Aspects of the prosody of Kuot, a language where intonation ignores stress[1]

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Abstract

This article describes the basic system of intonation and lexical stress in Kuot, a non-Austronesian language of New Ireland, Papua New Guinea. Kuot employs pitch (F_0 variation) primarily to express structural information about the clause. Some intonation contours express functions that are commonly expressed by intonation crosslinguistically, such as final vs. nonfinal clauses and parts of clauses, and yes/no questions. In addition, Kuot has particular contours (or tunes) for question-word questions and negated sentences.

Word stress, on the other hand, does not interact with intonation in terms of its encoding. It displays a very stable correlation with duration but no association with F_0; in other words, there is no consistent marking of stress by means of F_0 in Kuot. The position of Kuot word stress is lexically determined, yielding minimal stress pairs.

In this article, we present a description of Kuot intonation on the basis of pitch extractions made from spontaneous speech. The results reveal that intonation in Kuot is anchored only at the boundaries of intonational phrases. A phonetic analysis of minimal stress pairs recorded in controlled environments demonstrates that lexically stressed syllables do not correlate with pitch. The findings are discussed against a background of prosodic typology.

1. Introduction

In this article we present a description of some aspects of the prosodic system of the non-Austronesian (Papuan) language Kuot, spoken on New Ireland, Papua New Guinea. We argue that Kuot has a prosodic system in which lexically stressed syllables do not carry intonational accents. As far as we know, such a system has only been reported for one

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other language, namely for the Niger-Congo language Wolof (Rialland and Robert 2001). This unusual prosodic system is described against the background of a typology of word-prosodic features and intonation, given in Section 2. Then follows an introduction of the Kuot language, and of the fieldwork situation in which the data was collected in Section 3. The analyses of Kuot intonation and word stress themselves are presented in Sections 4 and 5, respectively. The results are summarized and discussed in Section 6.[2]

2. Prosodic typology

This section discusses the crosslinguistic properties of lexical accent and intonation.

2.1. *Lexical stress, lexical pitch accent, and lexical tone*

At the level of word (lexeme), languages tend to have one of three different word-prosodic features: lexical stress accent, lexical pitch accent,[3] or lexical tone. This three-way distinction is based on a combination of phonological and phonetic criteria (cf. Beckman 1986; Figure 2 below). From a phonological perspective, we can determine whether the word-prosodic feature is contrastive in a syntagmatic or in a paradigmatic way: a syntagmatic feature distinguishes a syllable from those preceding it or following it, while a paradigmatic feature contrasts a syllable with other syllables that may appear in the same position. The distinction is illustrated in Figure 1.

By this criterion, accent is distinguished from tone. Both stress accent and pitch accent are syntagmatically contrastive, while lexical tone is contrastive in a paradigmatic way. The distinctions are summarized and illustrated with linguistic examples in Figure 2. The examples are discussed after the figure.

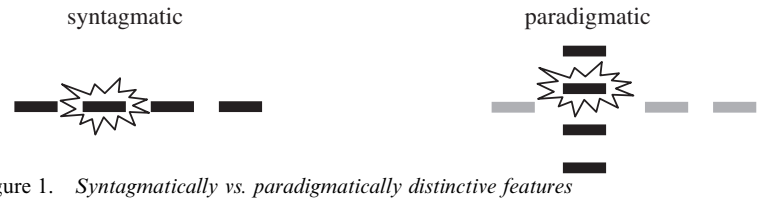

Figure 1. *Syntagmatically vs. paradigmatically distinctive features*

Phonology	Culminative syntagmatic contrast; delimitative or potentially distinctive				Paradigmatic contrast; distinctive	
	Lexical stress (e.g. English)		Lexical pitch-accent (e.g. Somali)		Lexical tone (e.g. Iau)	
	Accent	Example	Accent	Example	Tone	Example
	penult	'*pervert*	penult	'*inan* 'son'	Low level	*be* 'fire'
	final	*per*'*vert*	final	*i*'*nan* 'daughter'	High rise	*be* 'snake'
					Low rise	*be* 'path'
Phonetics	Encoding: parameters other than F_0		Encoding: fundamental frequency (F_0)			

Figure 2. *A classification of word prosodic features, based on Trubetzkoy (1969 [1939]) and Beckman (1986). Iau example from Bateman (1990: 35); Somali example from Hyman (1981)*

Syntagmatically contrastive features like lexical stress and lexical pitch accent thus single out a unit (syllable) from a string of similar units. For example, in English, stress on the first syllable of '*pervert* (noun) contrasts with the unstressed final syllable.

Similarly, in Somali (Afro-Asiatic), which has lexical pitch accent, a high tone on the penultimate syllable of '*inan* 'boy' stands out relatively to the low pitch of the following syllable.

Lexical tone is fundamentally different, being contrastive in a paradigmatic rather than in a syntagmatic way, as illustrated in Figure 2 by the Papuan language Iau. A high tone on *be* 'snake' contrasts with the other elements in the Iau tonal paradigm, three of which are listed in Figure 2: low, high, and low rise. In other words, in a paradigmatic contrast, a property contrasts with other properties that could have been marked on the same unit, in this case tone on the syllable or the vowel. The resulting contrast is comparable to that between /p/ and /b/ in a language with distinctive voicing on stops.

The functional distinction between syntagmatically and paradigmatically contrastive elements on the syllable level thus sets apart stress and pitch accent on the one hand from lexical tone on the other. Tone will not be further discussed in this article.

The syntagmatically contrastive function of both stress and pitch accent is sometimes called ''culminative'' (Trubetzkoy 1969 [1939]). A particular syllable is made more prominent within a particular prosodic domain, normally the word, thereby signaling the occurrence of another word in the string.[4] It operates differently in different languages. In

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languages where the position of the accented syllable is fixed with respect to the word boundary, an accented syllable also acts as a cue to that boundary (in Trubetzkoy's [1969 [1939]: 27] terminology it serves a "delimitative function"). A case in point is Czech, where stress is invariably associated with the initial syllable, and where stress prominence therefore constitutes a reliable marker of the beginning of a word. In languages where the location of the accented syllable is not predictable, accent can distinguish different words from one another. Somali and English are examples of languages where accent placement is variable, forming minimal accent pairs (this is Trubetzkoy's "distinctive function").

We also need to touch upon the acoustic encoding of the above-mentioned word-prosodic features. It is in this respect that stress and pitch accent differ. In a language that features pitch accent, the syntagmatically prominent syllables stand out perceptually through a pitch marker: there may be a peak on the pitch-accented syllable, or the prominent syllable may be characterized by a falling contour, etc. The acoustic correlate of pitch is fundamental frequency, F_0, measured in hertz (Hz). Whatever the F_0 pattern that encodes the pitch accent, the form of the pitch contour of the utterance is determined to a greater extent by word prosody.

Stress prominence, on the other hand, is marked primarily by means of cues other than the F_0 pattern: duration, intensity-related parameters (the acoustic cause of perceptory loudness), and vowel quality. This implies that in a language that has lexical stress, the F_0 contour of an utterance is not determined at the lexical level. Instead, we find that the pitch contour (intonation) in these languages signals a wide range of other functions. That is, we do find pitch accents in a stress language like English, but they are fundamentally different from the lexical pitch accents of Somali, both in form and in function. This will be explored in the following section.

Before leaving the topic of lexical accent, we should note that there are languages which have been analyzed as having no prominence features associated with particular syllables of the word. We shall return briefly to this phenomenon in Section 2.3.

2.2. *Intonational phonology*

The objective of this section is to briefly introduce some concepts relating to utterance-level prosody, that is, intonation. This background information is relevant to the description of intonational phenomena in Kuot in Section 4. It is all the more relevant because Kuot prosody features some

intonational phenomena that are typologically unusual, with respect both to form and meaning.

A useful distinction can be made between two broad categories of intonational phenomena: boundary phenomena and phrase-internal phenomena.[5] On the one hand, there are those phenomena that take place at the edges of prosodic domains, such as a rise or fall at the end of a phrase. These are known as boundary tones, and they mark off the edges of prosodic constituents from one another. Prosodic domains thus delimited are known as intonational phrases (IPs), or as intonation units (IUs). Crosslinguistically, the boundary tones at the end of prosodic phrases tend to convey a lot of information, while initial boundaries are of little linguistic importance in most languages.

On the other hand, there are intonational phenomena that take place within the intonational phrase. They are called intonational pitch accents. Like the lexical pitch accents discussed in the previous section, intonational pitch accents consist of a peak, dip, fall, or rise in fundamental frequency. For each language (or perhaps dialect), they have a typical excursion size (pitch range), and they are aligned with stressed syllables in ways that are specific to the particular pitch accent. It has been considered a linguistic universal that pitch accents are associated with stressed syllables, often those of words that are important in terms of the information structure of the discourse (see below).

To avoid confusion, we can qualify the pitch accents of a stress language such as English as intonational, that is, having their shape specified at the utterance level, and those of pitch accent languages like Somali as lexical, with their shape determined by lexical specification. It is worth noting that stressed and lexically pitch-accented syllables may be realized without intonational pitch accents, especially in connected speech.

Both the boundary tones and the intonational pitch accents express a wide range of meanings, including grammatical information such as sentence modality (e.g. Ladd 1996: 121–123), and informational status of a constituent (see, e.g., Pierrehumbert and Hirschberg 1990; Grosz and Sidner 1986). Intonation may also convey speaker attitudes such as surprise which are paralinguistic in the sense that they are not required by the grammar of the language.

