Linguistik Aktuell Linguistics Today 167

Austronesian and Theoretical Linguistics

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Amsterdam / Philadelphia

Library of Congress Cataloging-in-Publication Data

Austronesian and theoretical linguistics / edited by Raphael Mercado, Eric Potsdam and Lisa deMena Travis.

p. cm. (Linguistik Aktuell/Linguistics Today, ISSN 0166-0829 ; v. 167)

"The papers presented within this volume were selected from the fourteenth meeting of the Austronesian Formal Linguistics Association (AFLA XIV), held May 4-6, 2007 at McGill University in Montreal, Quebec, Canada."

Includes bibliographical references and index.

1. Austronesian languages--Congresses. I. Mercado, Raphael. II. Potsdam, Eric, 1964- III. Travis, Lisa deMena.

PL5022.A96 2010

499'.2--dc22 2010028219

ISBN 978 90 272 5550 1 (Hb ; alk. paper)

ISBN 978 90 272 8775 5 (Eb)

John Benjamins Publishing Co. · P.O. Box 36224 · 1020 ME Amsterdam · The Netherlands

John Benjamins North America · P.O. Box 27519 · Philadelphia PA 19118-0519 · USA

Acknowledgements

In May of 2007 McGill University hosted the 14th Meeting of the Austronesian Formal Linguistics Association (AFLA). We would like to express our gratitude to all those who were involved in the conference and resulting selected proceedings. The conference was generously funded by the Social Sciences and Humanities Research Council of Canada, the Linguistics Department at McGill University, and the Taipei Economic and Cultural Office. We gratefully thank the students at McGill University, (Alyona Belikova, Gustavo Beritognolo, Jarren Bodily, Heather Burnett, Eva Dobler, Deena Fogle, Blakey Larsen, Luisa Meroni, Joey Sabbagh, Michelle St-Amour, Tobin Skinner, Naoko Tomioka, Athanasios Tsiamas and Jozina Vander Klok), Ezra Van Everbroek of Pasha, the abstract reviewers, and the conference participants, who all helped to make the conference such a success. We also wish to take this opportunity to thank the Theoretical and Applied Linguistics Laboratory at the University of Western Ontario, which hosts the permanent website for AFLA at http://westernlinguistics.ca/afla/index.html.

These papers represent the selected proceedings of AFLA XIV. The editors were helped in their jobs by Joey Sabbagh, Tobin Skinner, and Mona Luiza Ungureanu. We thank them for the excellent assistance they provided during various phases of the editing process, from review to final formatting. Each paper submitted to the proceedings was evaluated by at least two anonymous reviewers who were specialists in both Austronesian languages and formal linguistics. We thank them for their time and expertise in evaluating the papers. Finally, we thank Elly van Gelderen and Kees Vaes at John Benjamins for approaching us with the idea for this collection of papers.

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Introduction

The papers presented within this volume were selected from the fourteenth meeting of the Austronesian Formal Linguistics Association (AFLA XIV), held May 4–6, 2007 at McGill University in Montreal, Quebec, Canada. AFLA was created in 1994 by five researchers who met for an informal workshop at the University of Toronto. The original objective was to provide a forum where researchers working on Austronesian languages within the context of generative linguistic theories could present and get feedback on their ideas.

Since 1994, AFLA has continued to meet annually and has been hosted by universities in Asia, Europe, and Australia as well as Canada and the United States. The size of the conference has grown considerably as has the range of topics. The first AFLA had five papers on the morpho-syntax of Malagasy, Tagalog, and Niuean. In more recent years, the scope of the papers has expanded to include semantics and phonology and other branches of the language family, notably the Formosan languages.

AFLA XIV had two specific goals. One was to continue the trend of broadening the scope of the papers by including more phonology papers and highlighting the contribution of research on the Formosan languages. The other goal was to encourage comparative research at two levels – within the language family (microvariation) and outside the language family (macrovariation). The papers in this volume reflect these goals.

