Consequences of catalexis

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Paper presented at the *First HIL Phonology Conference* (HILP I), University of Leiden, 14-16 January 1993.

Published 1995, in: H. van der Hulst & J. van de Weijer (eds.) *Leiden in Last: HIL Phonology Papers I*, The Hague: Holland Academic Graphics, 269-298.

1. Introduction

As the logical counterpart of extrametricality, Kiparsky (1991) has proposed catalexis. Like extrametricality, this notion was borrowed from metrics, where it refers to the phenomenon that at the end of a line, a short syllable may substitute for a long one. Earlier an almost similar idea was introduced into metrical theory by Giegerich (1985).

A prosodic constituent is extrametrical when it is invisible to prosodic rules and principles. Various proposals have been made with respect to the formalization of extrametricality (cf. Hayes 1980, 1991, Inkelas 1989). Kiparsky (1991) argues that it is formally the erasure of a prosodic constituent (mora or syllable) at the edge of a domain, together with all prosodic structure dominating it. In (1ai), a right-peripheral syllable has been erased, which has thereby become unaccessible for foot construction. In (1aii) the right-peripheral mora of a formerly moraic consonant has been erased, resulting in loss of moraic syllable weight.

In Kiparsky's proposal, catalexis is the exact logical opposite of extrametricality, or prosodic erasure. A segmentally empty prosodic constituent, mora or syllable, is added at the edge of the domain, where it becomes accessible to prosodic rules. More precisely, catalectic constituents are adjoined to the super-ordinate metrical structure if permitted by the language's well-formedness constraints. Thus, in a language that allows bimoraic syllables, a catalectic mora renders a preceding light syllable heavy, see (1bii). And in a language with trochaic feet, a right-peripheral catalectic syllable is footed together with a preceding syllable. (Foot structure is not depicted in 1bi)[1]. Crucially, catalexis and extrametricality are subject to the Peripherality Condition.

(1)

a. *Extrametricality*				b. *Catalexis*			
(i) Syllable		(ii) Mora		(i) Syllable		(ii) Mora	
σ	σ	σ	σ	σ	σ	σ	σ
|	|	|	|	|	|	|	| \
μ	μ	μ	μ	μ	μ	μ	μ μ
/|	/|	/|	/|	/|	/|	/|	/|
ta	ta #	ta	n #	ta	#	ta	#

[1] A question that remains unsolved at present is whether a catalectic element (say, a syllable) can be the head of a foot. If so, one would expect rightward trochaic systems with initial catalexis, with sub-minimal words and consistent second syllable stress. Kiparsky argues that such analyses should be ruled out.

With Kiparsky, I assume that the addition of a catalectic constituent of higher types does not automatically induce a catalectic constituent of a lower type. That is, the catalectic syllable in (1bi) does not induce a catalectic mora. This will become important later.

The notion of catalexis has two kinds of theoretical motivation. Perhaps the strongest motivation is that it allows metrical theory to completely eliminate degenerate feet. Degenerate feet are monomoraic feet in languages with syllable weight contrasts, and monosyllabic feet in languages lacking weight contrasts. This is a welcome result, since studies such as McCarthy and Prince (1986), Hayes (1987, 1991), Kager (1989, 1992a), Prince (1990), and Mester (1992), argue that many stress systems avoid, or even completely disallow, degenerate feet.

The second theoretical advantage of catalexis is a direct consequence of the first. Prosodic theory is now able to impose a universal word minimum of a proper foot: a bimoraic minimum (a heavy syllable) in languages with weight contrasts, and a disyllabic minimum in languages lacking weight contrasts. 'Sub-minimal' are monomoraic words in systems with weight contrasts, and monosyllabic words in systems lacking weight contrasts. Such words can satisfy universal minimality only with the help of catalexis.