Cruttenden (1986: 10) notes that superficial descriptions of intonation in non-European languages tend to document the association of a range of tunes with sentence types such as statements vs. yes/no questions. He suspects that more sophisticated documentation of attitudinal and discoursal uses of intonation in languages other than English may be established through improved research. However, the possibility cannot be discounted that English and other well-studied European languages are

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simply typologically unusual in the extent to which intonation expresses speaker attitude. At any rate, it is clear that more work on non-European languages is badly needed before we can be sure to what extent present-day generalizations about prosody are valid outside Europe.

While segmental phonology can make recourse to minimal meaning pairs to establish phonemes, there is no corresponding empirical heuristic for intonation that can determine when there are distinct meaning types, and when there are simply different realizations of the same type. Part of the problem is that intonational variation is typically gradual in nature, so that an excited realization may differ only in pitch excursion size from a neutral realization of the same utterance, while the shape of the contour remains constant.[6] In recent years, research has focused increasingly on the alignment of pitch contour turning points with the segmental string, and have found that pitch accents appear to be aligned in a relatively specific and stable manner, allowing little room for paralinguistic variation.

The study of intonational typology is not well-developed. In a paper dedicated to the topic, Fitzpatrick (2000: 88) concludes that crosslinguistic and crossdialectal research on intonation has yet to lead to "implications and correlations." That is, our knowledge on crosslinguistic variation in intonation is so limited that distinct types have not become apparent. But while no over-arching typology has been developed, and while important problems remain in the study of form and meaning of intonation, the intensive research during the last decades has brought clarity in the parameters in which intonational systems can differ from one another (see Fitzpatrick 2000). At this limited state of knowledge, however, it has been more fruitful to look for universals — language-independent tendencies — rather than for systematic patterns of variation. The following three tendencies are well-known (Bolinger 1978; Cruttenden 1981; and Vaissière 1995):

(i) new/focused information is marked by a pitch accent;
(ii) questions and incomplete phrases tend to be marked by a rising final boundary tone;
(iii) statements tend to end in a falling boundary tone.

Gussenhoven (2002) presents more general principles that underlie such crosslinguistic similarities.

2.3. *Lexical stress and intonational pitch accent*

As indicated above, the general consensus among students of prosody is that, in a stress language, F_0 phenomena on stressed syllables are to be

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attributed to intonation, and it has been considered a language universal that stressed syllables constitute the anchor points at which intonational pitch accents are associated with the utterance.[7] In the mainstream metrical-autosegmental framework, this universal is expressed by the fact that pitch accents are associated with stressed (i.e. metrically strong) positions, the association being marked by "*" (see Fitzpatrick 2000 and references there). In her review paper on intonational typology, Fitzpatrick reports the universal status of intonational pitch accents to mark focus in a number of studies.

In a paper on intonational universals, Vaissière (1995) writes the following about the most common realization of the intonational pitch accent:

> *Each language* associates a basic succession of F_0 heights and/or movements for the acoustic characterization of its lexical units, and anchors the relevant heights or movements to the word-boundaries and/or to the stressed syllables. (Vaissière 1995: 127, our emphasis)

Throughout the literature, the assumption is that languages have pitch accents of one sort or another. This is the case also in a typology by Ladd (1996), illustrated in Figure 3.

Ladd's purpose with this illustration is to show the logical independence of the following factors: the phonetic realization of syllable prominence as stress and non-stress accent (i.e. pitch accent) across the rows, and the presence or absence of lexical specification of such syllable prominence (where "postlexical pitch" stands for an intonationally assigned pitch accent) going down the columns. The figure also makes it clear that the shape of a pitch accent in the speech signal may be due primarily to lexical specification as in Swedish and Japanese, or to intonation only but tied to a stressed syllable as in English, or to intonation alone, as in Bengali, where pitch accents are intonational and may have various shapes but where these are associated with the initial syllable of the word (Hayes and Lahiri 1991).

One more type of language which we have not touched upon causes potential problems for Ladd's typology. This concerns those languages

		Phonetic typology	
		Stress accent	*Non-stress accent*
Lexical typology	*Lexical pitch*	e.g. Swedish	e.g. Japanese
	Postlexical pitch only	e.g. English	e.g. Bengali

Figure 3. *A typology of factors determining pitch accents, after Ladd (1996: 156)*

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which do not have syllable prominence specified at a lexical level at all, briefly mentioned in Section 2.1 above. Korean (Jun 1996), Indonesian (van Zanten et al. 2003), and French (Féry 2001) have all received this analysis, although the issue is often controversial. In these languages, intonational pitch events are typically associated with a particular syllable of a phrase rather than a word; the phrase in these cases approximately corresponds to a syntactic phrase on the level of noun phrase or verb phrase. The location of the syllable to be made prominent is determined with reference to the phrase boundary. Whether these languages would share a cell with Bengali in Figure 3 or would not fit at all depends on whether Ladd's labels across the top are defined more generously so as to include pitch accents that do not emanate from lexical specification, but perhaps from a phrase template or similar; otherwise, another column would have to be added to accommodate them.

But there is yet another type of language, with yet another configuration of the relevant prosodic factors, and for this type there is definitely no room in Figure 3. These are languages with lexical stress but without any sort of pitch accents, neither lexical or intonational.[8] Descriptions of such languages are only just emerging, Kuot being the second one to date, and they have yet to be incorporated into typological models of prosody. The previous language of this type to be described was Wolof.

On the basis of a considerable dataset, Rialland and Robert (2001) recently published an overview of the intonation of Wolof, a Niger-Congo language which is nontonal and has fixed stress. The authors argue that in Wolof, stressed syllables do not constitute anchor points by means of which the intonational contour is associated with the segmental string. Instead, the shape of the intonational contour is determined relative to phrasal boundaries, and in this case, phrases typically correspond to clauses on a syntactic level. Particular pitch contours are associated with particular utterance types and will extend over whatever number of syllables is needed, often several clauses. Very few local pitch perturbances are allowed in Wolof, and for example, focus is expressed entirely by an inflectional grammatical marker and does not interact with pitch in any way. As regards the realization of stress, there is no specific study of it for Wolof, but it is the authors' impression that its perceptual correlate is mainly in the quality of articulation of both vowels and consonants.[9]

There is clearly no room for a language like Wolof in the typology as it is given in Figure 3. To accommodate Wolof, we need to add the possibility for languages not to feature intonational pitch accents, as in Figure 4. While Wolof is an example of a language with lexical stress but no intonational pitch accents, it is logically impossible for a system to have lexical pitch accents which are not manifested at an intonational level.

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		Phonetic typology	
		Stress accent	*Non-stress accent*
Lexical typology	*Lexical pitch*	e.g. Swedish	e.g. Japanese
	Postlexical pitch only	e.g. English	e.g. Bengali
	No pitch-accents	Wolof	<<impossible>>

Figure 4. *A typology of factors determining pitch accents, after Ladd (1996: 156), expanded to include the type represented by Wolof*

In the following, we will provide more evidence for the relevance of this typologically unusual prosodic system, using data from a language in an entirely different part of the world. We will show that Kuot, a non-Austronesian language of Papua New Guinea, features phenomena very similar to those that Rialland and Robert observed in Wolof. We will argue that Kuot has lexical stress, but that its stressed syllables do not constitute anchor points by means of which the intonational contour is associated with the sentence.

3. Kuot

Kuot is spoken by around 1,500 people in some ten villages along the coasts of north-central New Ireland, an island province of Papua New Guinea, in the southwest Pacific. It is currently losing ground to Tok Pisin, an English-lexified creole (and one of Papua New Guinea's three national languages). Kuot is an isolate, quite different from other non-Austronesian (Papuan) languages of the region, and is the only non-Austronesian language of New Ireland Province. Its grammar is remarkably little influenced by surrounding Austronesian languages,[10] but there are clear signs of contact on different levels, such as shared items of kinship vocabulary, suggesting intermarriage. There is also something of a phonological alliance (Sprachbund), where neighboring Austronesian languages have adopted several phonological processes and restrictions (such as lenition and voicing of voiceless stops intervocalically) from Kuot (or possibly from other non-Austronesian languages that are now extinct).[11] In return, Kuot appears to have acquired the phonemes /s/ and /f/ from its neighbors. Whether the features of intonation and stress to be described below can be observed in nearby languages as well remains to be established, but it is possible, as (impressionistically) at least some of them carry over to the Tok Pisin spoken by Kuot speakers.

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3.1. *Kuot grammar and phonology in brief*

Kuot has the basic constituent order VSO. There is frequent topicalization by fronting of a core argument and/or an adverbial. This is usually marked by the relator *lə*, or sometimes by *ga*. There are three verb classes (based on the order of the stem in relation to subject and object affixes), and a class of adjectives, equally closed and syntactically verb-like. Only one verb class is productive, while two verb classes and the adjective class are closed. Nominals have three numbers (singular, dual, and plural), and distinguish feminine and masculine in the singular. Among the pronouns there is further an exclusive/inclusive distinction in the first person dual and plural, giving a total of twelve pronominal categories.

