Paiwan. The VOTs for labial stops tend to be shorter than the other two stops in Northern Paiwan, as shown in Figure 1. One-factor analyses of variance have revealed that the effect of place was significant, and there was a significant VOT difference between alveolar and velar stops. No significant differences were found between the male and female speakers for each dialect.
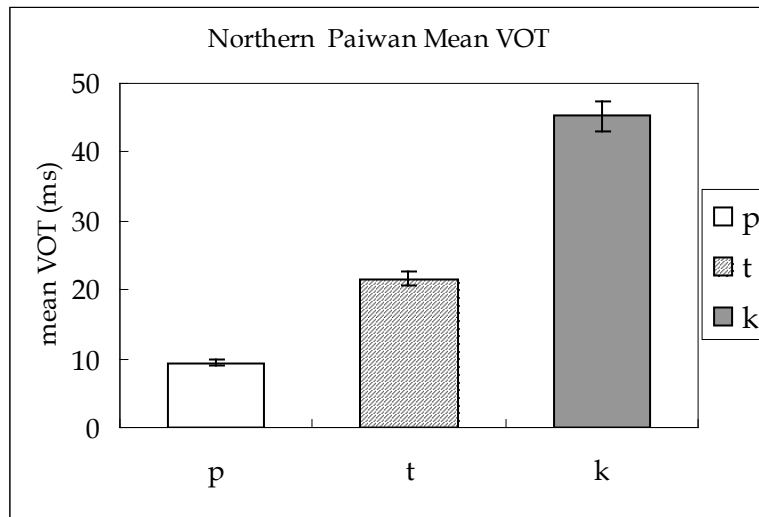
Figure 1. Mean VOT of Northern Paiwan stops
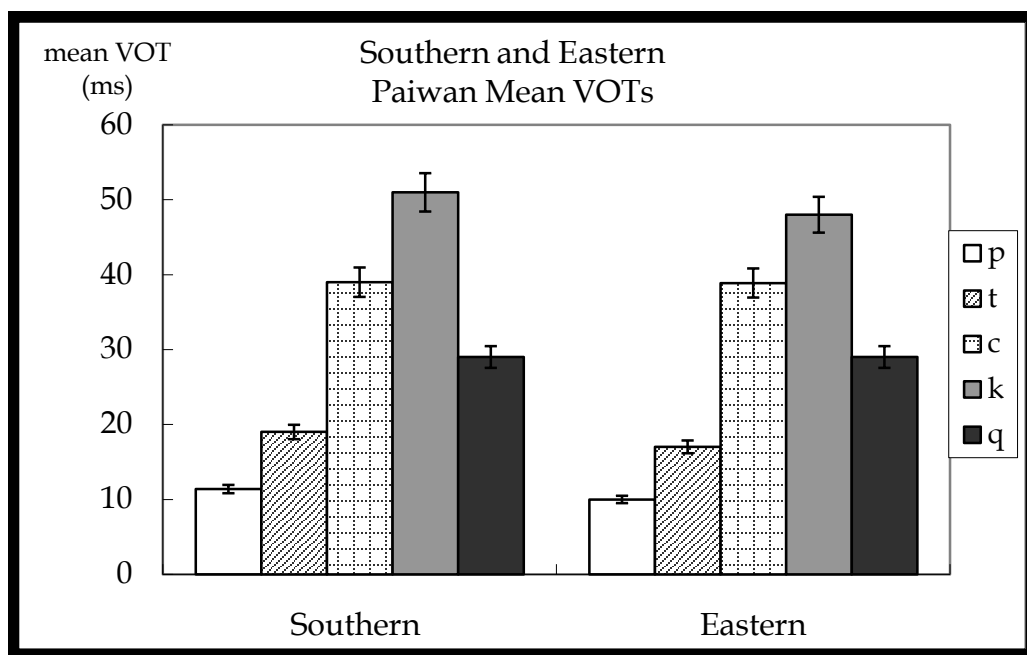
Figure 2. Mean VOT of Southern and Eastern Paiwan stops

The results agree with the general observation that stops with back articulated closure such as /k/ and /q/ have longer VOTs than /p/ or /t/. While a significant difference was found among the voiceless stops in Northern and Southern Paiwan, no significant VOT difference was found between Southern Paiwan and Eastern Paiwan. The results indicate that phonologically Southern Paiwan and Eastern Paiwan villages tend to form a grouping, whereas one observes a more heterogeneous grouping of northern villages. Phonetically, the shorter contact area might result in a short VOT for uvulars in Paiwan. Yet, alveolar /t/ and palatal /c/ in Paiwan are not only two separate phonemes; they also have independent

phonetic representations.

Cho and Ladefoged (1999) investigated VOTs in 18 languages, and they found that either velar or uvular stops had the longest VOTs in five languages that had contrasts between velar stops and uvular stops. In the Paiwan language, velar stops have the longest VOTs among the voiceless stops. However, Cho and Ladefoged (1999) found that the differences between bilabial stops and coronal stops were not significant. The present study has shown that the effect of place was significant among the Paiwan village dialects. It does not support Cho and Ladefoged's (1999) findings, as the differences between labial stops and coronal stops in Paiwan were significant. VOTs of the palatal stop /c/ were not included in Cho and Ladefoged's (1999) study and most of the studies on VOTs (Fischer-Jørgensen 1954 and Taff et al. 2001). The VOT measures of the palatal /c/ in the present project provide phonetic output of the Paiwan consonants and should be included in the specific components of the Paiwan grammar.

4. NON-STRESS PROSODIC FEATURES

Generally speaking, stress patterns are predictable in Paiwan pronouns, as long as pronouns are treated as well-formed prosodic words. However, it has been observed that second person pronouns in Paiwan demonstrate different patterns of peak prominence from other categories of pronouns in the same context. The prosody in independent pronouns is shown in Table 2. In the following paradigm, 'H' indicates a high tone. All the pronoun tokens were recorded in isolation.

Table 2. Paradigm of pronouns

Free Pronoun	**Nominative**	**Genitive**	**Accusative**
1sg	tiakən (ɓ σ)	niakən (ɓ σ)	canuakən (σ ɓ σ)
2sg	isun (σ σ) H	nisun (σ σ) H	canusun (σ σ ɕ) H
3sg	timaɟu (σ ɓ σ)	nimaɟu (σ ɓ σ)	caimaɟu (σ ɓ σ)
1pl (inclusive)	ticən (ɓ σ)	nicən (ɓ σ)	canuicən (σ ɓ σ)
1pl (exclusive)	tiamən (ɓ σ)	niamən (ɓ σ)	canuamən (σ ɓ σ)
2pl	timun (σ σ) H	nimun (σ σ) H	canumun (σ σ σ) H
3pl	tiamaɟu (σ ɓ σ)	niamaɟu (σ ɓ σ)	caiamaɟu (σ σ ɓ σ)

As shown in Table 2, second person free pronouns in Paiwan, either singular or plural, have a high pitch accent falling on the final syllable, not the stressed syllable. The pitch accent attested here has something to do with the spatial concept of the Paiwan speakers.