Elimination of degenerate feet by catalexis is exemplified by Ono, an Australian language (Phinnemore 1985). Ono has no vowel length contrast, and freely allows monosyllabic words. Its stress pattern is trochaic: main stress is initial, and secondary stresses are on odd-numbered syllables, including final syllables in odd-numbered words. In a theory without catalexis, degenerate feet are required for the analysis of monosyllables (2a), as well as for final secondary stresses in odd-numbered words (2c):

(2)	a.	b.	c.
	(*)	(*)	(* .)
	(*)	(* .)	(* .)(*)
	σ	σ σ	σ σ σ
	kúm 'palm bark'	déne 'my eye'	ári lè 'I went'

A catalexis-based analysis avoids degenerate feet by postulating a catalectic syllable at the right edge of the word. From here on, catalexis will be informally represented with square brackets, e.g. [σ]. See (3):

(3)	a.	b.	c.
	(*)	(*)	(* .)
	(* .)	(* .) .	(* .)(* .)
	σ [σ]	σ σ [σ]	σ σ σ [σ]
	kúm	déne 'my eye'	á ri lè

Observe how the catalectic syllable defines its own position on the grid, bracketed together with the preceding syllable's grid position in a binary trochee. See (3a,c). But in (3b), the analogous 'catalectic' grid position remains unbracketed, since feet are strictly disyllabic. Evidence for nonexhaustive bracketing (when binary feet cannot be formed), from various languages, is presented in Hayes (1991), Kager (1992a), and Mester (1992).

The primary diagnostic for catalexis in a language is the presence of sub-minimal words. In Ono, catalexis is motivated in this way, but it can also be inferred from polysyllabic words. Ono is a trochaic system with iterative rightward foot parsing. In such systems, a second diagnostic of catalexis resides in the presence of final secondary stresses, or rhythmic beats, in odd-numbered polysyllables. Final syllables form binary feet together with a catalectic syllable. See (3c).

Kiparsky (1991) suggests that the correlation between sub-minimal words and final stresses in Ono-type languages reflects a cross-linguistic generalization of much wider scope. Rightward trochaic systems which have sub-minimal words, usually display secondary stresses on final odd-numbered syllables. In such systems the catalexis parameter is set to 'on'. Conversely, rightward trochaic systems without sub-minimal words usually lack such final stresses. Here, the catalexis parameter is switched 'off'.

An example of the latter kind is Diyari, another Australian language (Austin 1981). Like Ono, Diyari lacks vowel length and has initial main stress. However, it has a disyllabic minimum on content words, while secondary stresses never fall on final syllables. The standard analysis, based on degenerate feet and extrametricality, is given in (4). (Here extrametricality is informally represented with angled brackets, e.g. <...>.)

(4)	a.	b.	c.
	(*)	(*)	(* .)
	(*)	(* .)	(* .)(*)
	σ <σ>	σ σ <σ>	σ σ σ <σ>
	ká na	pína du	wíla pì na
	'man'	'old man'	'old woman'

In a catalexis-based analysis degenerate feet are avoided, and extrametricality need not be invoked. See (5):

(5)	a.	b.	c.
	(*)	(*)	(* .)
	(* .)	(* .) .	(* .)(* .)
	σ σ	σ σ σ	σ σ σ σ
	kána	pínadu	wíla pìna

Summarizing, rightward trochaic languages with sub-minimal words have final stresses, while similar languages without sub-minimal words lack final stresses. This correlation follows from the theory of catalexis, since the presence or absence of catalexis has effects on both monosyllables and polysyllables. The theory not only eliminates degenerate feet while imposing a universal word minimum, but it also links up the absence of a word minimum and the presence of peripheral stresses in a highly principled way.

It is important to note that this typological correlation goes unexplained in any theory based on degenerate feet. In the theories of Hayes (1980) and Halle and Vergnaud (1987) degenerate feet are universally and obligatorily constructed whenever no larger feet can be built. Consequently, all rightward trochaic systems which lack final secondary stresses, such as Diyari, must have extrametrical final syllables (see again 4). Now consider the fact that Diyari-type systems not only lack final secondaries, but lack monosyllabic content words as

well. The lack of monosyllabic words cannot be due to extrametricality, since monosyllables are universally protected from extrametricality in any theory. For Diyari-type systems, a language-specific disyllabic word minimum must then be assumed, in addition to final syllable extrametricality. In the theories under discussion, this co-occurrence of final extrametricality and a word minimum is completely accidental, since they involve independent parameters. These theories are therefore incapable of correlating the lack of monosyllables with the lack of final secondary stresses in a principled way.