There are thirteen consonants and six vowels. Some of the distinctions are phonemic in some contexts and allophonic in others. For example, /n/ and /l/ contrast in some positions but in others do not, and a similar relation holds between /a/ and /ə/ for which there are a number of minimal pairs, while at the same time /a/ is often realized as [ə] in unstressed positions. There are several regular phonological and morphophonological processes. Of relevance here is the fact that the voiceless stops /p/, /t/ , and /k/ undergo lenition to the corresponding voiced fricatives or rhotic ([v∼β], [r], and [γ]) whenever they occur in intervocalic position; in the case of final /t/, the rule is not blind but takes into account the nature of the following morpheme.

The data for this study was collected as part of a larger project, that of writing a descriptive grammar of the Kuot language. To this end, the first author spent a total of eighteen months in Papua New Guinea, in three trips (exploratory trip; ten months; seven months) in 1997–2000. Most of this time was spent in the Kuot-speaking village of Bimun on the west coast of New Ireland. The bulk of the data consists of recorded narrative speech (which was followed up with extended discussions about grammar, grammaticality judgment questions, vocabulary elicitation, and so forth). The recordings are of varying quality since the recording situation in all cases was a village setting. As far as possible, disturbance-free sections have been selected for this study.[12]

The data for each of the analyses will be described in more detail in the appropriate sections.

4. Kuot intonation

Intonation in Kuot can be described in terms of distinct pitch contours, or tunes. These tunes have the function of signaling information about the type or structure of the clause. Several of these functions are

commonly marked by intonation crosslinguistically (and some of them were indicated in Section 2.2 above): final clause in a sequence of clauses; nonfinal clause or topicalized constituent; yes/no questions. A distinctive contour for question-word questions is not as common, and a special tune for negated clauses is not attested at all in the literature available to us. The functions for which particular intonation contours have been established in Kuot are thus:

- declarative, nonfinal (including constituents topicalized by fronting);
- declarative, final;
- negated clause;
- question-word question;
- yes/no question.

Each of these will be illustrated by F_0 contours generated from recorded narrative speech (including cited speech for questions). The genre imposes some limitations on the dataset available for analysis. For example, it is likely that clarification questions and echo questions would differ from the question types reported here. There is also an absence of certain utterance types, such as commands, but unfortunately no conversational material was recorded. Within the genre, however, the observations appear stable for the types tested.

Pitch (F_0) extractions were performed in response to the auditory impression that there was something special about intonation in negated clauses (etc.), and the impression was borne out in the first few examples that were analyzed instrumentally. The results remained stable when checked against equivalent constructions from other speakers. It was only possible to check a small number of utterances: three to four examples were investigated for each type. Care was taken to vary speakers within each of the types to avoid idiosyncratic use of intonation.

The pitch extractions shown in graphs below were made by the second author using Praat (Boersma and Weenink 1996; see also http://www.praat.org [checked April 21, 2003]).[13]

The transcription in figures is phonemic. However, allophonic lenition with voicing has been indicated, since the resultant voicing can give rise to segmental F_0 variation, where voicing frequently lowers F_0 and voicelessness raises it.[14]

Although prosodic phrases, or IUs, do not necessarily correspond to syntactic clauses or phrases,[15] in the examples analyzed here they typically do. A Kuot speaker will organize a sequence of clauses such that a particular rise–fall contour on the last syllable of a clause shows that another clause is about to follow. The last clause in the sequence is signaled by a clear F_0 fall over the last few syllables, steeper than can reasonably

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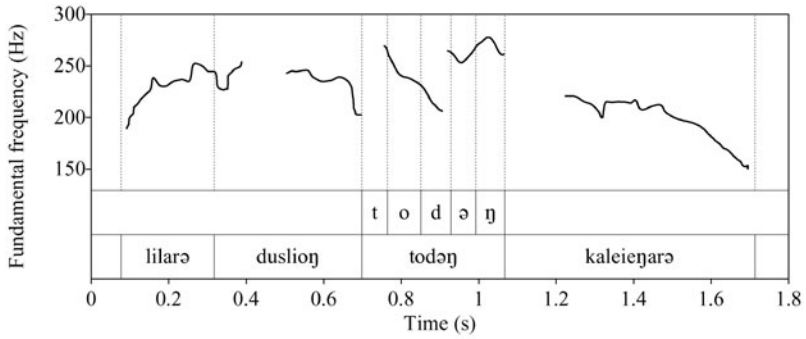


[*Li-la=rə* *dus=lioŋ*] *todəŋ,* *kale=ieŋ=arə.*
3dS-go=ASP stand=3dS down sing.out=3fS=ASP
'They went (and) stood below, she called out.'

Figure 5. *Nonfinal and final intonation (female speaker: KD)*

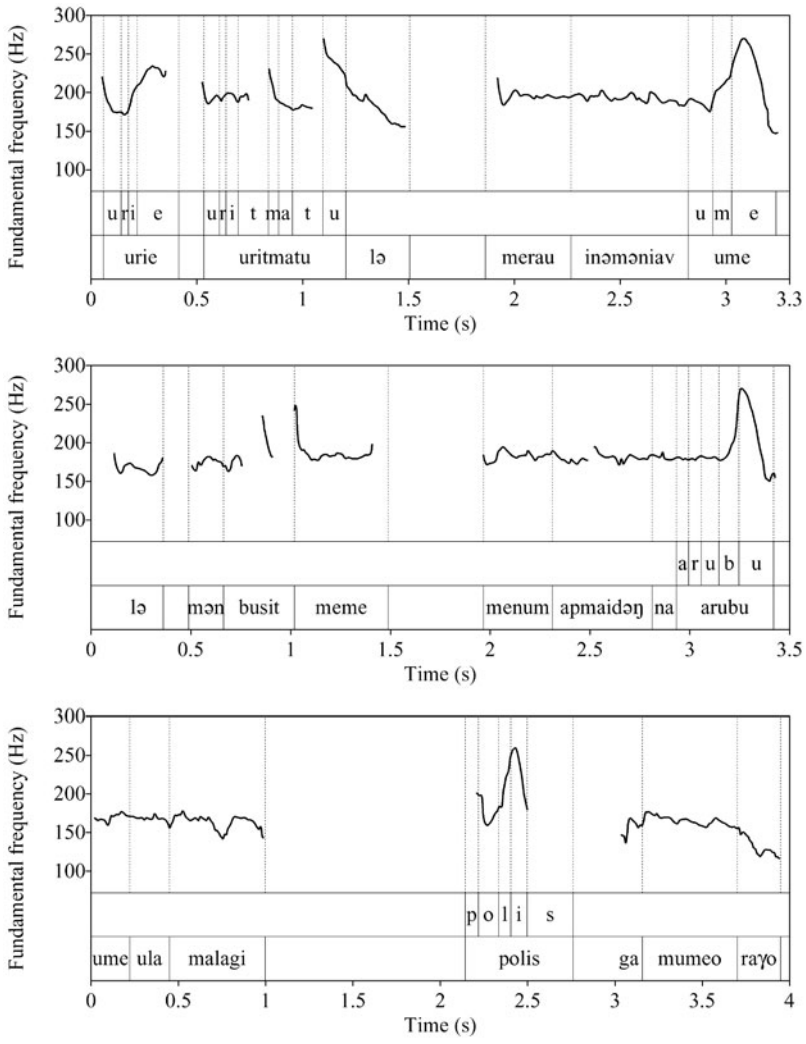
be attributed to declination. A sequence of nonfinal and final IUs can be understood syntactically as a multi-clause sentence.

Figure 5 illustrates a nonfinal clause with a rise on the last syllable (*-dəŋ*), followed by a utterance-final clause showing the typical fall over the last syllables (the clitics *=ieŋ=arə*).

In the next excerpt, a different speaker is talking of how the people of Bimun came to move from the mountains to their present coastal location; he has just explained about the police fetching the mountain dwellers to the coast (''here'') and repeats the gist of his tale in the utterance given in three graphs in Figure 6. There are six IUs. First there is an expression *u-tie* 'alright' which is used to introduce a new section of a narrative. This has a rising contour of its own. Then there is a topicalized fronted phrase (*u-titmat u*), syntactically marked by the relator *lə*, then three nonfinal clauses, all marked by a rise–fall contour,[16] and lastly, a final clause with a fall at the end.

Each of the instances of nonfinal clause contour (on the words *u-me*, *arubu*, and *polis*) shows a very clear peak in the vowel of the last syllable of the clause, followed by a rapid fall across the rest of the syllable's rhyme. The fall starts while the vowel is in full strength, showing that the combination of peak and fall is the important cue. (The non-final contours have a considerable range even for Kuot standards.) The topicalized constituent at the beginning has the same contour, but the rise is obscured because it takes place on the voiceless segment /t/.