Second person pronouns were elicited as calling persons face-to-face. The words were not used when the recipients were not present. In other words, second person pronouns were treated as address forms, to call a listener or addressee with face-to-face distance from the speakers. Similar pitch accent was also attested in Paiwan proper names.

High pitch accent in address forms falls to the final syllable of the proper nouns or kinship terms, regardless of the quality of the vowel and the position of the stressed syllable. The assignment of the vocative accent occurs in the context where the face-to-face relationship between the speaker and the listener has been established.

5. CONCLUSIONS

Phonetic details have long been considered irrelevant in the study and documentation of phonology. The majority of field reports on Formosan languages give rather minimal details on their prosodic properties, usually one or two lines of vague description. However, the present study has supported the argument that acoustic variables play a part in the documentation of stop consonants. Phonetic studies of the Paiwan dialects play a role in the phonological representations of the Paiwan phonemes. The results have shown that alveolar /t/ and palatal /c/ in Paiwan are not only two separate phonemes but also have independent phonetic representations. The variation of VOTs should be taken into account in the documentation of phonemes.

The investigation on Paiwan pronouns and address forms has revealed that pitch accent on nouns has something to do with the spatial concept of the Paiwan speakers. Address forms were not used when the recipients were not present. In fact, vocative accent in Paiwan occurs in words, sentences, and discourse. Canonical stress rules or cyclic phonological rules cannot account for the distribution of word-level prosodic features.

The present project draws evidence from the field data and proposes an account for the interaction between phonetic variance and phonological invariance among the Paiwan dialects. The preservation of the phonetic sound files of the Paiwan dialects would help researchers understand more about the dialects and the language.

ACKNOWLEDGEMENTS

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出席國際學術會議心得報告

計畫編號	NSC 97-2410-H-005-036
計畫名稱	臺灣排灣語方言語音音韻之介面研究：語音資料庫的建立(Ⅱ)
出國人員姓名 服務機關及職稱	陳春美 (計畫主持人) 國立中興大學外國語文學系助理教授
會議時間地點	98 年 1 月 30—98 年 2 月 1 日 美國洛杉磯 (Los Angeles, USA)
會議名稱	UCLA – UC Berkeley Joint Conference on Languages of Southeast Asia UCLA-UC Berkeley 東南亞語言聯席會議
發表論文題目	Prosody in Contact: Evidence from Budai Rukai Stress 韻律接觸：來自霧台魯凱重音的實證

一、參加會議經過

　　UCLA-UC Berkeley 東南亞語言聯席會議(UCLA – UC Berkeley Joint Conference on Languages of Southeast Asia)在美國加州大學洛杉磯分校(UCLA)舉行，此次會議的重點在於結合致力於東南亞語言學各面向研究的學者，討論東南亞多種語言目前研究的現況與展望。 論述議題包括歷時性語法研究、句法學、語意學、韻律學、構詞學、音韻學、少數民族語言的習得與語言教學、語言資源、語言變化與語言計畫、語音學、語言類型學、語言接觸等，論文所涵蓋的語言甚廣，從東南亞國家語言到南島語言，還包含了東南亞地區性的手語型態等。計畫主持人在執行本計畫收集排灣語料的過程中，發現排灣語重音型態影響了鄰近霧台魯凱發音人及排灣魯凱雙語人士的言談對話重音。根據重音規則的衍生與歷時魯凱重音語料的比較、排灣語與魯凱語同源詞(cognates)的對照、以及霧台魯凱重音型態田野調查的分佈，佐證韻律接觸的事實。論文摘要被 UCLS-UC Berkeley 東南亞語言聯席會議所接受，排定於 98 年 1 月 30 日的會議 Session 2: Prosody 的場次中發表。 另外，計畫主持人並接受會議籌備小組的邀請，擔任 98 年 1 月 31 日 Session 8: Phonetics 會議場次主持人。

　　計畫主持人於 98 年 1 月 29 日搭乘長榮航空班機前往美國洛杉磯(Los Angeles, USA)。98 年 1 月 29 日抵達會場後，即展開和與會人士的交流，並聆聽其他學者發表的論述與議題。計畫主持人發表論文的場次主持人為國際知名的音韻學家 Professor Bruce Hayes，而計畫主持人所發表的論文"Prosody in Contact: Evidence from Budai Rukai Stress"當中對於田野調查霧台魯凱描述性的重音分析正是運用 Professor Hayes 的 Metrical Stress Theory。Professor Hayes 對於該篇論文所呈現的語料型態評論為相當顯著而有趣，從歷史語言學同源詞的角度切入韻律接觸的論點讓他感到相當有趣，論文值得進一步研究與深入的語料探討。UCLA 語言學系 Professor Kie Zuraw 曾與計畫主持人在其他語言學相關會議中相識，對於所發表論文的語料深感興趣，會後與計畫主持人進一步研究分析的新面向與提供音韻學上歷時的分析重點。Professor Zuraw 同時也是本次會議的籌備委員之一，與計畫主持人分享了其在籌備會議過程中的心得、在 UCLA

從事教學研究等工作的點滴。

　　計畫主持人在 UCLA-UC Berkeley 東南亞語言聯席會議中還巧遇了過去在其他南島語言相關會議中熟識的學者，比如來自泰國的 Professor Phanintra Teeranon, 與來自德州大學奧斯汀分校的 Professor Angela Nonaka。計畫主持人與 Professor Nonaka 分享了諸多德州大學奧斯汀分校語言學系與人類學系教授的近況與研究重點。Professor Nonaka 長期性在泰北地區進行語言人類學的研究，對於當地手語手勢在語言表達上的多樣性具有深入的研究。Professor Phanintra Teeranon 則曾經來過台灣參加南島形式語言學術會議，並且持續地在泰國地區從事少數民族南島語言的語音學研究；其所發表的論文 "The Interaction between Pitch and Vowel Length in Mon-Khmer and Tai Languages: Evidence for Tonogenesis Theory" 提供語音學的韻律型態提供新的實證，與計畫主持人本計畫的研究重點亦具相關性。計畫主持人在會議晚宴中與多位學者更進一步交流東南亞語言的研究現況與新的研究方法：