Secondly, consider the theory of Hayes (1991), in which degenerate feet are allowed on a parametric basis. Diyari selects the *strong prohibition*, which absolutely excludes degenerate feet. This rules out both monosyllables and final stresses in odd-numbered words. For Hayes, the problem resides in languages of the Ono-type, which have monosyllabic content words as well as final secondary stresses. The presence of monosyllables signals that Ono selects the *weak prohibition*, which says that degenerate feet are restricted to main-stressed positions. Since the single degenerate foot of a monosyllable is main-stressed by definition, this accounts for sub-minimality. However final secondary stresses in Ono-type languages do not occur in strong positions, hence require additional assumptions. Hayes suggests to reinterpret the final secondaries as mere low-level effects of final lengthening. The merits of this analysis in itself are not completely clear. But regardless of this issue, this analysis must fail to correlate the occurrence of monosyllables (*weak prohibition*) to that of final secondary stresses (*final lengthening*). We find that Hayes' theory runs into the same problem as was discussed above for theories which construct degenerate feet universally.

In the remainder of this paper I will provide evidence for Kiparsky's theory of catalexis from two sources. I will present extensive typological confirmation of the predictions made by the theory, while greatly expanding the number of systems in Kiparsky's survey. I will then go on to explore the explanatory value of catalexis by case studies of Toba-Batak and Tongan, two languages in which catalexis functions as a morpheme, and of Korafe, a language in which catalexis is lexically marked.

2. Typological confirmation

2.1 Rightward trochaic systems

Let us first discuss the typological evidence for the correlation that was mentioned above. Kiparsky's survey included two dozens of stress systems of various types (both rightward and leftward). In this section, I will extend the number of rightward trochaic systems in the survey to 44, and demonstrate that the prediction is still strongly confirmed.

Here are some remarks on the criteria that I used in categorizing the languages with respect to word minimality and stress patterns. The most reliable indication of minimality is an explicit statement in the source. However, most sources fail to provide such a direct statement. In such cases I had to consult the items in the dictionary in the source, if it had one. If not, the only way to find out about minimality was by inspecting actual examples quoted in the source. Admittedly, this method runs a certain risk of arbitrariness, and I decided to use it only for sources which quote large numbers of examples. Information on stress patterns was usually somewhat more reliable. Most sources provided explicit statements even about secondary stresses, as well as examples.

My survey of rightward trochaic systems contains a high percentage of Australian and Finno-Ugric languages. I haste to point out that the under-representation of languages from other groups is not due to a (methodologically unsound) decision, but merely reflects the distribution of rightward trochaic systems over the world's languages.

Now to the survey. Firstly, 20 rightward trochaic systems in my survey lack sub-minimal words, and do not display final stresses, as predicted. See (6). The opposite predicted type, presence of sub-minimal words, plus final stresses, occurs in 13 systems. See (7). I have indicated the presence of lexical vowel length contrasts.

(6) *No sub-minimal words, no final stresses* (20)

a. *No length contrast* (8): Bidyara/Gungubala (Breen 1973), Diyari (Austin 1981), Djadjala (Hercus 1986), Dyirbal (Dixon 1972), Laragia (Capell 1984), Njungar (Douglas 1976), Pitta-Pitta (Blake 1979), WembaWemba (Hercus 1986).

b. *Length contrast* (12)[2]: Anguthimri (Crowley 1981), Estonian (Hint 1973), Finnish (Carlson 1978), Mantjiltjara (Marsh 1969), Margany/Gunya (Breen 1981), Lappish (Collinder 1949), Pintupi (Hansen and Hansen 1969), Vogul (K lm n 1965), Walmatjarri (Hudson and Richards 1969), Warlpiri (Nash 1980), Yukulta (Keen 1983), Yuulngu (Wood 1988).

(7) *Sub-minimal words, final degenerates* (13)

a. *No length contrast* (7): Auca (Pike 1964), Kala Lagaw (Kennedy 1981), Maranungku (Tryon 1970), Murinbata (Street 1981), Ningil (Manning and Sanders 1977), Ono (Phinnemore 1985), Selepet (McElhanon 1970).

b. *Length contrast* (6)[3]: Cahuilla (Seiler 1965), Czech (Jakobson 1962), Dehu (Tryon 1967a), Eastern Ostyak (Gulya 1966)[4], Hungarian (Hall 1938), Urii (Webb 1974).