It is interesting to note the ''downstep'' over the sequence of clauses: from the middle of the first graph, each clause maintains a fairly constant



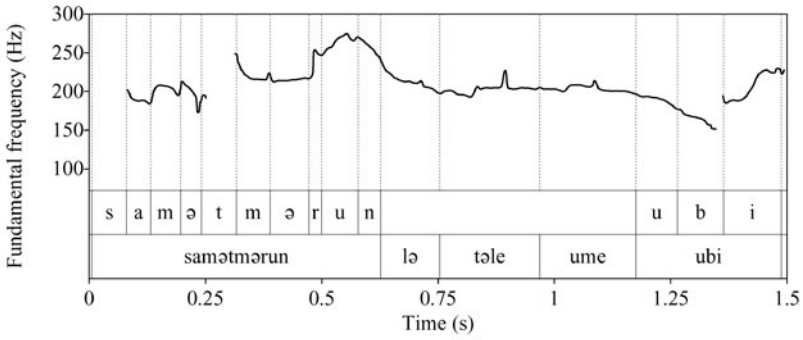
U-tie, [*u-titmat u*] *lə me-rau inəməniap u-me*
3f-there 3f-ANAPH DEM.3f RELR 3pS-afraid people.pl 3f-about
lə [*mən busit me-me me-num*] *apmaidəŋ na arubu*
RELR CONT always 3pS-HAB 3pS-walk downwards in night

[*u-me u-la ma-lagi*] *polis, ga mu-me-o tako.*
3mS-HAB 3mS-go 3pO-fetch=Ø police and come-3pS-stm$_2$ here
'Alright, that's it, (why) people were afraid of it, (that) they were always walking down at night, a policeman used to go get them, and they came here.'

Figure 6. *Nonfinal and final intonation (male speaker: JL)*

pitch; that is, there is little declination within the IU, but each unit has a somewhat lower mean frequency than the previous one, separated by pitch peaks.

The following example illustrates both fronting and negation. The first word, the name Samətmərun, has been topicalized, and we recognize the pitch peak+fall on the last syllable (*-run*). The negated clause following has a very different pattern: pitch drops to a minimum in the onset of the last syllable, followed by a rise on the rhyme — this is the characteristic pattern for negated clauses. The negator is *təle*, the most general negator in Kuot. Note that the intonation contour is not associated with the negator as such, but the negation-marking dip-rise is located relative to the clause edge.

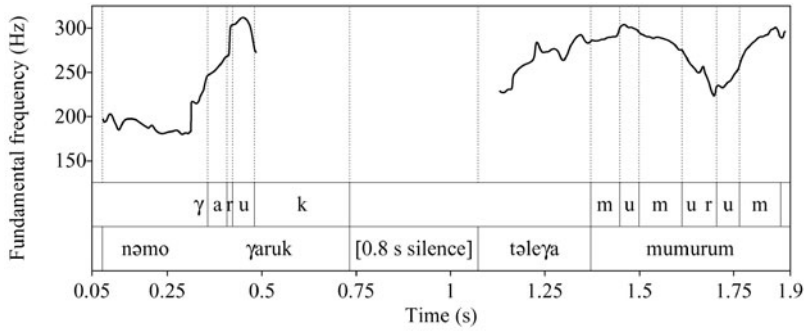


Samətmərun *lə* [*təle* *u-me* *ubí*].
S. RELR NEG 3mS-HAB work=Ø.
'Samətmərun didn't work.'

Figure 7. *Negated clause intonation (verb; female speaker: KD)*

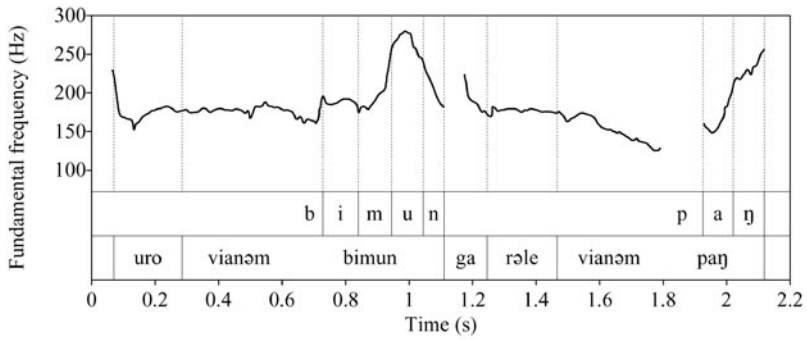
The same intonation structure, with a nonfinal IU (its fall phase partly obscured as the last segment, /k/, is voiceless) followed by the negation contour, is seen in the following utterance by the same speaker, where the head of the negated clause is an adjective (Kuot adjectives are syntactically very verb-like).

The next example shows negation with *təle* in a verbless utterance (by the speaker of Figure 6). The first part (*u-to pianəm Bimun*) is topicalized (here syntactically marked by *ga*) and has the nonfinal intonation on the last syllable. After that, pitch falls to the onset of the last syllable of the utterance, to rise again on the rhyme in the typical dip-rise negation contour.



Nəmo karuk, təle=ka mu-mur-um.
say no NEG=yet RED-good-3p.
'He said "No, they are not good yet."'

Figure 8. *Negated clause intonation (adjective; female speaker: KD)*

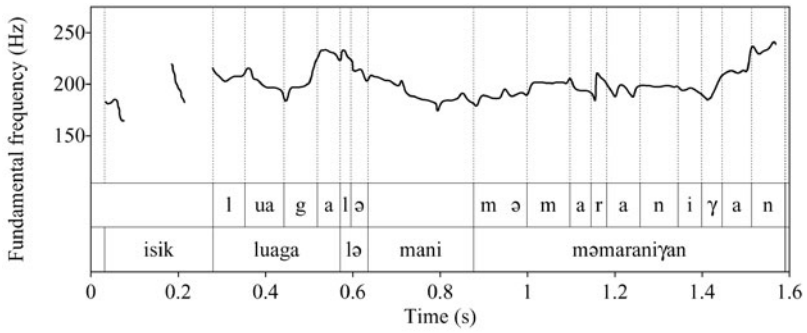


U-to pianəm Bimun ga təle pianəm paŋ.
3f-here village/place(f) B. RELR NEG village 1px.PossII.3s
'This place Bimun is not our place.'

Figure 9. *Negated clause intonation in a verbless clause (male speaker: JL)*

These examples have all involved the negator *təle*, but we will now turn to a slightly different construction, with a different negator. In Figure 10, we see a clause negated by the negator *mani* (which appears to have developed from the question word *mani* 'what').

Constructions with *mani* differ syntactically from those with *təle* in the placement of enclitics like *=kan* 'EMPH.' These always attach to the first



I-sik *luaga* *lə* *mani* *mə-mərəni=kan*
3m-DEM bench(m) RELR NEG RED-strong=EMPH
'This bench (was) not strong.'

Figure 10. *Negated clause intonation with the negator* mani *(female speaker: KD)*

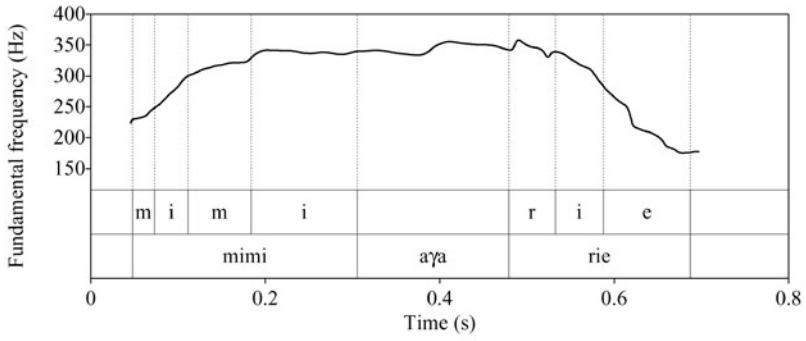
constituent of the syntactic phrase to which they belong, thus providing a useful criterion for phrasehood. With *mani*, the host for the enclitic is the word following *mani*, indicating that *mani* is not part of the phrase it negates, as seen just above in Figure 10. With *təle*, however, the enclitic attaches to the negation itself, showing that the negation is part of the phrase, as in example (1), which also shows an adjectival predicate:

(1) *təle=kan* *to-kak-kan-i*
NEG=EMPH 1S-RED-big-sg
'I (am) not big.'

The different position of the enclitic with the two words shows us that *mani* and *təle* are not simply synonyms, but that the language has two separate negation constructions.

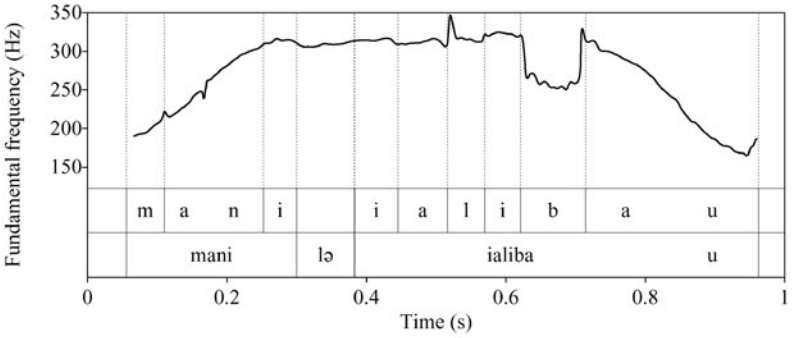
The fact that a clause negated by the *mani* construction receives the same prosodic coding as one negated with the *təle* construction provides additional support for the idea that it is the function of negation as such that conditions the intonation contour.

Question-word questions have their special intonation pattern as well. Pitch rises on the first syllable of the IU, stays up through the utterance, and falls on the final syllable.[17] It is interesting to note that the initial boundary tone appears to be part of the specification in the case of question-word questions, while for the other contours described here no consistent patterns have been noted for beginnings of phrases. The following two examples show how this pattern remains constant in spite



"Mimi aka tie?"
2p who there
"'Who are you(pl) there?"'