　　UCLA-UC Berkeley 東南亞語言聯席會議中許多論文著重在實証研究、歷時分析、少數民族語言教育語言習得的議題、語言學與科技整合性的研究。如何紀錄東南亞地區少數民族語言及進行語言資源重建計劃等，皆為當代值得重視的課題。從來自世界各地學者們所發的論文與研究的深度與廣度，更讓計畫主持人學習東南亞語言不同層面的研究方法與認知諸多現況。會議中還有諸多值得探討的議題，比如爪哇語會話中動詞的低及物性、高棉語中的新詞來源、越南語的節律型態、印尼語的語法語意形式結構等，呈現東南亞語言的多樣性與豐富性。計畫主持人也在會後與其他論文發表人進行交流，並請教資深學者在語言歷史重建方面的研究重點。　此行 UCLA-UC Berkeley 東南亞語言聯席會議讓計畫主持人對當代東南亞語言各面向的研究，有更深入的了解與思考，是相當難能可貴的經驗。計畫主持人於會議活動結束後即搭機返回台灣，結束這次豐收的東南亞語言之旅。

二、與會心得

　　此次會議囊括主題甚廣，從理論到實證研究，語言教學至語言政策計畫，包括經由影帶呈現的手勢所傳達的意念，實驗結果的剖析、多種語言形式結構的分析、關聯性理論的延伸與應用等。對於計畫主持人而言，印象最深刻的是記錄少數民族語言的科際整合與以語料庫為基礎的語言形式分析；對於語言類型學的研究，則有了新的理解。語料庫的建置與實證語料的分析，為本研究計畫的重點之一。

　　綜觀言之，對於當代東南亞語言學的研究發展與應用，此次國際會議提供了多面向的探討，也讓與會學者認知此研究領域待努力之處與不同面向進一步的研究重點；對於發表論文的語言學、人類學、語言教學學者，也提供了交流與新的思考層面。計畫主持人也從擔任場次主持人的過程中感受到此領域學者對於研究議題的熱衷與探究的濃厚興趣。相信這些研究成果及討論交流，都將成為當代對於東南亞語言研究有興趣的學者研究的新動力。也相信每個與會學者，經由這次國際會議的交流，對於其研究議題，都會有更精益求精的後續探討及論述。

　　東南亞語言研究與表述的多樣性，遠超乎計畫主持人先前的預期。對於東南亞諸多少數語言的類型與形式認知，計畫主持人仍屬起步階段。我們若能從國際交流、參與國際會議的經驗學習如何開展學術領域的深度與廣度，對於台灣語言學的發展與未來，皆有所助益。

出席國際學術會議心得報告

計畫編號	NSC 97-2410-H-005-036
計畫名稱	臺灣排灣語方言語音音韻之介面研究：語音資料庫的建立(Ⅱ)
出國人員姓名 服務機關及職稱	陳春美 (計畫主持人) 國立中興大學外國語文學系助理教授
會議時間地點	98 年 3 月 12—98 年 3 月 14 日 美國夏威夷(Hawaii, USA)
會議名稱	The 1st International Conference on Language Documentation and Conservation 第一屆語言記錄與保存國際會議
發表論文題目	Sound Files and the Phonetics-Phonology Interface in Paiwan 聲音檔案與排灣語語音音韻介面之探討

一、參加會議經過

　　第一屆語言記錄與保存國際會議(The 1st International Conference on Language Documentation and Conservation)在美國夏威夷大學(University of Hawaii at Manoa)舉行，此次會議的重點在於討論少數民族語言及瀕臨絕種語言的記錄與保存的方法與現況之探討。 計畫主持人在執行本研究計畫收集排灣語各次方言語料的過程中，發現排灣語在音韻類別與語音變化之間的互動，藉由數位音檔之保存，直接體現語音音韻無法分離之關係。記錄臺灣排灣語的過程中，常面臨音位建立之後的地域性語音變化的挑戰。音位與從數位音檔中得到的語音實證，兩者可以相輔相成。「聲音檔案與排灣語語音音韻介面之探討」(Sound Files and the Phonetics-Phonology Interface in Paiwan)該篇論文排定於 98 年 3 月 13 日的會議中發表。

　　98 年 3 月 12 日抵達會場後，即展開和與會人士的交流，並聆聽其他學者發表的論述與議題。會議論文論述相當多樣化，田野調查語料的類型探討，包括原始資料(raw data)、主要資料(primary data)、以及結構性的資料(structural data)：根據語言保存資料需求的不同，在收錄與處理語料的階段各自有其評量標準；不論哪一類資料，皆為記錄語言學提供訓練過程中的核心目標。會議所探討記錄的語言，包括 Kawesqar (the last spoken Fueguian language)、北瑞典的少數民族語言、澳洲的原住民語言、秘魯亞馬遜河的 Iquito、馬雅語言、北歐的 Saami、Baïnouk、Fataluku、Anishinaabe (Ojibwe)、秘魯的孤立語言 Aymara、墨西哥的 Mocho′與 Cajonos Zapotec、Macuiltianguis Zapotec、阿拉斯加語言、菲律賓語言、Michif(s)、非洲語言 Mankon 與 Cameroon、巴基斯坦與印度邊境的 Burushaski 語言、Ikema Ryukyuan、Hezhen (Kile, a Tungusic language)、沖繩語言(Okinawan language)、美國加州的 Kumiai 語言、巴西的 Akuntsú (目前僅剩 6 人使用)、新幾內亞島的 Tobati 語言、北美印第安語言 Cherokee、萬那杜的

Neverver 語言、孟加拉語、Bédik、Kove、非洲蘇丹的語言記錄計畫、智利的 Kawesqar 語言文化、Uto-Aztecan 的 Tohono O'odham 語言、Nez Perce 語言、Cajun French、印尼的 Dhao 語言，以及臺灣的南島語言等。所有曾經在書面上見過的語言與未曾謀面的語言，皆在此次國際會議中現身展示。論文所涵蓋的範圍包括田野調查方法的探討、記錄與保存的施行細則與過程、研究工具、科技的運用與效應、語言文化的流失與保存復甦、口語文化的記錄、語言社區的互動與評估、語料處理的方式與軟體、田野調查設備與效能、語言記錄與語言形式的保存、語言記錄保存計畫執行的成果效應與評估等。對於計畫主持人而言，參與聆聽每一場論文發表皆有嶄新的收穫，此會議可謂之為世界少數民族語言的巡禮，每一篇論文都是研究者長期努力的結晶，論文的背後，皆有動人的調查研究少數民族語言的故事。