Eleven languages do not follow the prediction: one language has sub-minimal words but no final stresses, while ten languages lack sub-minimal words, but display final stresses:

[2] Most of these languages have bimoraic word minima. The most common type of minimum is absence of open, short-voweled monosyllables (both CVV and CVC are bimoraic). This is found in Estonian, Finnish, Vogul (all Finno-Ugric), and in Walmatjarri and Yuulngu (both Australian). A second type of bimoraic minimality is absence of short-voweled monosyllables (CVC is monomoraic). This holds in Anguthimri (where bimoraic minimality is enforced by monosyllabic lengthening), Mantjiltjara, Margany/Gunya, Pintupi, and Warlpiri (all Australian). Bisyllabic minimality is reported for Lappish (Finno-Ugric) and Yukulta (Australian).

[3] Open short-voweled monosyllables occur in all languages of (7b), although they are rare in Cahuilla, Czech, Eastern Ostyak, and Hungarian. Closed short-voweled monosyllables are quite common.

[4] Syllables with reduced vowels count as light for stress placement. Accordingly, sub-minimal words are defined as a monosyllable with a reduced vowel. However, all sub-minimal words are closed, suggesting a word minimum defined on open vs. closed. If so, Eastern Ostyak should be included in (6).

(8) *Sub-minimal words, no final stresses* (1)

a. *No length contrast* (1): Timucua (Granberry 1965).
b. *Length contrast* (0).

(9) *No sub-minimal words, final stresses* (10)

a. *No length contrast* (1): Wangkumara (McDonald and Wurm 1979).
b. *Length contrast* (9)[5]: Baagandji (Hercus 1984), Guugu Yimidhirr (Haviland 1979), Icelandic[6] (Árnason 1985), Northern Ostyak (Rédei 1965), Lappish[7] (Itkonen 1955), Vogul (=Mansi, Lakó 1957), Votic (Ariste 1968), Yindjibarndi (Wordick 1982), Yuwaalarraay (Williams 1980).

A first evaluation of Kiparsky's hypothesis shows that out of 44 rightward trochaic systems, 33 (or 75%) behave as predicted. That is 88% of systems without a length contrast, and 67% of systems with a length contrast. Furthermore, all languages in the sample that have sub-minimal words, also have final stresses. An exception is Timacua, to which I will return below. It thus appears that catalexis in monosyllables implies catalexis in polysyllables. This implication confirms that sub-minimality is the primary diagnostic for catalexis.

Apparently the reverse implication (that final stresses in odd-numbered words imply sub-minimality) is more problematic, as 33% of the systems that disallow sub-minimal words, have final stresses. Interestingly, 90% of the problematic systems have a lexical length contrast. I will return to this observation below.

Timacua (Granberry 1956, 1990) is the single language in my survey (8a) that has sub-minimality, but no final stresses[8]. This might be construed as a restricted use of catalexis: it is invoked only to insure that every content word meets the bimoraic word minimum. Allowing for such restricted catalexis has a severe theoretical disadvantage, however: it incorrectly predicts that languages such as Timacua should be typologically common, and thus gives up the strong typological correlation between word minima and final stresses as a consequence of the theory. Fortunately, the evidence for sub-minimality in Timacua is rather weak. Only one sub-minimal (primary-stressed) content word is quoted by Granberry.

Wangkumara is the single system in (9) which lacks a length contrast. It has a disyllabic word minimum, and displays final secondaries. But interestingly, McDonald and

[5] All languages of (9b) have bimoraic word minima. Monosyllables must contain long vowels in Guugu Yimidhirr, Yindjibarndi, Yuwaalarraay (all Australian). Monosyllables must contain long vowels or be closed in Northern Ostyak, Lappish, Vogul, Votic (all Finno-Ugric), Baagandji (Australian), and Icelandic (Germanic).

[6] Kiparsky (1991) lists Icelandic as 'having monosyllabic content words', ignoring bimoraicity.