Figure 11. *Question-word question intonation (female speaker: KD)*



"Mani lə i-alibə-a u?"
what(m) RELR 3fS-cry-3mO DEM.3f
"'What is she crying for/about?"'

Figure 12. *Question-word question intonation (female speaker: KD)*

of the different position of the question word itself in each of the utterances.[18]

Both of the above are by the same speaker, in the same narrative. The following example, by a different speaker, contains a question-word question with a similar contour to the previous two examples, as well as a yes/no question. Yes/no questions have a very distinctive sharp pitch rise–fall

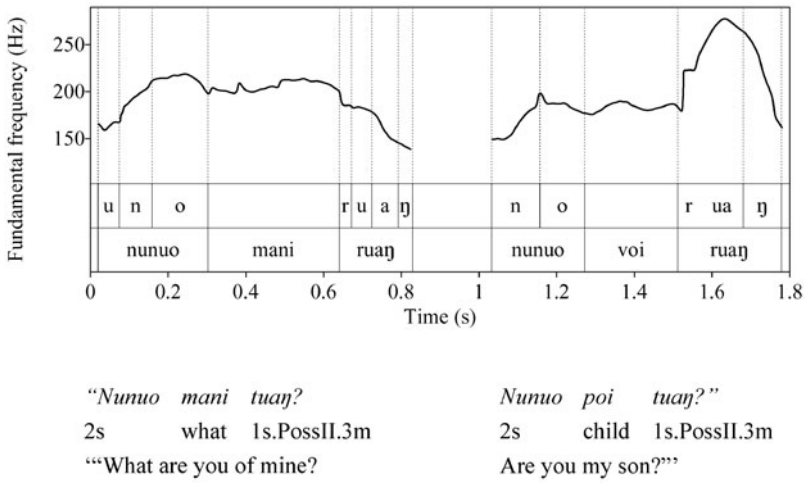


Figure 13. *Question-word question and yes/no question intonation (male speaker: SS)*

contour on the last syllable, very similar to the nonfinal contour we have seen above. The example is from a story of a man who finds an unknown boy at his homestead and tries to find out who he is.

This concludes the presentation of Kuot intonation data, to be further discussed in Section 6. From the examples given above, it should be clear that Kuot has an inventory of F_0 patterns, or tunes, used in consistent ways for particular grammatical functions, and that these are anchored to the edges of phrases rather than to particular syllables in the utterance. In the next section, we shall see that stress is expressed by duration rather than pitch.

5. Kuot lexical stress

Kuot stress placement is lexically determined, that is, there are no general stress rules that make reference to syllables or moras, but the position of stress has to be known for each lexeme. In other words, minimal stress pairs can be found, although they are relatively few, and it is clear that stress has a low functional load in terms of word disambiguation.

In this section, we will attempt to demonstrate the thesis that lexical stress in Kuot is manifested chiefly through duration, but is not associated with pitch. A note on how the location of stress was determined is in order, given the very different perceptual quality of Kuot stress compared

to the authors' native European languages (in particular the first author who carried out the field work, whose mother tongue is Swedish). Indeed, stress was problematic from the very start, since the location of the prominent syllable of particular words appeared to move in unpredictable ways. This later turned out to be due precisely to the unfamiliar nature of the encoding of stress: pitch was initially a factor in the author's perception of stress, but since pitch is not actually part of the expression of stress in Kuot, it led to stress being perceived in the wrong places. In spite of these difficulties it soon became clear that there were minimal stress pairs, and the sentences containing minimal pairs used in the present study were constructed and recorded towards the end of the second field period. However, they were not analyzed until after the last field period, because instrumental analysis of a perceptual category is only useful once the category is consistently perceived. Some time into the last field period it was: stress was perceived as consistent, regardless of the position of the word in an utterance, and initial analysis was carried out against this acquired perception of consistent stress on return from the field.

The data and results of more detailed analysis are described in the following subsections.

5.1. *Data and analysis*

To investigate the variation between stressed and unstressed syllables, some minimal and near-minimal stress pairs were recorded in controlled syntactic environments.

Data was collected from two male native speakers of Kuot (referred to hereafter as AT and RS). They are around thirty years old, are fully fluent in the language, and have spent most of their lives in the Kuot-speaking village of Bimun. While also fluent in Tok Pisin, and to a lesser extent in English, Kuot is their first language and was the dominant play language when they were children.

The minimal pairs were elicited as follows. The first author made up sentences for each member of each minimal pair, taking care that the word appeared in a realistic context and attempting to keep the contexts as parallel as possible for the two members of a pair. Given the role of pitch in intonation, it was evident that the target words had to appear in several syntactic positions, so as to control for the pitch effects of utterance intonation. The target words were embedded in the following four utterance positions: sentence-initially; sentence-medially but not followed by an intonationally marked phrase boundary; sentence-medially followed by an intonationally marked phrase boundary; and sentence-finally (with some variation to this schema depending on word class).

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A typical set of example clauses is given in (2), showing the target words *ka'ranim* 'reef' and *'baranim* 'shop' in sentence-medial position, nonadjacent to a phrase boundary:

(2) *dak=ieŋ* *karanim* *o* *urirə*
be.full=3fS reef(f) 3f.PossI octopus(f)
'The reef is full of octopus.'
dak=oŋ *baranim* *a* *tinpis*
be.full=3mS store(m) 3m.PossI can.of.fish(m)
'The store is full of cans of fish.'

The sentences were presented to the speakers in such a way that target words were not adjacent. In other words, the set of clauses containing *karanim* was given separated from the set of clauses containing *baranim*, to avoid overdifferentiation. For each sentence, the speakers were instructed to read it and interpret it, and to say it out loud afterwards. The request for the speakers to interpret the sentence before uttering it was motivated by the fact that, while proficient in reading Tok Pisin and to some extent English, neither of the two was used to reading their native Kuot. It was hoped that requesting them to pronounce the sentences as wholes would result in a more natural realization.

Altogether, eight minimal and near-minimal stress pairs were recorded in this way. While all combinations of members of minimal pairs with utterance position were collected orthogonally for each of the two speakers, a number had to be discarded due to hesitation in critical positions, background noise, etc. As a result, the dataset was reduced to 66 tokens.[19] Those that remained are given in (3), with indications of where regular lenition of intervocalic stops applies (in each case to the second instance of the stop):

(3)

'baranim	shop	*ka'ranim*	reef, low tide
'kadik	nod	*ka'dik*	mourn, be sorry
'ŋane	stubborn(3m)	*ŋa'ne*	meat
'kakat [γ]	soon	*ka'kat* [γ]	wobble
'papa [v∼β]	in-law	*pa'pa* [v∼β]	face

The first two syllables of each word were analyzed, except for the last pair where only the first syllable was analyzed.

Figure 14 illustrates one of the pairs in clause-final position.

The remaining data was segmented manually by the second author, and the following measurements were made:

- duration (in milliseconds) of the vowel of each target syllable;
- mean fundamental frequency (F_0) over the same domain;
- vowel quality (F_1 and F_2) of [a] tokens.

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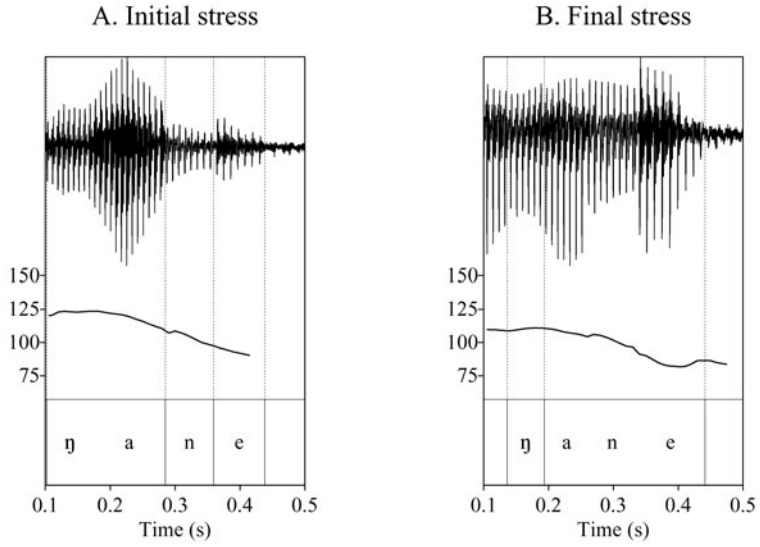

Figure 14. *Waveform: F_0 track (in Hz) and segmentation for each member of a minimal stress pair*

Since we did not expect tonal shape to be aligned in any specific way with stressed syllables, mean F_0 was used as a rough measure that should be sensitive to any consistent F_0 marking aligned within the relevant domain.

The vowels of unstressed syllables tend to be reduced, which translates into F_1 and F_2 values that are closer to the center of their respective ranges. Centralization of vowels affects different vowels in different ways: while for the vowel [u] it involves a raising of both F_1 and F_2, it translates into a lowering of F_1 for the vowel [a]. The majority of vowel tokens in our dataset happen to be [a] — 55 out of 66 — and because the occurrence of other vowels is so limited, it was not considered useful to analyze them. So while both the descriptive and inferential statistics for duration and mean F_0 reported below reflect all 66 tokens, those for vowel quality are based on the 55 tokens which have the vowel /a/.