計畫主持人與此次會議巧遇過去於美國德州奧斯汀大學求學期間的同學與系友 Prof. Sadaf Munshi 與 Christine Beier，他們過去皆著力於少數民族語言的調查研究，對於少數民族語言的熱情歷經多年仍不減反增，與他們再次見面，場面相當溫馨；大家分享了於少數民族語言社區工作的情形與研究的進度等，也給彼此勉勵，作為進一步研究的動力。在參加會議過程中，也與其他的田野工作者互相分享田野調查工作的情形，如何在研究方法與工具方面力求精進，與會的資深學者給予諸多建設性的意見。此次會議也與台灣中央研究院語言學研究所的研究員 Prof. Elizabeth Zeitoun 會面，Prof. Elizabeth Zeitoun 提供了論文改進的方法與重點，計畫主持人受益良多。

此次會議令人印象深刻的，是日本近幾年來在少數民族語言記錄與保存方面所運用的科技軟體與執行進度，遠遠超乎其他國家性的語言計畫規模。日本學者在對於語言保存方面所研發的技術與方法令人佩服，他們所付出的熱情與執行成果，足以作為保存或記錄台灣少數民族語言的研究者或民間田野調查工作者努力方向的參照。另外，許多學者也提供與少數民族部落或社區建立良性互動關係的步驟與方法。當所有來自世界各地的田野調查研究人員齊聚一堂時，所激盪出來的火光，是相當壯觀的。

第一屆語言記錄與保存國際會議(The 1st International Conference on Language Documentation and Conservation)是一場豐盛的少數民族語言及瀕臨絕種語言記錄與保存的饗宴。諸多學者的建議與提問，也讓計畫主持人對於論文有進一步深入分析與改進的方向。礙於學校課程的安排，計畫主持人於主要會議結束後即搭機返回台灣，結束這次豐收的美國夏威夷語言記錄與保存之旅。

二、與會心得

此研討會開拓了計畫主持人對於少數民族語言的認識與日新月異的田野調查方法，最大的感動來自於多位論文發表人對於少數民族語言的熱情與執著。對於計畫主持人而言，最為實用的是以語料庫為基礎的田野調查步驟與方法，因為語料庫的建置與語料的分析，為本研究計畫的重點。語言記錄與保存以及語料庫為基礎的研究，無論是語言學形式上的分析或是語言習得方面的教材與復甦計畫的基礎題材等，共通點為耗時及費力，

但都具有實證性與說服力。語言記錄與保存的科技日新月異，現代田野調查工作者必須實事求是，運用科技同時力求語料的完整性與語言文化全貌的保留。這不是一項件單的工作，卻是深具意義與影響深遠的任務。

　　此次會議對於少數民族語料庫的建置與字典的編纂等議題，亦有所論述。將田野調查語料分類為不同的年齡層或以研究需求進一步分類，對於本研究計劃，是積極性的建議。此學術會議中所發表的論文，對於拯救瀕臨絕種語言的方法與步驟著墨較少，且多處於起步階段；此現象不禁令人懷疑：絕種語言是否真能復活？

　　綜觀言之，對於少數民族語言及瀕臨絕種語言的記錄與保存的方法與現況，此次國際會議提供了全面性的探討。與其他來自地球各個角落致力於語言保存工作的研究者面對面交流，讓計畫主持人察覺：少數民族語言的記錄與保存工作，一點也不孤單。此次會議也提供了計畫主持人諸多新的思考層面，相信這些研究成果及討論交流，都將成為當代對於少數民族語言及瀕臨絕種語言的記錄與保存的方法有興趣的學者努力的新動力。也相信每個與會學者，經由這次國際會議的交流，對於其研究議題，都會有更精益求精的後續探討及論述。台灣南島語言的記錄與保存，也在這一次的國際學術會議中現身，是相當可喜的現象，值得政府相關單位後續的鼓勵與支持。

1 🔲 Prosody in Contact:
Evidence from Budai Rukai Stress

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2 🔲 Outline of the Talk
- Fieldwork data: segmental phonology, phonetic representations and prosody of Budai Rukai
- Important findings: prosodic patterns, extrametricality and its implications
- Generalization of the characteristics of Paiwan and Budai Rukai prosody
- Prosody in contact

3 🔲 Background Information
- Budai Rukai: one of the Rukai dialects spoken in Pingtung County
- Budai tribes investigated:
    1=Budai; 2=Haocha
    3=Southern Sanhe (village with Northern Paiwan speakers)

4 🔲 The Rukai Language
- The Rukai language is divided into six dialects: Tanan, Budai, Labuan, Tona, Maga, and Mantauran
- Internal Relationship of the Rukai Dialects (Li 1977a, 1995)   Rukai

        BTL   MTM

            TL   MT   M

    Budai   Tanan Labuan   Maga Tona Mantauran

5 🔲 Earlier studies on Budai Rukai
- Much more interest has been focused on whether Rukai is closer to Tsouic or Paiwanic branch (cf. Li 1977a; Ho 1983)
- Shelley (1978) deals with some socio-linguistic aspects of the Budai dialect of Rukai, with an analysis of the genetic relationship with the other Rukai dialects
- Phonemic inventory of Budai Rukai has been constructed in Li's (1995) wordlist
- Zeitoun's (2000) reference grammar

6 🔲 Significance of Budai Rukai

- Budai is referred as Rukai proper
- Although the influence from Paiwan is inevitable, Budai is considered as the most representative Rukai dialect in terms of phonological change (Li 1995)
- Based on Li's (1977a) data, Ross (1992) proposes that the oxytones of Budai are apparently the last remnants of PAN contrastive stress

7 🔲 Significance of the Paiwan Language
- Paiwan is notable for its large sum of consonantal phonemes, compared with the other Formosan languages
- Paiwan does not show extensive mergers and splits among Proto-Austronesian (PAN) stops (Ferrell, 1982)
- Paiwan phoneme inventory is directly comparable to the PAN inventory proposed in Dempwolff's (1934-38) and Dahl's (1973) reconstruction studies

8 🔲 PAN Accent Patterns
(Wolff, 1993)
- In Proto-Austronesian (PAN) the stress patterns fell on the penult of the root if it was long (or accented) and on the final syllable of the root if the penult was short (or unaccented)
- Vowel reduction to schwa in various Formosan languages provides evidence for lost stress
- There has been a tendency for the number of roots with penultimate stress to increase in Formosan languages

9 ▣ Problems of Budai Rukai
  ■ Irregular stress: oxytone, paroxytone, and proparoxytone???
  ■ Ross (1992) proposes the following patterns in Budai Rukai
    1. Trisyllables: second syllable accented
    2. Quadricsyllables: second syllable accented
    3. CVCV: penult accented
    4. CVCVC: accent unpredictable
  ■ Blust (1997) points out that Ross's theory yields an incorrect prediction in about 43%
  ■ Influence from Northern Paiwan