[7] Lappish is the more familiar name for what is actually a group of languages called Saami by the speakers (thanks to Curt Rice for pointing this out). Norwegian Lappish is described by Itkonen (1955) as having final secondary stresses, but by Collinder (1949) as lacking them. This may well be due to a difference of dialects, or even languages. This is why I include Lappish in (6b) as well. Similar comments apply to Vogul. For Northern Vogul, Kálmán (1965) claims that final syllables are unstressed, but Lakó's (1957) description of Mansi, which is the same language as Vogul, implies that final stresses occur.

[8] This holds for lexical words: enclitic conjunctions have final stress.

Wurm (1979) claim that word-final syllables are unstressed in connected speech, and may be stressed only at the end of an utterance. This suggests that in Wangkumara, syllable catalexis is not available throughout the phonology. In the lexicon, catalexis is switched 'off', from which it follows that all content words are minimally disyllabic. Post-lexically, catalexis is switched to 'on', which explains the utterance-final stresses.

Putting these cases aside, the remaining problematic class of languages in the survey are the 9 languages in (9b) which have final stresses, but no sub-minimal words. In all of these, the word minimum is bimoraic. That is: heavy monosyllabic words are allowed.

Before addressing the relevance of a vowel length contrast in these systems, I must point out that the status of final secondary stresses in several systems is somewhat doubtful, for various reasons. Firstly, final stresses in Lappish and Baagandji are reported to be very weak, or even optional. Secondly, sources disagree on final stresses for Lappish and Vogul (although this may be due to dialectal differences, see fn. 8). Thirdly, Hayes (1991) reports that final secondary stresses in Icelandic are ignored by a rule of stress shift operative in compounds.

Other systems of (9b) may be analysed away as cases of level-ordering, similar to Wangkumara above. In Votic (Ariste 1968), final secondaries are restricted to stem-syllables, and do not occur on case affixes. Kiparsky (1991) suggests that by level-ordering, catalexis could be switched 'off' at the level where case affixes are adjoined. In Guugu Yimidhirr (Haviland 1979), final secondaries are restricted to final syllables outside the stem-domain, on which the bimoraic word minimum is defined. Here catalexis could be 'off' at stem-level, and switched 'on' at word-level.

But suppose that the final secondaries in at least some of the systems of (9b) are genuine. We must then explain why these systems have a bimoraic minimum, while simultaneously allowing for final secondaries. How can these two options be reconciled without giving up the central idea of the correlation between word minimum and catalexis? Actually, the presence of a length contrast in all of the languages of this category is not just a coincidence, as I will now go on to show.

The key observation is that for all languages of (9b), the minimal word is defined as a heavy syllable. Actually, bimoraic minima seem to be universally preferred over disyllabic minima in languages with lexical length contrasts, which have some word minimum at all (Kager 1992b)[9]. In catalexis theory, the bimoraic minimum has a clear interpretation: it signals that mora catalexis must be 'off'. (If it were 'on', monomoraic content words would be allowed, as in the languages of (7b).) But theory also tells us that the final secondary stresses in odd-numbered words in the languages of (9b) must be due to some form of catalexis (mora or syllable). We have just ruled out mora catalexis, and may therefore conclude that the catalectic element must be the syllable.

So far, so good, but if syllable catalexis is 'on' in languages of (9b), why are content words still required to be bimoraic? I suggest that the answer may reside in Kiparsky's idea that catalexis is the addition of a prosodic constituent, nothing more and nothing less. Hence,

[9] Kager (1992c) proposes an analysis of such systems which involves parsing on two metrical layers, one moraic, the other syllabic. On the moraic layer, heavy syllables are all footed universally (Prince 1983). Under this analysis, the bimoraic word minimum is adequately captured in terms of moraic foot structure.

syllable catalexis does not add a mora. A monomoraic word formally fails to satisfy the bimoraic minimum of systems with lexical length contrasts, whether or not a catalectic syllable is present. Monosyllables therefore need to bring their own two moras.