Another parameter that is frequently a correlate of stress is intensity (as suggested by Figure 14). Spectral balance, which has been shown to be more closely related to perceptual loudness than amplitude, was initially investigated, using the measurements presented in Sluijter and van Heuven (1996). The results were nonsignificant, but due to background noise in the recording, they were judged to be inconclusive and are not presented here. In other words, intensity may still be a factor in the expression of stress in Kuot, but we are unable to give quantitative support for it.

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As the two speakers sampled cannot be taken to be representative of the whole population, ANOVAs were carried out for each speaker. Linear discriminant analyses (LDA) were used to corroborate the results of the ANOVAs over speakers. Since the LDAs were carried out on the data from both speakers together, the measurements for mean F_0 and vowel quality were standardized per speaker, in both cases using z-transformation, to control for between-speaker variation in frequency register and range.

5.2. *Results*

The descriptive statistics are presented in Table 1. There is a clear difference between stressed and unstressed vowels in terms of duration: 107 vs. 68 ms. on average, respectively. Moreover, the standard deviations for the durations of stressed and unstressed vowels indicate that the respective distributions hardly overlap at all. In terms of vowel quality, the means for stressed and unstressed vowels are also well apart, but here the overlap between the distributions is slightly more substantial. Mean F_0, on the other hand, does not vary as a function of stress.

The ANOVAs that were carried out for each speaker separately confirm that while stress determines duration and vowel quality in a significant way, it has no significant effect on mean F_0. For duration, we find a highly significant effect of stress for both speakers [AT $F(1,28) = 21.6$, $p < .001$; RS $F(1,24) = 41.4$, $p < .001$], but no effect of utterance position [AT $F(3,28) = 2.2$, n.s.; RS $F(2,24) = 1.8$, n.s.]. The interaction between stress and utterance position also is not significant for both speakers [AT $F(3,28) < 1$, n.s.; RS $F(2,24) < 1$, n.s.].

The same pattern is found with F_1 as the dependent variable. Again there are highly significant effects of factor stress for both speakers [AT

Table 1. *Mean (*M*), standard deviation (*SD*), and number of cases (*N*) for stressed and unstressed vowels; results are presented both by speaker and over speakers*

Measure		Speaker AT			Speaker RS			Both speakers		
		M	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*	*N*
Duration (ms)	[+stress]	108	29	18	107	16	15	107	23	33
	[−stress]	67	22	18	68	16	15	68	19	33
Mean F_0 (Hz)	[+stress]	90	8	18	105	11	15	97	12	33
	[−stress]	94	14	18	106	9	15	99	14	33
Vowel quality (F_1)	[+stress]	624	68	14	599	32	12	612	55	26
	[−stress]	527	62	14	531	31	12	529	49	26

$F(1,20) = 12.5$, $p = 0.002$; RS $F(1,18) = 22.0$, $p < 0.001$]. And as was the case with the dependent duration, neither utterance position nor the interaction between utterance position and stress are significant — neither for speaker AT [utterance position: $F(3,20) = 1.8$, n.s.; interaction: $F(3,20) < 1$, n.s.], nor for speaker RS [utterance position: $F(2,18) = 2.5$, n.s.; interaction: $F(2,18) < 1$, n.s.].

The results are markedly different with F_0 as the dependent variable. Now the factor stress is not significant, for either of the two speakers [AT $F(1,28) = 1.3$, n.s.; RS $F(1,24) < 1$, n.s.]. In other words, for neither of the two speakers is the stressed syllable singled out by F_0. However, there is a significant effect of the factor utterance position [AT $F(3,28) = 5.0$, $p = 0.007$; RS $F(2,24) = 10.5$, $p = 0.001$]. This can be attributed to the context where the target word is located before an intonationally marked boundary. Finally, the interaction between stress and utterance position is not significant [AT $F(3,28) < 1$, n.s.; RS $F(2,24) < 1$, n.s.].

Linear Discriminant Analyses were carried out to determine to what extent each of the three acoustic measures (duration, vowel quality [F_1], and mean F_0) discriminate between stressed and unstressed syllables. These analyses were performed on the data from both speakers together. As expected, stressed and unstressed vowels can be distinguished best from one another on the basis of their duration (85 percent of cases correctly classified). And while vowel quality gives a correct classification result of 79 percent, the result for mean F_0 is around chance level (52 percent).

Importantly, the descriptive statistics and the ANOVA results of the two speakers are similar for all three measures, which makes it highly probable that these values reflect language characteristics rather than individual idiosyncracies. While the limited number of speakers precludes a conclusive statement for the Kuot language population as a whole, the results and the descriptive and inferential statistics provide reasonably strong support for the claim that stressed syllables in Kuot do not carry pitch accents.

6. Discussion and conclusions

In this article, we have attempted to show that there are aspects of Kuot phonology that challenge established assumptions about crosslinguistic features of prosody. In particular, it would appear that Kuot has nothing that could be called a pitch accent, neither lexical nor intonational. The absence of pitch accents also means that Kuot provides a counterexample to the suggested typological universal which states that intonational pitch

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accents are anchored to stressed syllables. Indeed, if the limited data presented here can be taken to be representative of the language as a whole, no pitch movements of any kind are tied to lexical stress. The intonational patterns investigated are all concerned with information about the structure or type of clause, rather than speaker attitude, etc.

The language still makes extensive use of pitch, but it is limited to boundary tones. Final boundaries, in particular, carry salient contour markers of a variety of functions. One of these, negation, has not been described for other spoken languages.[20]

In African tone languages, there is sometimes a prosodic component to negation, but it should be noted that this is more in the way of a tonal morpheme, or a tonal component of the negation morpheme, occurring on a particular constituent of the clause. It appears that it is in some cases the only marker of negation.[21]

The same phenomenon is reported for Ndyuka (an English-lexified tonal creole of Suriname),[22] and for Papiamentu (an Iberian-based creole of the Netherlands Antilles with some tonal features [Römer 1991]).[23]

There are also some reports of particular prosody associated with negation in nontonal languages, such as Jakarta Indonesian,[24] other dialects of Malay,[25] and English,[26] but typically restricted to a few verbs and with additional attitudinal meaning.

It should be noted that all these versions of prosodic primary or secondary marking of negation by means of F_0 differ from that of Kuot in that they are associated with particular constituents of the clause, rather than the clause as a whole as is the case in Kuot.

Another unusual, although not unique, function of intonation in Kuot is that of marking question-word questions with their own specific contour. The shape of this contour further suggests that phrase-initial boundaries can also play a defining role.

The fact that yes/no questions are intonationally marked is more commonplace, and it is worth noting that the contour has the same shape as the rise–fall contour that typically marks nonfinality. This mirrors the situation in many intonation systems, including Dutch (Caspers 1998), which use a rise to mark both nonfinal IUs and questions. It remains to be investigated whether there is a significant difference in excursion range between the two types.

Regarding the nonfinal contour (also used in yes/no questions), to the best of our knowledge it is crosslinguistically very unusual for a rise–fall rather than a simple rise to mark nonfinal. The presence of this pattern in Kuot could be related to the fact that, unlike most other stress languages, Kuot does not have rise–fall pitch accents associated with lexically stressed syllables.

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One other language of a similar type has been described — that is, one having no pitch accents but plenty of boundary tones. This is the Niger-Congo language Wolof discussed above (Rialland and Robert 2001), and Kuot fits in the same cell in Figure 4. In Wolof, too, stress is entirely independent of pitch; stressed syllables do not constitute anchor points for clause-related pitch movements; and intonational tunes signal information of clause and phrase type. But there are some differences between the prosodic configurations of the two languages. First, while the position of Kuot stress is lexically determined, Wolof stress is fixed. Secondly, as we have seen, Kuot stress correlates strongly with duration, while Wolof stress appears to be expressed by vowel and consonant quality, but not by duration. This last difference is likely to be related to the fact that Wolof has distinctive length in both vowels and consonants, that is, the use of duration to encode segmental distinction may preclude its use as a stress marker.[27]

An interesting question is whether the absence of pitch accents has any implications regarding the inventory of intonational contours. That is, it would be worthwhile determining whether the absence of pitch accents in languages like Kuot and Wolof implies a greater variety of intonational contours, in a functional way.[28] In other words, it could be that the absence of intonational pitch accents in languages such as Kuot and Wolof correlates with a richer inventory or a greater functional load of configurations associated with prosodic phrase boundaries. We may note in this context that in both languages, plateau contours have a high functional load.

In spite of the fact that it is insufficiently studied at present, it is worth including a note on some prosodic means of expressing emphasis in Kuot. Emphasis is a complex phenomenon, and no typology will be attempted here. Without further analysis, we will simply point to a few salient expressions of it in Kuot. On the one hand, there is morphological expression of emphasis, in the emphatic enclitic *=kan*. This clitic is not prosodically prominent, as can be seen in Figure 10. On the other hand, we have (at least) three prosodic expressions of emphasis: lengthening, articulatory energy, and overall high pitch.

The lengthened segment is usually the one with the most relevant semantic content for the context, but occasionally other segments in the structure receive lengthening. In Figure 15, the speaker is telling of his grandfather who was a phenomenal bird catcher, and at this point comes to find his net full of birds. The elongated segment is the second syllable of *kukuom* 'tree' (possibly because it is phrase-final), which has a duration of 0.6 seconds. It is also spoken at quite a high F_0 for a male speaker, around 220 Hz.