10 ▣ Classification and Evidence for Austronesian Accent (Zorc, 1993)
  ■ Paiwan: paroxytone, with accent (with or without secondary vowel lengthening) falling regularly on the penult
  ■ Schwa could neither be long nor stressed
  ■ Grammatical use of accent is proposed for verbs (falling on the ultima)
  ■ Certain syntactic classes, such as pronouns, deictic, interrogatives, negatives, and numerals had accent on the final syllable

11 ▣ Empirical studies in need
  ■ Phonological variation of lexical stress and phonetic representation of lexical stress in Budai Rukai
  ■ Prosodic aspects of Rukai have rarely been investigated in earlier studies
  ■ Phonetic variation of Budai Rukai: speakers in Budai mountain area or those in contact with Northern Paiwan

12 ▣ Consonants of Budai Rukai

13 ▣ Syllable Structure of Budai Rukai
  ■ Onset is not obligatory in Budai Rukai
  ■ There is no word-final coda.
  ■ Phonetically, however, high vowels in the vowel sequences may be realized as glides in natural speech

                          σ

           Onset   Rhyme

                          Nucleus

              (C)   V   (V)

14 ▣ Some Field Data…

Budai	Gloss	Budai	Gloss
a. bitsiŋi	'skin'	ma-palili	'salty'
b. patsulu	'knee'	uŋulu	'to drink'
matuḻulu	'thirty'	mapitulu	'seventy'
c. ma-rətəsə	'faint'	ḻəpəŋə	'to finish'
d. ḍamarə	'moon'	ḻidamə	'tongue'
mapusalə	'twenty'	maḻimalə	'fifty'

15 ▣ More Field Data…

Stem	Gloss	Imperative	Gloss
a. uŋulu	'to drink'	uŋul-a	'Drink!'
b. ələbə	'to close'	ələb-a	'Close!'
c. tətərə	'to kick'	tətər-a	'Kick!'
d. səkətə	'to hide'	səkət-a	'Hide!'
e. kanə	'to eat'	kanə-a	'Eat!'
f. piḻi	'to choose'	piḻi-a	'Choose!'
g. sauḻi	'to return'	sauḻi-a	'Return!'

16 ▣ Echo Vowels in Budai Rukai
- Echo vowels are treated as epentheses to avoid consonantal coda in Budai Ruka
- Echo vowels are extrametrical in the representation of stress
- In word-level prosody, echo vowels are never stressed and never lengthened

17 ▣ Canonical Stress Patterns

Budai Rukai	GLOSS
a. dáə	'earth'
b. ḷáva	'flying squirrel'
c. válisi	'tooth'
d. ə́bəḷə	'smoke'
e. túburu	'bamboo shoot'
f. okóoɖo	'crutch'
g. karáaða	'pangolin'
h. ləgə́ḷəgə	'mountain'

18 ▣ Secondary Stress

Budai Rukai	GLOSS
a. kalàkətsə́lanə	'winter'
b. kàikamə́anə	'today'
c. tàtsəkə̀tsəkə́lanə	'family'
d. tàraɖámarə	'one month'
e. muàḷiŋə́dələ	'noon'
g. lupàkaváalə	'the day after tomorrow'

19 ▣ Stress in Prefixed or Infixed Forms
- Primary stress never falls on prefix or infix morphemes
- Stress falls on heavy monosyllabic roots, light or heavy penult of disyllabic roots, heavy penult or antepenultimate syllable of trisyllabic or longer roots.

wa$_{prefix}$-pəə$_{stem}$ wapə́ə   'to squeeze'
wa$_{prefix}$-tinono$_{stem}$ watínono   'to weave'
ma$_{prefix}$-busuku$_{stem}$ mabúsuku   'drunk'
si$_{prefix}$-a$_{infix}$-titi$_{stem}$ siatíti   'to hit'
tu$_{prefix}$-a$_{infix}$-saapa$_{stem}$ tuasáapa   'to weave a mat'
ŋi$_{prefix}$-a$_{infix}$-vələvələ$_{stem}$ ŋiavələ́vələ   'to move'

20 ▣ Stress in Suffixed Forms
- Primary stress falls on the antepenultimate syllable of each suffixed word

kanə-anəsuffix   kanə́anə   'food'
wa-ɖəələ -ŋasuffix   waɖə́ələŋa   'saw'
maprefix-pusa-ləsuffix   mapúsalə   'twenty'
a-ələb-anəsuffix   aəlóbanə   'to be closed'
sanu-tuḷu-lusuffix   sanutúḷulu   'three times'
kala-bətsəŋ-anəsuffix   kalabətsə́ŋanə
                                                'millet festival'

21 ▣ Stress in Budai Rukai
- Generalization: when long vowels occur at penult, they get main stress
- Primary stress in Budai Rukai falls on
  (i) heavy monosyllabic roots
  (ii) the penultimate syllable of disyllabic roots (iii) the heavy penult or the antepenultimate syllable of tri-syllabic or longer roots and suffixed forms
- Long vowels in the other positions where they do not receive main stress are shortened

22 ▣ Parameters of Lexical Stress
(cf. Metrical Stress Theory in Hayes 1995)

(1) Syllable Extrametricality

$\sigma \rightarrow <\sigma> / \_\_\_]_{word}$

where σ is not a monosyllabic root

(2) Foot Construction: Form moraic trochees
from right to left
Degenerate feet are permitted only in
strong position

(3) Word Layer Construction: End Rule Right

23 ▣ **Extrametricality**
(Hayes 1981; 1995)
- $X \rightarrow <X> / \_\_\_\_]D$
- An extrametricality rule designates a particular prosodic constituent as invisible for purposes of rule application
- Restriction on extrametricality:
  a. Constituency: only constituents (seg, syll, ft, ph-wd, affix) may be marked as extrametrical
  b. Peripherality: a constituent may be extrametrical only if it is at a designated edge (left or right) of its domain
  c. Edge Markedness: the unmarked edge for extrametricality is the right edge

24 ▣ **Quantity-Sensitive Stress in Budai Ruaki**
- WSP: Heavy syllable are stressed (Prince and Smolensky 1993)
- Leftmost: Align (Hd-Ft, Left, PrWd, Left)
  The head foot is leftmost in PrWd
- Rightmost: Align (Hd-Ft, Right, PrWd, Right)
  The head foot is rightmost in PrWd
- NonFinality (Prince and Smolensky 1993)
  No prosodic head is final in PrWd
- Critical constraints in Budai Rukai:
  NonFinality>> WSP, Rightmost>> Leftmost