The papers

The volume includes five phonology papers and twelve syntax papers. The five phonology papers present a range of topics from articulatory phonetics to syntactically informed prosody. **Brunelle's** paper describes how laryngoscopic information can provide insight into the articulation mechanisms of the tense/lax distinction in Javanese. He shows that there is relative lowering of the larynx in lax stops. Two of the phonology papers provide accounts for reduplication patterns. **Yanti and Raimy** show how Precedence Based Phonology can account for nine reduplication patterns found in Tanjung Raden Malay. **Nuger**, investigating discontiguous reduplication in Ulu Muar Malay, proposes that the patterns are best characterized not by edge anchoring but rather by a prosodic correspondence constraint. The last two phonology papers investigate problems of the syntax/phonology interface. **Tang** argues that the cyclic spell-out of syntactic domains that are input to the phonological component accounts for

the pattern of vowel raising as it differs with compounds and phrases in Javanese. **Frascarelli** argues that intonational patterns in Malagasy and Tagalog support proposals that the V initial word order in these languages is derived by phrasal movement rather than by head movement.

Among the syntax papers, three discuss possessive constructions. **Donohue and Donohue** survey a range of Austronesian languages and argue that an analysis where possessors are treated as subjects of DPs cannot account for the variation found in these languages. **Otsuka** investigates a particular Tongan construction where the external argument of a relative clause is realized as a possessor on the head noun. She argues that this genitive is base-generated in the Spec, DP position and interpreted in the relative clause through pragmatics. **Pearce** discusses direct and indirect possession in Unua-Pangkumu and concludes that the indirect possessor is generated higher in the DP than the direct possessor.

Two syntax papers discuss the problem of adverbial predicates in Formosan languages. **Holmer** proposes that Seediq adverbial constructions are best captured as adverbial heads along the extended projection of the verb. **Chang**, surveying a range of Formosan languages, argues that the adverbial heads have both lexical and functional characteristics.

Two papers provide an in depth analysis of particular Malagasy constructions. **Paul** probes details of the *dia* specificational construction and argues that it is an inversion structure transposing the predicate and the topic. **Potsdam** investigates the imperative structure in Malagasy and argues that the unusual positioning of the apparent subject receives an explanation once one understands that this DP is a vocative rather than a subject.

Two papers discuss the realization of arguments in Niue. **Ball** focuses on the problem of instrumentals and *aki*, the predicate that introduces them in two different constructions. He uses the HPSG notion of 'argument composition' to account for the differences in these two *aki* constructions. **Massam** discusses the more general problem of accounting for the position of arguments in Niue. She observes that a roll-up analysis of phrase structure in Niue can account for the order of adverbial expressions but not arguments. As a solution, she suggests that arguments are merged outside of the VP and are introduced by higher functional heads.

Law examines the structure of impersonal constructions in Tagalog and proposes that these constructions are basically the same as existential constructions and possessive constructions in Tagalog. **Cole, Hermon, and Yanti** examine the binding facts of Jambi Malay and conclude that coreference is not determined by grammatical principles but rather by pragmatic considerations.

Finally, **Baker** investigates two macroparameters that account for agreement patterns crosslinguistically. In his study of these two parameters within the Austronesian language family, he observes that Austronesian languages show similar patterns of variation as Niger-Congo and Indo-European languages.

The papers presented here have an obvious common denominator – the language family under investigation. However, in terms of theoretical content, they represent a wide range of subjects that, nevertheless, contain recurring themes.

Themes

Conferences devoted to language families are expected to produce certain types of results. Often papers include new data, new analyses of old data, comparisons of closely related languages and speculations as to language change. Many of the papers of this volume have such contributions.