Below are some examples from Icelandic (Árnason 1985):

(10)

a. (* .)	b. (* .) .	c. (* .) (* .)
σ [σ]	σ σ [σ]	σ σ σ [σ]
/ \	/ \ |	| / \ |
μ μ	μ μ μ	μ μ μ μ
/ | |	/ | | / |	/ | / | | / |
j ó n	t á s k a	h á m i ŋ j à …
Jón (name)	taska ‘briefcase’	hamingja ‘happiness’

Parametrizing the unit of catalexis provides the parameter settings of two other types of systems with lexical length contrasts. Firstly, the systems of (6b), such as Finnish and Pintupi, all have bimoraic word minima, but lack secondaries on odd-numbered final syllables. Here both mora and syllable catalexis must be ‘off’. Secondly, the systems of (7b), such as Hungarian and Cahuilla, have monomoraic words as well as final secondaries in odd-numbered words. Here, mora catalexis must be ‘on’. The three options are illustrated in (11):

(11)

	Word minimum	*Odd final secondaries*	*Syllable catalexis*	*Mora catalexis*
Finnish, Pintupi	bimoraic	no	Off	Off
Icelandic, Baagandji	bimoraic	yes	On	Off
Hungarian, Cahuilla	none	yes	Off	On

The fourth option, of both syllable and mora catalexis ‘on’, would be empirically indistinguishable from the Hungarian and Cahuilla case: sub-minimal words are allowed, and odd final stresses occur.

2.2 Systems with penultimate stress

I will now turn to the predictions of the theory for systems with penultimate main stress. Two types occur. Firstly, systems where penultimate main stress is fixed, which means: exceptional words with final stress are not allowed. (In moraic trochee systems, fixed penult stress is relatived to moras. That is, light final syllables are always unstressed, while heavy final syllables are usually stressed.) In the second type of system penultimate stress is *predominant*, so that stress may exceptionally fall on other syllables, crucially including the final syllable.

Predictions about penultimate stress systems are based on three premisses. Firstly, I assume that penultimate stress is due to a final trochee, rather than final extrametricality plus End Rule final. Secondly, I assume that exceptions to penultimate stress are due to lexically marked final catalexis, rather than accent (see Kager 1992d). Thirdly, I assume uniformity, as in rightward trochaic systems. That is, catalexis treats polysyllables and monosyllables on a par. If idiosyncratic catalexis is available in polysyllables, then it should be available in monosyllables, and vice versa.

Now theoretical predictions are as follows. Whenever a system tolerates lexical exceptions to penultimate stress which crucially include words with final stress, then it should also tolerate idiosyncratic monomoraic words, and thus display sub-minimality. These are systems for which catalexis is available as a lexical option. Conversely, if a system disallows lexical exceptions to penultimate stress (and has no final stress), it should display rigid minimality. These are systems for which lexical catalexis is ruled out.

My survey contains 57 penultimate stress languages, shown in (12) through (15). Predictions are confirmed by 81% (46/57) of the systems. Firstly, 89% (17/19) of the systems with predominant penultimate stress (see 12 and 14) have occasional sub-minimality. All of the 17 languages of (12) have occasional final stress, while one of the two languages of (14) has final stress on heavy syllables only. Secondly, 76% (29/38) of the systems with fixed penultimate stress (in 13 and 15) have rigid minimality. As we will see, most exceptions are apparent only.

(12) *Predominant penultimate stress, occasional sub-minimality* (17):

a. *No weight contrast* (4): Chamorro (Chung 1983), Polish[10] (Rubach and Booij 1985), Toba-Batak (Nabanan 1981), Zoque (Wonderly 1951).

b. *Weight contrast* (13): Djingili (Chadwick 1975), Dutch[11] (Kager 1989), Italian (Sluyters 1990), Kutenai (Garvin 1948), Lenakel[12] (Lynch 1978), Manam[13] (Lichtenberk 1983), Sentani (Cowan 1965), South-West Tanna[14] (Lynch 1982), Spanish (Harris 1983), Squamish[15] (Kuipers 1967), Stoney Dakota[16] (Shaw 1985), Tonkawa[17] (Hoijer 1946), Zapotec (Swadesh 1947).

(13) *Fixed penultimate stress, rigid minimality* (29):

a. *No weight contrast* (13): Anyula[18] (Kirton 1967), Banggai (Van den Bergh 1953), Cavineña (Key 1968), Colta Quechua[19] (Reyburn 1954), Indonesian[20]

[10] Except in some loans, final stress occurs in certain native words, productively in prefixed words and acronyms (Franks 1991).