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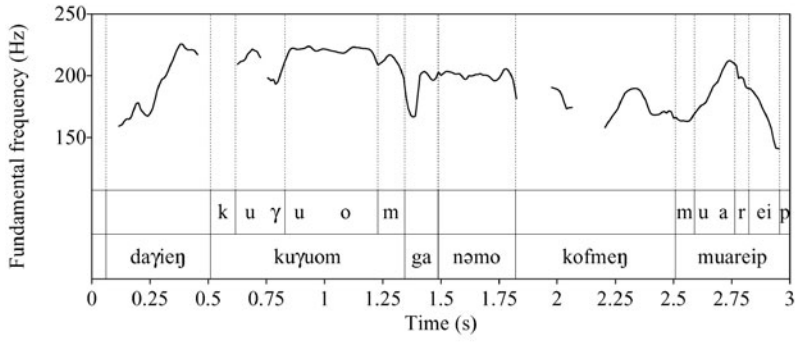

Dak=ieŋ ***kukuom*** *ga* [*nəmo* *kkof=meŋ*] *muareip*
be.full=3fS tree(f) and be.about.to break=3pS branch.pl
'The tree was full and the branches were about to break'

Figure 15. *Emphasis by lengthening (male speaker: SEL)*

The segmental pronunciation is generally emphatic in this part of the text; /k/ in *kof* 'break' is not lenited as it would normally be in intervocalic position, and, for example, *muareip* at the end of the utterance is spoken with very clearly pronounced consonants and much energy on the vowels, but without the high pitch and increased duration. This type of "tense" pronunciation is another way of emphasizing particular words and syllables.

In spite of Cruttenden's (1986: 10) misgivings regarding the presence of meaningful intonational contours in lesser-known languages, we would argue that the patterns found in Kuot are valid at least for the narrative genre, but agree that more detailed analysis is needed, in several areas. It is likely that more patterns can be found, associated with other clause types (for example, imperative, prohibitive, and relative clauses are areas yet to be investigated). Ladd (2001: 1383) makes the observation that languages may use the same tune in several functions (as in Kuot's use of pitch peaks for both topicalization and other kinds of nonfinality), and also points out that languages appear to vary in the number of tunes that they use. What seems extraordinary about Kuot is the degree of specialization of tunes, perhaps especially in functions that are also expressed lexically, such as question-word questions and negation. Investigation into further clause types and functions may show some recurrence of tunes, or it may expand the inventory of tunes even further.

Other related areas for further research include: the expression of prominence on particular constituents, such as new information and contrastive focus, and the interaction of such features with clause intonation;

the expression of attitude of various kinds; genre-related variation;[29] and metalinguistic parameters such as politeness (which, impressionistically, is expressed by speaking "softly" but perhaps also with intonational corollaries). Regarding attitudinal parameters such as surprise and anger, the absence of observations may be a direct effect of the type of data used in this study: narrative monologue is likely to have significantly less emotive expression than dialogue.

Meanwhile, we are pleased to have been able to demonstrate some aspects of an unusual prosodic system, one where intonation ignores stress, and where there are no pitch accents.

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Appendix. Abbreviations and conventions in examples

1s	1st person singular	ASP	aspect
1px	1st person plural exclusive	ANAPH	anaphoric demonstrative
2s	2nd person singular	CONT	continuous aspect
3d	3rd person dual	DEM	demonstrative
3f	3rd person singular feminine	EMPH	emphatic clitic
3m	3rd person singular masculine	HAB	habitual aspect
3s	3rd person singular	NEG	negation
3p	3rd person plural	PossI	inalienable possessive
f	feminine	PossII	alienable possessive
m	masculine	RED	reduplication
sg	singular	RELR	relator
pl	plural	stm_2	2nd part of bipartite stem
O	object		
S	subject		

As for other conventions, noun phrases and verb phrases in examples are in square brackets. Parentheses have been used in translations around words which have been added because they are required by English, but which are not present in the Kuot.

Notes

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Although the article as a whole represents a collaborative effort, parts of it reflect a division of responsibility such that the first author was responsible for data collection and initial observations, while the second author performed and described the detailed acoustic analysis and the statistics of Section 5. Some of the findings presented in this article have previously appeared in Lindström (2002). Correspondence address: Dr. Eva Lindström, Dept. of Linguistics, University of Stockholm, 106 91 Stockholm, Sweden. E-mail: evali@ling.su.se.

2. The expression of focus in Kuot has not yet been studied to the point where anything conclusive can be said. A few remarks on emphasis are made in Section 6.
3. Stress accent is also known simply as stress, and the terms will be used interchangeably in this article. Stress accent contrasts with pitch accent, which is also sometimes referred to as non-stress accent (Beckman 1986) or tonal accent (e.g. Hyman 1981).
4. "Word" here may be taken to indicate a phonological domain that can include unstressed items such as articles, which do not normally have independent marking of prominence (cf. Nespor and Vogel 1986).
5. This distinction is a fundamental tenet of the metrical-autosegmental framework, which postulates that intonational contours are built up from local events (Pierrehumbert 1980; Gussenhoven 1984; Ladd 1996, 2001).
6. A number of studies have tried to arrive at workable heuristics such as the mimicking paradigm (Pierrehumbert and Steele 1989) and categorical perception (Ladd and Morton 1997; Remijsen and van Heuven 2003), but none of these have proved sufficiently reliable. See Gussenhoven (1999) for a discussion of such heuristic tests.
7. While contemporary typological studies consider the connection between intonational pitch accents and lexically stressed syllables as a given, earlier research did not distinguish the phenomena of lexical stress and intonational pitch accent on lexically stressed syllables at all. The relation between the two was ill-understood, with the pitch accent being considered part of the realization of the lexical stress with which it is associated (see Fry 1958 and references there). Also, Bolinger (1964) does not consider stress to be phonetically realized in the absence of an intonational accent.
8. Ladd (1996: 149) does speculate that there may exist languages with boundary tones ("edge tones" in his terminology) but no pitch accents (one type of "core tones" to Ladd).
9. It is duly noted that the investigation of Wolof prosody by Rialland and Robert is far more extensive and detailed than ours of Kuot, taking into account a larger sample and examining more factors, including, for example, focus (which is found not to influence pitch in Wolof).
10. Cf. Lindström (2002, forthcoming).
11. Cf. Ross (1994), Lindström (in prep.).
12. All recordings were made in mono onto magnetic tape cassettes and later digitized.
13. Preliminary analysis was based on extractions made using Speech Analyzer 1.5 (Summer Institute of Linguistics, Acoustic Speech Analysis Project; the pitch extractions

shown in Figures 6, 9, and 13 were double-checked with Waves™ [Entropic/Microsoft] by Robert Eklund [Telia Research, Sweden]).

14. Examples of these processes in the data presented here can be seen for instance in Figure 6 (raising caused by /s/ and /t/ in the second graph), and in Figure 12 (lowering occasioned by /b/).
15. See, for example, Nespor and Vogel (1986) and Shattuck-Hufnagel and Turk (1996).
16. We have not yet determined what controls the distribution of the two contours rise and rise–fall.
17. This plateau is reminiscent of the flat-hat patterns of Dutch ('t Hart et al. 1990; Ladd 1996: 15). An important difference is that in Dutch, the rise and fall that delimit the plateau are pitch accents associated with stressed syllables. In Kuot, on the other hand, the plateau is anchored at the edges of the phrase.
18. The dip in the plateau in Figure 12 is attributable to segmentally conditioned F_0 variation caused by the voicing in [b], and the word has been segmented to show this. (The possibility of an octave jump as a result of the pitch range being set too narrow at extraction has been examined, but was not found to explain this case.)
19. This number is the result of nonorthogonal variation between the following factors: speakers (2), minimal pairs (5), syllables (2 — initial and second), and sentence positions (3–4). Two minimal pairs had to be discarded because of vowel raising ([a] > [ə]), so that these word pairs were not distinguished exclusively by lexical stress, but potentially by phonemic differences. Another cause for discarding data was lenition ([p] > [β]). While this process affects stressed and unstressed syllables alike, the affected items could not be segmented with sufficient reliability. One minimal pair was discarded for this reason, as were the measurements for the second syllable of another pair.
20. Sign languages, however, frequently have facial gestures and/or head movement — equated with intonation in spoken languages — accompanying lexical (manual) negation. Some sources even state that nonlexical negation alone can sometime express negation. Bencie Woll and Roland Pfau, personal communication in response [http://www.linguistlist.org/issues/14/14-1173.html] to a query by the second author on Linguist List [http://www.linguistlist.org/issues/13/13-2045.html#2], hereafter abbreviated as "LL."
21. Tonal-only negation was reported by Bruce Connell for Mambila and other Benue-Congo languages; Elke Hentschel for Kele (Benue-Congo), referring to Carrington (1949: 19); Roland Pfau for Ga (Kwa), Ogbru (Abidji; Kwa); Janet Bing for Liberian Krahn (Kru) (all these LL); also Mano (Mande; see Dahl 1979 quoting Becker-Donner 1965). In a crosslinguistic study of negation comprising 297 languages, Miestamo (2003) reports two which have no negation morpheme but achieve all negation through tone modification and modification of the form of various affixes for subject or tense/aspect: Degema and Igbo (contrary to Payne's [1985: 207] statement that "standard negation never seems to be realized by such modifications alone"). All of these languages belong to the Niger-Congo family.
22. George Huttar (LL).
23. Remijsen and Martis (in prep.) argue that Papiamentu features a word accent contrast, and that negation has a prosodic component which involves a change of the word accent of the verb or of the predicate noun from one accentual pattern to the other.
24. David Gil (LL).
25. Bert Remijsen (field notes).
26. Remy Viredaz, Michael Becker, Michael Bernstein (LL).
27. Cf. Berinstein (1979).