25 ▣ **Evaluation of Earlier Account**
- Ross's (1992) approach
  1. *Trisyllables: second syllable accented
     > Heavy penultimate syllables are stressed
  2. *Quadricsyllables: second syllable accented
     > Antepenultimate syllables are stressed
  3. *CVCV: penult accented
     > Form moraic trochees from right to left
       and End Rule Right

26 ▣ **Implications of Extrametricality**
- Li (1977a) argues that echo vowels must be given in the Lower Three Villages of Rukai but may be optional in Tanan dialect
- Echo vowels exist in Proto-Rukai, and echo vowels should be historically inherited from Proto-Rukai (Li 1977a)
- All the echo vowels in Budai Ruaki were perceived clearly, except for the schwa /ə/
- Extrametricality in Budai Rukai is a reflex of the historical development of echo vowels

27 ▣ **Stress in Northern Paiwan**
- Penultimate Stress in Northern Paiwan
  (cf. Metrical Stress Theory in Hayes 1995)
  (1) Foot Construction: Form syllabic trochees from right to left
  (2) Word Layer Construction: End Rule Right

```
        x   )              (x   )
      .)(x  .)            (x   .)
```

$\cdots \sigma\ \acute{\sigma}\ \sigma\ \#$ and $\quad\#\ \acute{\sigma}\ \sigma\ \#$

28 🔲 Contact Stress Variation
- Budai Rukai speakers who live in the Southern Sanhe Village or have frequent contact with the Paiwan speakers tend to produce the Paiwan stress patterns
- Canonical Rukai stress patterns are retained in elder speaker's utterance
-

29 🔲 Examples of Stress Variation
- Three-syllable words

Budai Stress	Stress Variation	GLOSS
válisi	valísi	'tooth'
ábələ	əbə́lə	'smoke'
túburu	tobóro	'bamboo shoot'
vágisi	vagísi	'thigh'

- Four-syllable words

dərə́dərə	dərədə́rə	'thunder'

- Five-syllable words

takurápaŋə	takurapáŋə	'toad'

30 🔲 Cognates

	Budai Rukai	Northern Paiwan	GLOSS
a.	tsáki	tsáʔi	'excrement'
b.	válisi	ális	'tooth'
c.	luáŋə	luáŋ	'cattle'
d.	látsəŋə	látsəŋ	'vegetables'
e.	ŋisíŋisi	ŋísŋis	'beard'
f.	káatsə	k-əm-áts	'to bite'
g.	kánə	k-əm-án	'to eat'
h.	údalə	ʔúdal	'rain'

31 🔲 Phonetic Representation of Stress
- Four types of stress patterns were measured for comparison (N=32)
  Type I: stressed penult and unstressed final
  Type II: stressed antepenult and unstressed penult
  Type III: stressed antepenult and unstressed final
  Type IV: stressed antepenult and unstressed initial

32 🔲 Contrast of Stressed Penult and Unstressed Final
33 🔲 Contrast of Stressed Antepenult and Unstressed Penult
34 🔲 Contrast of Stressed Antepenult and Unstressed Final
35 🔲 Contrast of Stressed Antepenult and Unstressed Initial
36 🔲 Phonetic Correlates of Stress in Budai Rukai
- Pitch is the most robust phonetic correlate in Budai stress
- Higher pitch is always associated with stressed Budai syllables, whereas vowel length is subject to its position in words
- Peak prominence in the pitch tracks verifies the presence of phonological stress variation
- Phonetic representation of vowel length supports the argument of penultimate lengthening (Long: Short= 2.08: 1)

37 🔲 Pitch Tracks of Variation
38 🔲 Distinction between Paiwan and Budai Rukai stress
39 🔲 Historical Derivation of Stress
40 🔲 Contact Phonology
41 🔲 Language Contact
(Dutton & Tryon, 1994)

- Language contact is widespread in island Southeast Asia and the Pacific
- The Austronesian area provides excellent opportunities for studying language contact: the area is estimated t contain approximately one-quarter of the world's languages
- There has been and continues to be considerable and varied contact between speakers of Austronesian languages
- In some cases a particular Austronesian language has been imposed on others

42 ▢ **Prosody in Contact**

- Antepenultimate stress in three-syllable, four-syllable, and five-syllable Budai Rukai words shifts to the penultimate position
- The pattern in variation violates the general principle of Budai Rukai stress
- Because of the cognates shared with Northern Paiwan, and because of being surrounded by the Northern Paiwan speakers in the plain areas, stress patterns in Budai Rukai were affected by Northern Paiwan stress

43 ▢ **Documentation of Prosody**

- Documentation and analysis of prosody in the two Formosan languages have never been described in any earlier theoretical study or field report
- Indicators that reflect the contrastive stress in PAN: syllable extrametricality in Budai Rukai
- Position in a prosodic word may determine the vowel length of a syllable
- Stress variation of Budai Rukai reported in the current study has provided direct evidence for the language contact in Formosan languages

44 ▢ **Paiwan-Budai Continuum**

45 ▢ **Concluding Remarks**

- Documentation of phonological varieties is the base for historical reconstruction
- Phonetic variation and sound change are relevant to phonological representation and the preservation of an indigenous language
- Empirical and instrumental studies are needed to verify the phonetic categories in a speech community with diverse varieties
- Description of phonology and prosody is the prerequisite for a comprehensive grammar of Paiwan and Budai Rukai

46 ▢

The End

Thank you!

Sound Files and the Phonetics-Phonology Interface in Paiwan

Paiwan is an Austronesian language spoken in Southern Taiwan, with around 66,000 speakers

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Outline of the Project

- The present project draws evidence from the field data and proposes an account for the interaction between *phonetic variance* and *phonological invariance* among the Paiwan dialects

- Construction of voice corpus

- Compilation of varieties from different village dialects

- The interaction between phonetic variation and phonological distinctive features

- The application of the principles and the methodology in Laboratory Phonology and Acoustic Phonetics

The Paiwan Language

- Paiwan is notable for its large sum of consonantal phonemes
- Paiwan does not show extensive mergers and splits among Proto-Austronesian (PAN) stops
- *Central and southern Paiwan villages tend to form a loose grouping, opposed to an even more heterogeneous grouping of northern and eastern villages* (Ferrell 1982)
- Paiwan is divided into an uncertain number of dialects and dialectal variants (Hua and Zeitoun 2005)
- It is rather *difficult* to map the phonemic distribution of *tj* and *dj* in *geographical* terms (Ho 1978)

Investigation of Paiwan village dialects

- **Pingtung County:** *Sandimen, Majia, Taiwu, Gulou, Shimen, Mudan village dialects*