New data and new analyses

As is expected with papers devoted to an under-documented language family, many present new data. Cole, Hermon, and Yanti provide detailed data sets of binding facts in Jambi Malay. Pearce's paper introduces new data from possessive constructions in Unua-Pangkumu, Otsuka from Genitive Relative constructions in Tongan, Potsdam from imperative constructions in Malagasy, and Paul from specificational structures in Malagasy. Tang presents phonological data from compounds in Javanese, Yanti and Raimy give six additional reduplication patterns from Malay, and Frascarelli describes prosodic data from Malagasy and Tagalog.

Other papers provide new analyses for previously reported data. For example Nuger's paper proposes a different account of discontiguous reduplication in Ulu Muar Malay, Ball's paper offers an HPSG account for *aki* constructions in Niuean, and Brunelle reanalyzes a laryngoscopic video of Javanese stop articulation made in 1994.

Language variation and language change

A conference devoted to a language family is also expected to provide comparisons among related languages. Work of this type has become increasingly important as the interest in microvariation and microparameters has developed. Chang discusses the range of variation in adverbial constructions in Formosan languages. Otsuka shows how Genitive Relatives in Tongan differ from other Eastern Polynesian languages. Donohue and Donohue discuss differences in the realization of possessors across Austronesian languages.

The comparison of closely related language often leads to diachronic speculations and several papers have proposed possible paths of language development. Cole, Hermon, and Yanti suggest that the type of pragmatically controlled binding patterns that they find in Jambi Malay might lead to a grammaticalization of binding and a system of coreference similar to that found in languages like English. Holmer suggests

that positioning of clitics following the first element of a sentence might lead to reanalyzing the clitic as verbal morphology and the first element as a verb. Yanti and Raimy, in the domain of phonology, point out that ambiguities in the structure of the reduplicating element could lead to innovative reduplication patterns.

Theories and theoretical constructs

As its name suggests, AFLA emphasizes not only data work but also theoretical work. The papers show a diversity of theories but also some common interest in particular theoretical constructs. While most of the syntax papers are written within the Minimalist program of Chomsky (1995), Ball works within the HPSG framework (Pollard & Sag 1994) and Donohue & Donohue use Lexical Decomposition Grammar (Wunderlich 1997, Kiparsky 2001). Within the Minimalist papers, several issues recur. Pearce and Massam both crucially use predicate fronting to account for word order while Frascarelli uses predicate fronting to account for prosody. Tang and Frascarelli both rely on cyclic spell-out of phases at the PF interface to account for phonological phenomena.

Looking inward and outward

Conferences and associations that are centered around a specific language family run the risk of become insular. While it is comfortable to present material to an audience that has a certain familiarity with the data and the issues, it is crucial that the results of this research eventually reach a wider audience.

One step in the direction of communication beyond the boundaries is to relate the discoveries within the language family to similar facts in unrelated languages. Many of the papers in this volume do exactly this. Cole, Hermon, and Yanti compare the binding facts of Jambi Malay, Tuvaluan, and Madurese to the binding facts of languages such as English. Frascarelli contrasts the intonation in inverse (predicate fronting) VO languages like Malagasy and Tagalog with a direct (V-movement) VO language like Italian. Holmer discusses languages as diverse as Hebrew, Scottish Gaelic, Nootka, Car Nicobarese, Choapan Zapotec, Finnish and Estonian. Baker brings to his work on Austronesian, a macroparameter devised for Indo-European languages and Niger-Congo languages. Discussing a wide variety of languages outside of the Austronesian language family (Kilega, Zulu, Swahili, Kinande, Spanish, Welsh, Icelandic, Hindi, Burushanski, Georgian), he shows that the parameters that are relevant for these languages also predict a clustering of characteristics in Austronesian languages.

The other step is to bring the findings of the conference to the attention of the larger linguistics community. It is with this goal in mind that we have gathered these papers and created this volume.