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28. Such a functional explanation of prosodic encoding has been proposed for lexical stress by Berinstein (1979).
29. In a study of negation in French and English, Yaeger-Dror (2002) finds that the prosody of negation varies with register as well as language.

References

Bateman, Janet (1990). Iau segmental and tone phonology. In *Miscellaneous Studies of Indonesian and Languages in Indonesia, Part X*, NUSA 32, Bambang Kaswanti Purwo (ed.), 29–42. Jakarta: Universitas Katolik Indonesia Atma Jaya.

Becker-Donner, Etta (1965). *Die Sprache der Mano*. Wien: Österreichische Akademie der Wissenschaften.

Beckman, Mary E. (1986). *Stress and Non-Stress Accent*. Dordrecht: Foris Publications.

Berinstein, Ava E. (1979). *A Cross-linguistic Study on the Perception and Production of Stress*. MA thesis, UCLA Working Papers in Phonetics 47.

Boersma, Paul; and Weenink, David (1996). *Praat: A System for Doing Phonetics by Computer*. Report of the Institute of Phonetic Sciences of the University of Amsterdam 132.

Bolinger, Dwight (1964). Around the edge of language: intonation. *Harvard Educational Review* 32(2), 282–293.

—(1978). Intonation across languages. In *Universals of Human Language, Vol II: Phonology*, Joseph Greenberg (ed.), 471–524. Palo Alto, CA: Stanford University Press.

Carrington, John F. (1949). *Talking Drums of Africa*. Oxford: Alden Press.

Caspers, Johanneke (1998). Who's next? The melodic marking of question vs. continuation in Dutch. *Language and Speech* 41, 371–394.

Cruttenden, Alan (1981). Falls and rises: meanings and universals. *Journal of Linguistics* 17, 77–91.

—(1986). *Intonation.* Cambridge Textbooks in Linguistics. Cambridge: Cambridge University Press.

Dahl, Östen (1979). Typology of sentence negation. *Linguistics* 17(1/2), 79–106.

Féry, Caroline (2001). The phonology of focus in French. In *Audiatur Vox Sapientiae. A Festschrift for Arnim von Stechow*, Caroline Féry and Wolfgang Sternefeld (eds.), 153–181. Berlin: Akademie-Verlag.

Fitzpatrick, Jennifer (2000). On intonational typology. In *Methodology in Linguistic Typology*, Sprachtypologie und Universalienforschung, Sonderheft 53, Peter Siemund (ed.), 88–96. ▮▮▮▮:▮▮▮▮.

Fry, Dennis B. (1958). Experiments in the perception of stress. *Language and Speech* 1, 126–152.

Grosz, Barbara J.; and Sidner, Candace L. (1986). Attention, intentions, and the structure of discourse. *Computational Linguistics* 12(3), 175–204.

Gussenhoven, Carlos (1984). *On the Grammar and Semantics of Sentence Accents*. Dordrecht: Foris.

—(1999). Discreteness and gradience in intonational contrasts. *Language and Speech* 42, 283–305.

—(2002). Intonation and interpretation: phonetics and phonology. In *Speech Prosody 2002 — Proceedings of the 1st international Conference on Speech Prosody*, Bernard Bel and Isabelle Marlien (eds.), 47–57. Aix-en-Provence: ProSig and Université de Provence, Laboratoire Parole et Language.

Hayes, Bruce; and Lahiri, Aditi (1991). Bengali intonational phonology. *Natural Language & Linguistic Theory* 9, 47–96.
Hyman, Larry (1981). Tonal accent in Somali. *Studies in African Linguistics* 12, 169–203.
Jun, Sun-Ah (1996). *The Phonetics and Phonology of Korean Prosody: Intonational Phonology and Prosodic Structure*. New York: Garland.
Ladd, D. Robert (1996). *Intonational Phonology*. Cambridge: Cambridge University Press.
—(2001). Intonation. In *Language Typology and Language Universals: An International Handbook*, Handbooks of Linguistics and Communication Science, vol. 20.2, Martin Haspelmath, Ekkehard König, Wulf Oesterreicher, and Wolfgang Raible (eds.), 1380–1390. Berlin: Walter de Gruyter.
—; and Morton, Rachel (1997). The perception of intonational emphasis: continuous or categorical? *Journal of Phonetics* 25, 313–342.
Lindström, Eva (2002). Topics in the grammar of Kuot — a non-Austronesian language of New Ireland, Papua New Guinea. Unpublished doctoral dissertation, Department of Linguistics, Stockholm University.
—(forthcoming). *A Descriptive Grammar of Kuot, a Non-Austronesian Language of New Ireland, Papua New Guinea*.
—(in prep.). Phonological convergence in New Ireland: Kuot and its Austronesian neighbours.
Miestamo, Matti (2003). Clausal negation; a typological study. Unpublished doctoral dissertation, Department of General Linguistics, University of Helsinki.
Nespor, Marina; and Vogel, Irene (1986). *Prosodic Phonology*. Dordrecht: Foris.
Payne, John R. (1985). Negation. In *Language Typology and Syntactic Description*, vol. I, Timothy Shopen (ed.), 197–242. Cambridge: Cambridge University Press.
Pierrehumbert, Janet B. (1980). The phonology and phonetics of English intonation. Unpublished doctoral dissertation, Massachusetts Institute of Technology.
—; and Hirschberg, Julia (1990). The meaning of intonational contours in the interpretation of discourse. In *Intentions in Communication*, Philip R. Cohen, ▮▮▮▮, and ▮▮▮▮ (eds.), 271–311. Cambridge, MA: MIT Press.
—; and Steele, Shirley A. (1989). Categories of tonal alignment in English. *Phonetica* 46, 181–196.
Remijsen, Bert; and van Heuven, Vincent J. (2003). On the categorical nature of intonational contrasts, an experiment on boundary tones in Dutch. In *The Phonological Spectrum: Suprasegmental Structure*, vol. 2, Jeroen van de Weijer, ▮▮▮▮, and ▮▮▮▮ (eds.), 225–246. Amsterdam: John Benjamins.
—; and Martis, Fariennne (in prep.). *Papiamentu Intonation (Curaçao Dialect)*.
Rialland, Annie; and Robert, Stéphane (2001). The intonational system of Wolof. *Linguistics* 39(5), 893–939.
Römer, Raúl G. (1991). *Studies in Papiamentu tonology*, Norval Smith et al. (eds.). Amsterdam: Amsterdam Centre for Caribbean Studies.
Ross, Malcolm (1994). Areal phonological features in north central New Ireland. In *Language Contact and Change in the Austronesian World*, Trends in Linguistics, Studies and Monographs 77, Tom Dutton, ▮▮▮▮, and ▮▮▮▮ (eds.), 551–572. Berlin and New York: Mouton de Gruyter.
Shattuck-Hufnagel, Stefanie; and Turk, Alice E. (1996). A prosody tutorial for investigators of auditory sentence processing. *Journal of Psycholinguistic Research* 25(2), 193–247.
Sluijter, Agaath M. C.; and van Heuven, Vincent J. (1996). Spectral balance as an acoustic correlate of linguistic stress. *Journal of the Acoustical Society of America* 100, 2471–2485.

(V7(M) 21/3/05 16:29) WDG/G J-1273 Linguistics, 43:4 PMU:IDP(CKN[W])21/3/2005 Times_M (0).3.04.05 (148×225mm) pp. 839–870 005_P (p. 869)

't Hart, Johan; Collier, René; and Cohen, Antonie (1990). *A Perceptual Study of Intonation: An Experimental-phonetic Approach*. Cambridge: Cambridge University Press.

Trubetzkoy, Nikolai S. (1969 [1939]). *Grundzüge der Phonologie*. *Vol. 7: Principles of Phonology*, Travaux du cercle de linguistique de Prague (trans. by C. A. M. Baltaxe), Berkeley: University of California Press.

Vaissière, Jacqueline (1995). Phonetic explanations for cross-linguistic prosodic similarities. *Phonetica* 52, 123–130.

van Zanten, Ellen; Goedemans, Rob; and Pacilly, Jos (2003). The status of word stress in Indonesian. In *The Phonological Spectrum*, *Vol. II: Suprasegmental Structure*, Jeroen van de Weijer ▮▮▮▮, and ▮▮▮▮ (eds.), 151–175. Amsterdam: John Benjamins.

Yaeger-Dror, Malcah (2002). Register and prosodic variation, a cross-language comparison. *Journal of Pragmatics* 34, 1495–1536.

(V7(M) 21/3/05 16:29) WDG/G J-1273 Linguistics, 43:4 PMU:IDP(CKN[W])21/3/2005 Times_M (0).3.04.05 (148×225mm) pp. 839–870 005_P (p. 870)