- **Taitung County:** *Dawu and Taimali village dialects*

Usage of Sound Files

- Measures of Voice Onset Time
- Formant plots for Paiwan speakers from different village dialects
- Phonetic correlates of stress in Paiwan: measures of vowel durations, pitch high, and intensity of stressed and unstressed vowels
- F0 realization of (imperative) accents: '(we) Buy!'
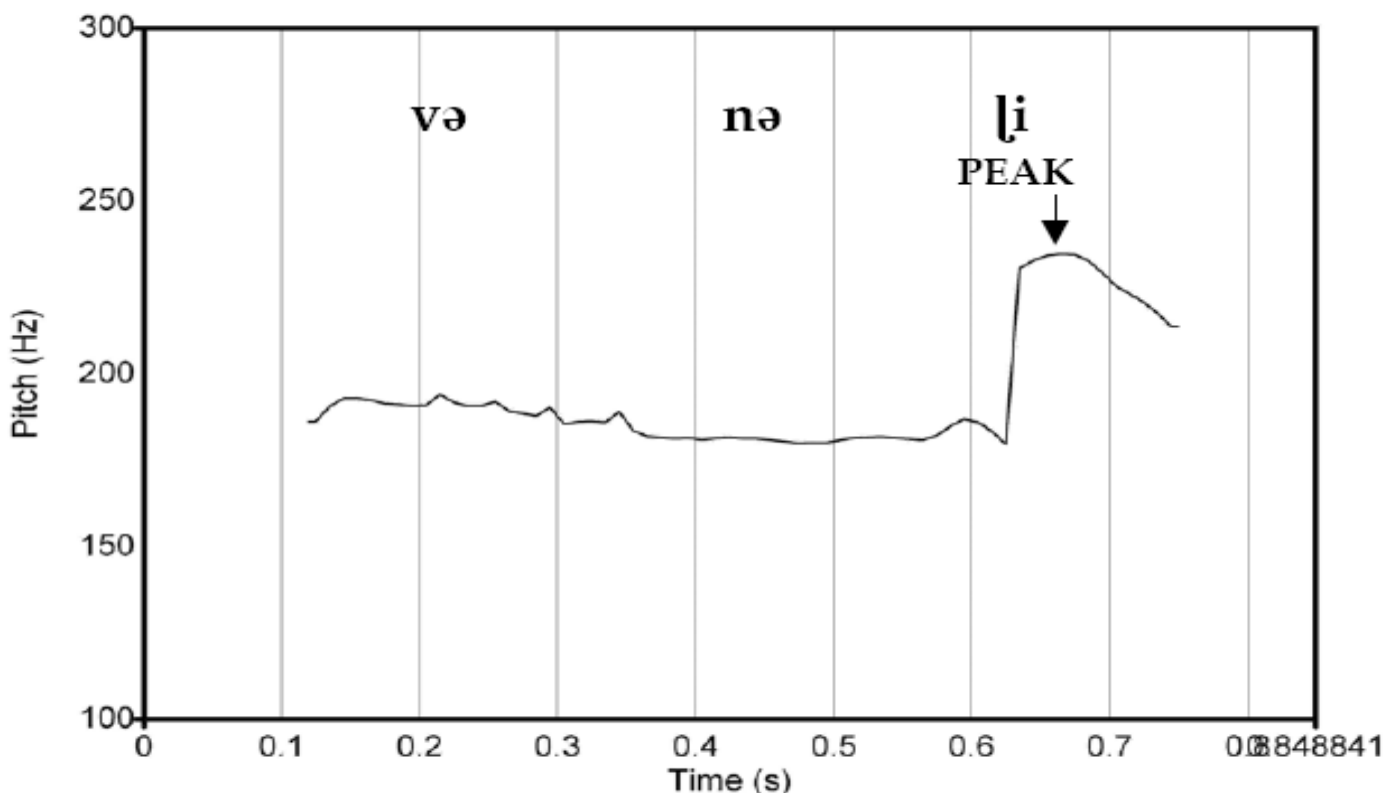
Paiwan Consonants

Sandimen Paiwan Consonants

	Bilabial	Alveolar	Retroflex	Palatal	Velar	Uvular	Glottal
Plosive	p b	t d	ɖ		k g		ʔ
Fricative	v	s z					h
Affricate		ts					
Trill		r					
Nasal	m	n			ŋ		
Lateral		l	ɭ				
Approximant	w			j			

Piuma Paiwan Consonants

	Bilabial	Alveolar	Retroflex	Palatal	Velar	Uvular	Glottal
Plosive	p b	t d	ɖ	c ɟ	k g	q	ʔ
Fricative	v	s z					(h)
Affricate		ts					
Trill		r					
Nasal	m	n			ŋ		
Lateral			ɭ	ʎ			
Approximant	w			j			

Phonetic Measurements

- Measures of Voice Onset Time (VOT): measures were taken for the voiceless non-aspirated stops of Paiwan

   VOT: the interval between the release of the closure and the point in time at which vocal-cord vibration starts

- The interval between the onset of the release burst and the first glottal pulse was measured on simultaneous waveform and spectrographic displays

- VOT varies with different place of articulation, and the further back the closure, the longer the VOT (Fischer-Jørgensen, 1954; Peterson & Lehiste, 1960)

- The more extended the contact area, the longer the VOT (Stevens, Keyser & Kawasaki, 1986)

Methods and Results

- The recorded data were sampled at 20,000 Hz using the PCquirer spectral analysis system

- A total of 312 elicitation tokens (60 X 4 speakers, plus 36 X 2 speakers) from six Paiwan native speakers were measured

Word List for VOT Measurements

CV	Paiwan	Gloss	CV	Paiwan	Gloss
pi	piku	'elbow'	ca	cakit	'hunting knife'
pu 🔊	puk	'tree bean'	cə	cəvus	'sugarcane'
pa	padaj	'rice plant'	ki	kinsa	'cooked rice'
pə	pənaɳuʈ	'to hit (with stick)'	ku 🔊	kutsu	'head louse'
ti	tima	'who'	ka	kapaz	'root'
tu 🔊	tutsu	'now'	kə	kədi	'small'
ta	tatsu	'clothing louse'	qi	qiʕas	'moon'
tə	təquɳ	'horn'	qu 🔊	quɟaʕ	'rain'
ci	cigərav	'larynx'	qa	qaʕits	'skin'
cu 🔊	curuvu	'many (people)'	qə	qətsap	'chopsticks'