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PHONETICS/PHONOLOGY/MORPHOLOGY

The role of larynx height in the Javanese tense ~ lax stop contrast*

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Javanese has a phonemic contrast between two series of stops. Tense stops are modern reflexes of Proto-Austronesian voiceless stops while lax stops correspond to former voiced stops. This complex contrast includes acoustic properties such as pitch, voice quality, vowel quality and VOT. Although different acoustic studies have yielded similar results, there is still disagreement over the type of articulatory mechanism(s) responsible for the tense~lax opposition. In this study, a laryngoscopic video of two Javanese speakers recorded by Katrina Hayward in 1994 is reanalyzed to determine if vertical laryngeal position is playing a role in the Javanese stop contrast. Results reveal a consistent lowering of the larynx during lax stops, suggesting similarities with Mainland Southeast Asian register.

In Javanese, stop voicing was lost in all positions, except after nasals. It was replaced by a contrast between plain voiceless stops and a series of voiceless stops associated with a low pitch, a long voice onset time (VOT), a breathy voice quality and relatively high vowels. A few minimal pairs are given in (1), where reflexes of original voiced stops are marked with a subscript dot.

(1) /paku/ 'nail' /p̤aku/ 'standard'
/pipi/ 'cheek' /p̤i̤p̤i/ 'aunt'
/kali/ 'river' /k̤ali/ 'to dig'

Since this opposition is acoustically subtle, it has been successively described as a contrast between unaspirated and aspirated stops (Samsuri 1958), voiceless unaspirated and voiced aspirated stops (Poedjosoedarmo 1974), light and heavy stops (Horne 1974; Fagan 1988), tense and lax stops (Hayward 1993; 1995), clear vs. breathy stops (Adisasmito-Smith 2004) and stiff vs. slack stops (Ladefoged & Maddieson 1996).

* Many thanks to Reza Falahati for processing the data and to Ricardo Tabone for preparing the MATLAB scripts used in this experiment.

Thanks to experimental work conducted since the late 1980s, the acoustic properties that make up the contrast have now been established more objectively. They are reviewed in Section 1, together with the articulatory mechanisms that may be responsible for their production. A study of one of these articulatory mechanisms – the vertical position of the larynx – is then presented in Sections 2 and 3, showing that this articulatory dimension can play an important role in the production of the contrast. Finally, similarities between the tense~lax contrast and Southeast Asian register and their implication for phonological theory is discussed in Section 4. Note that we arbitrarily use the labels tense and lax to designate the two series of Javanese stops. The tense stops are the modern reflexes of proto-Austronesian voiceless stops while the lax stops are the reflexes of former voiced stops.

1. Previous phonetic studies of the tense ~ lax contrast

Overall, acoustic investigations of the tense~lax contrast yield similar results, despite small idiosyncratic differences among subjects. It is now well established that the contrast is realized through a set of pitch, voice quality and vowel quality distinctions that are reviewed in Section 1.1. What is less well understood is how these acoustic properties are articulated. The most common hypotheses are discussed in Section 1.2.

1.1 Acoustic properties

Acoustic studies of the Javanese tense~lax stop contrast consistently show that it is realized through minor differences in pitch, voice quality, VOT and vowel quality, with a certain amount of variation among speakers. Pitch tends to be higher after tense than lax stops (Fagan 1988; Hayward 1993; 1995; Adisasmito-Smith 2004; Thurgood 2004), but this difference is not found in all speakers (Adisasmito-Smith 2004; Thurgood 2004). Voice quality differences, on the other hand, are more systematic. All studies looking into this question find a steeper spectral slope (i.e. a breathier voice quality) after lax stops than tense stops (Hayward 1993; 1995; Adisasmito-Smith 2004). Fagan (1988) also finds a systematically longer VOT after lax stops, which is likely caused by the same articulatory mechanisms as voice quality (other studies do not investigate this question). Finally, vowel quality is also a correlate of the contrast, although this needs to be qualified. While F1 is systematically lower after lax stops than after tense stops (Fagan 1988; Hayward 1993; 1995; Thurgood 2004), F2 differences seem more variable and depend on the vowel under investigation. In short, the tense~lax contrast seems to be systematically realized through minor voice quality and VOT distinctions, accompanied by more variable pitch and vowel quality differences.

(2) Summary of the acoustic properties of the tense~lax stop contrast

Tense stops	*Lax stops*
Short VOT	Long VOT
Higher pitch on foll. vowel	*Lower pitch on foll. vowel*
Following vowel is modal	Following vowel is breathy
Foll. vowel has a higher F1	Foll. vowel has a lower F1

1.2 Possible articulatory mechanisms

Three types of articulatory mechanisms have been proposed to account for these acoustic properties: The position of the tongue-root, the opening of the glottis and the vertical position of the larynx. Poedjosoedarmo (1986) first suggests that the contrast could be caused by the position of the tongue-root, following a proposal developed by Gregerson (1973) for acoustically similar types of oppositions in Mainland Southeast Asian languages. Her claim is that the tongue-root is fronted during the production of lax stops (Poedjosoedarmo 1986). However, this hypothesis has proven to be too restrictive: While the position of the tongue-root explains the differences in vowel quality (as the tongue tip moves along with the tongue root), it fails to account for differences in voice quality, VOT and pitch.

Other authors have therefore proposed that Javanese lax stops are produced with a relatively open glottis (Hayward 1995; Ladefoged & Maddieson 1996; Adisasmito-Smith 2004; Dresser 2005). This approach is more fruitful because it can account for pitch, voice quality and VOT differences. Glottal opening is not only generally involved in the production of breathiness and VOT, but it also accounts for the low pitch associated with the lax stops because the vocal folds vibrate more slowly when the glottis is open. However, it cannot by itself account for the F1 differences in the vowels following the two series of stops as it has no known relationship to formant frequencies.

For this reason, a third articulatory mechanism, larynx height, has been proposed to account for the tense~lax contrast (Catford 1964, Fagan 1988, Hayward 1993). Larynx height can produce by itself most of the acoustic properties of the tense~lax stop contrast, even if other mechanisms may also be involved. Since this articulation is discussed in detail in Sections 2 and 3, we now review its acoustic effects.

The first acoustic property that can be attributed to differences in larynx height is a change in formant frequencies (vowel quality). The effect of vertical laryngeal position on formant frequencies is often overlooked because tongue position is typically the main predictor of vowel quality differences. However, vertical laryngeal position affects the length of the vocal tract, a dimension that has long been recognized as a central factor in determining formant frequencies (Crandall 1925; Chiba & Kajiyama 1941). Since lengthening the vocal tract tends to lower formants, a low larynx is associated with lower formants. This effect is especially pronounced for F1, which is

largely dependent on the size of the cavity between the glottis and the point of maximum constriction between the tongue and the palate. The relatively low F1 of the vowels following lax stops, which makes these vowels sound more closed than their tense stop counterparts, may thus be attributed to a low larynx. In fact, this mechanism has already been proposed to explain the minor vowel quality differences found in vowels following tense and lax stops in Javanese (Fagan 1988; Ladefoged & Maddieson 1996; Thurgood 2004).

Another acoustic property of the Javanese stop contrast that can be accounted for by larynx height movement is pitch. The association between raised larynx and high pitch and lowered larynx and low pitch has been discussed by many authors as early as the first half of the 20th century (see Honda, Hirai et al. 1999 for a discussion of early research), but the effect of the action of the extrinsic laryngeals muscles, which raise and lower the larynx, on the vocal folds is difficult to model in the absence of good imaging techniques. Fortunately, a recent MRI study by a team of Japanese researchers sheds light on the biomechanical underpinnings of the correlation between pitch and larynx height (Honda, Hirai et al. 1999). The effect of the vertical position of the larynx on pitch seems to be largely due to the anterior convexity of the spine at the level of the larynx. As the larynx moves up and down, it also rotates on the front-back axis, which has the effect of modifying the angle between the cricoid and thyroid cartilages. Since the extremities of the vocal folds are attached to these two cartilages, any change in their relative position has an effect on the degree of stretching of the vocal folds. This is illustrated in Figure 1, where we can clearly see that the vocal folds are shorter when the larynx is low than when it is raised (all other things being equal). A low larynx indirectly results in slack vocal folds, which vibrate more slowly and yield a lower pitch than more stretched vocal folds.