Mean VOTs

Sandimen Paiwan Mean VOT
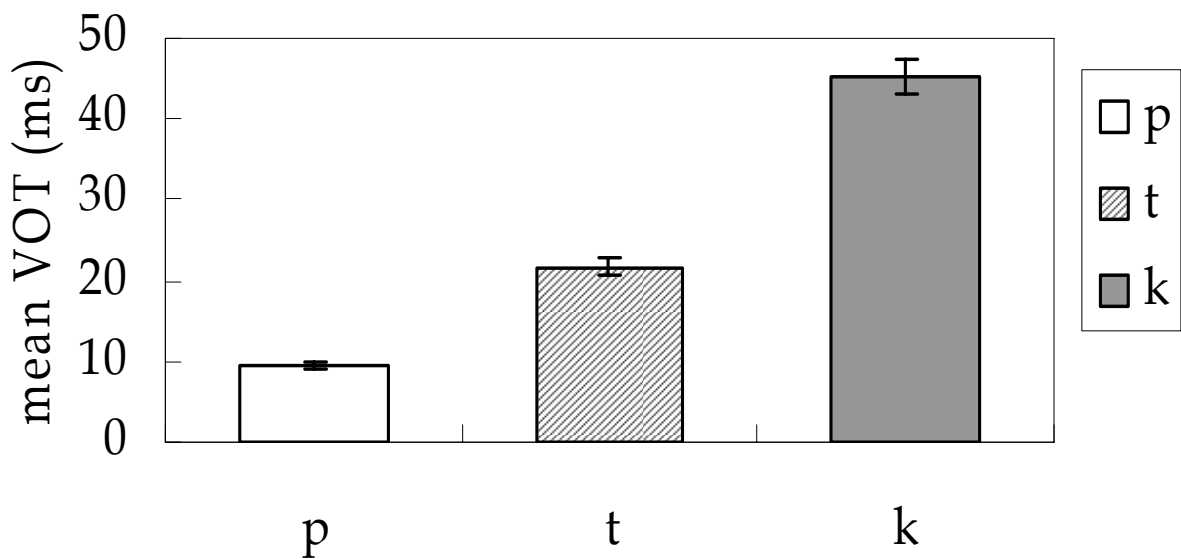
Piuma and Mudan Paiwan Mean VOTs
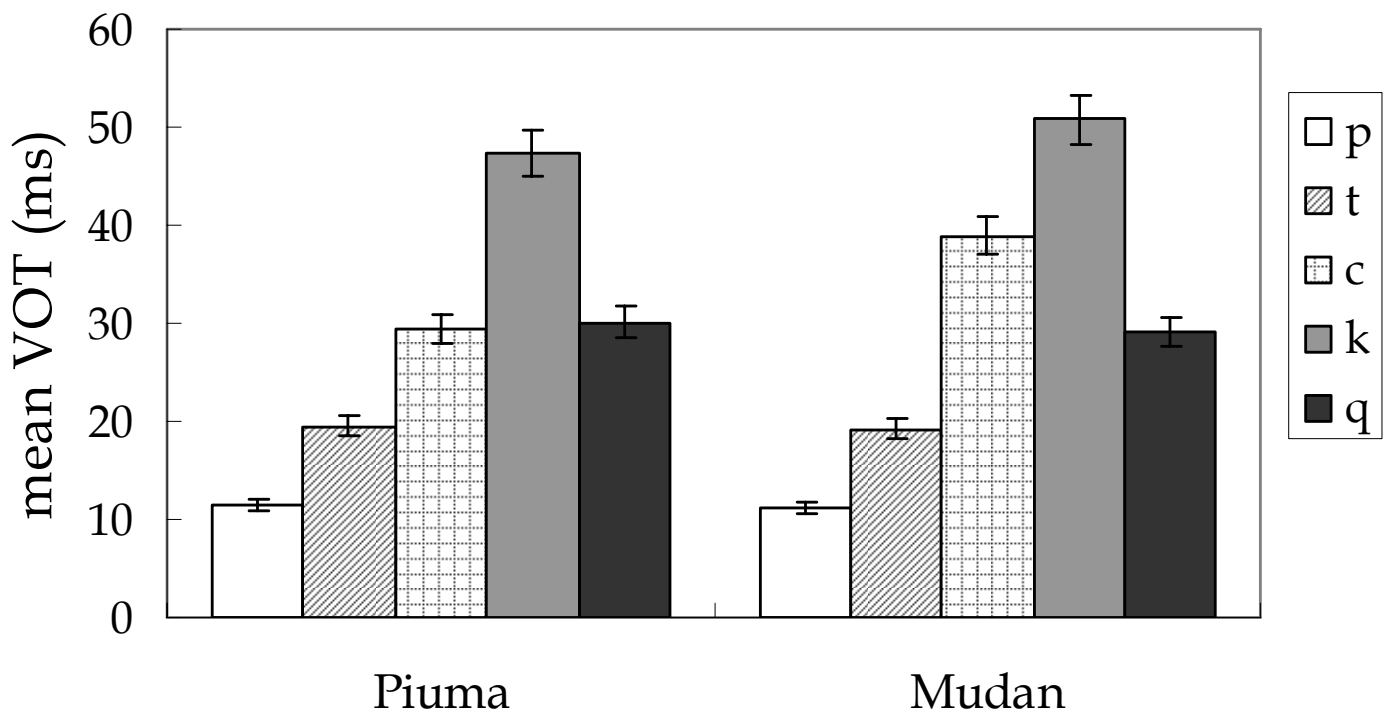
Discussion

- The results (Sandimen Paiwan: $F[2,69]=38.77$, $p<0.0001$; Piuma Paiwan: $F[4,115]=83.49$, $p<0.0001$; Mudan Paiwan: $F[4,115]=88.24$, $p<0.0001$) indicate that there was a significant difference in VOT between the consonants

- Stops with back articulated closure such as /c/ and /k/ have longer VOTs than /p/ or /t/

- But uvular /q/ has shorter VOT than velar /k/

- No significant VOT differences were found between Piuma and Mudan Paiwan village dialects

- The shorter contact might result in a short VOT for uvular stops in Paiwan

- Alveolar and palatal voiceless stops in Paiwan are not only two separate phonological phonemes but also two independent phonetic representations

Phonetics-Phonology Interface

- Sound patterns can operate as abstract phonological rules; there are language specific phonetic rules which must be part of the grammar of each language (Keating 1985, 1990; Pierrehumbert 1990; Cho & Ladefoged 1999)

- Longer VOT for voiceless palatal stop and shorter contact area for uvular stop

- Format plots support the dispersion theory (Liljencrants and Lindblom, 1972)

- Pitch as a phonetic correlate of Paiwan stress: stressed syllables always have higher **pitch** than unstressed syllables, and **pitch** tends to be a robust cue for the production and perception of Paiwan stress

- The pitch accent attested has something to do with the spatial concept of the Paiwan speakers

Concluding Remarks

--Empirical and instrumental studies are needed to verify the phonetic-phonological varieties in a speech community

--Description of phonetic and phonological variation is the prerequisite for a comprehensive Paiwan grammar