The breathy voice quality and the longer VOT that are usually found after lax stops are more difficult to explain through larynx height. The only explanation proposed so far in the literature is a speculative relaxation of the suprahyoid muscles during larynx lowering (Laver 1980). However, there may be a more mechanical explanation: First,

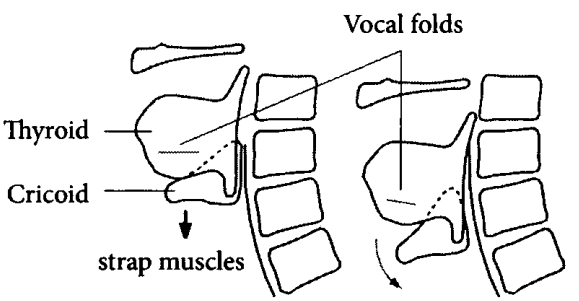

Figure 1. The effect of vertical laryngeal position on vocal fold length (reproduced from Honda, Hirai et al. 1999)

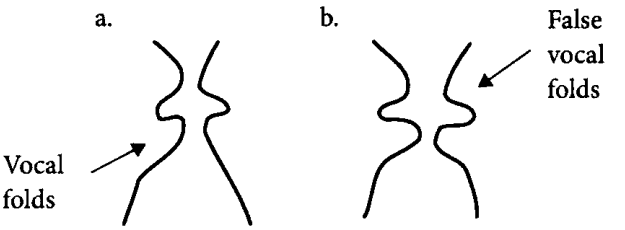

Figure 2. Effect of larynx height on the vertical tension of the vocal folds (reproduced from Arnold 1961)

a lowering of the larynx results in increased subglottal pressure. Second, larynx lowering also has a direct effect on the setting of the vocal folds, as shown in Figure 2. While the vocal folds are almost touching when the larynx is in default position (2b), they stretch vertically when the larynx is pulled down (2a), which reduces the degree of contact between them. Together, these two mechanisms can facilitate a leakage of the air contained in the subglottal cavity through the glottis. Since the glottis is opened during the production of voiceless stops (recall that lax stops are normally voiceless), this high transglottal airflow does not affect lax stops themselves, but rather, it delays the onset of voicing and drags on onto the beginning of the following vowel, resulting in breathiness.

Larynx height is therefore a good candidate to explain the main three acoustic properties of the Javanese tense~lax stop contrast, even if it is not the only articulatory mechanism involved in it. It is also a plausible articulatory mechanism from a diachronic perspective. We know that a low larynx position favours stop voicing by increasing transglottal pressure (Westbury & Keating 1986)[1]. Since Javanese lax stops are the modern reflexes of Proto-Malayo-Polynesian voiced stops, it is possible that a lowering of the larynx originally meant to favour voicing has been preserved in lax stops after the loss of the voicing contrast.

However, at this point, the role of larynx height is still speculative. In the next two sections, we present an experiment, based on a laryngoscopic video made by Katrina Hayward et al. (1994), which shows that there is indeed a difference in larynx height between the two series of Javanese stops.

2. Methods

A laryngoscopic movie made by a team led by Katrina Hayward in 1994 (Hayward, Grafield-Davies et al. 1994) has been processed and measured to quantify larynx height during the production of tense and lax stops. In this section, we describe the

1. However, a lowered larynx does not automatically result in voicing. An abduction of the glottis or a stiffening of the vocal folds can prevent vocal fold vibrations, even if the larynx is low.