[11] The absence of a word minimum is inferred from the weight distinction open versus closed (see Kager 1989), in combination with the occurrence of open monosyllables.

[12] Underlying vowel length conditions final stress, but is neutralized at the surface. Certain historically complex morphemes also take final stress.

[13] Words ending in CVC.CV.CV have antepenultimate stress. Five monomoraic verb roots occur, all of which take final stress when unsuffixed.

[14] See footnote 13 on Lenakel.

[15] The weight contrast (open vs. closed) is based on a destressing rule (Davis 1984). CV words are rare but C@C words occur. Final stress occurs in some words with schwa in the penult, and on certain suffixes.

[16] Weight contrast (open vs. closed) is based on stressed final CVCC (vs. CVC, CV) syllables. Final stress occurs in bisyllables (a residue of Dakota second-syllable stress), and in imperative verbs.

[17] Disyllabic words have final stress. CV monosyllables with short vowels are rare, but do occur.

[18] Some trisyllabic words optionally take initial stress, but final stress is unattested.

[19] Final stress marks emphasis. Also, a few Spanish loans have final stress.

[20] Words with schwa in the penult have final stress. A handful of loan monosyllables occur (Cohn 1992).

(Cohn 1989), Kiliai-Kove[21] (Counts 1969), Mohawk[22], Oneida, Onondaga (Michelson 1988), Proto-Northern Iroquoian[23] (Chafe 1977), Sama Baangingi (Gault 1979), Tigwa Manobo[24] (Strong 1979), Tiwi (Lee 1987).

b. *Weight contrast* (16): Apalai[25] (Koehn and Koehn 1986), Bhojpuri[26] (Shukla 1981), Fijian (Schütz 1978), Hawaiian (Schütz 1978), Kilivila[27] (Senft 1986), Kusaiean (Lee 1975), Modern Spoken Syriac[28] (Solomon and Headley 1973), Nunggubuyu (Hore 1981), Pangutaran (Walton 1979), Pipil (Campbell 1985), Rennellese/Bellonese (Elbert 1988), Rotuman (Churchward 1940), Tarma Quechua (Adelaar 1977), Tuamotuan (Kuki 1970), Tongan (Churchward 1953), Yokuts[29] (Newman 1944).

The problematic languages are in (14) and (15). First consider (14).

(14) *Predominant penultimate stress, rigid minimality* (2):

a. *No weight contrast* (1): Iraya Mangyan (Tweddell, Tweddell, and Page 1974).

b. *Weight contrast* (1): English (Kager 1989).

Actually, Iraya Mangyan offers some evidence for catalexis outside content words since it freely allows for stressed monosyllabic function words. And English has no exceptional final stress on light syllables, for which reason it cannot involve catalexis. Now consider the languages of (15).

(15) *Fixed penultimate stress, occasional sub-minimality* (9):

a. *No weight contrast* (6): Imbabura Quechua[30] (Cole 1982), Sanuma Yanomama[31] (Borgman 1990, Migliazza 1972), Sibutu Sama[32] (Allison 1979), Suriname Arawak[33] (Pet 1979), Warao[34] (Osborn 1966), Yanam Yanomama[35] (Migliazza 1972).

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[21] Final stress marks emphasis.

[22] Bisyllabic word minimum is enforced by epenthesis. Final stress is restricted to uninflected particles and borrowed nouns.

[23] Bisyllabic word minimum is enforced by epenthesis.

[24] Trisyllabic words have initial stress.

[25] Closed syllables and syllables with nasal vowels are heavy. Apparently no oral CV monosyllables.

[26] Long-voweled and closed syllables are heavy. Stress is penultimate in words where the final three syllables are of equal weight, else on the heaviest in the window.

[27] Diphthongal and closed syllables are heavy. Words ending in $Ca.CV_1.CV$, where V_1 is a high vowel, have antepenultimate stress.

[28] Final stress (inducing length) marks emphasis, especially in vocative proper nouns.

[29] Final stress does not occur, although some words have antepenultimate stress.

[30] Two monosyllabic (validator) suffixes optionally take final stress, but both have bisyllabic alternants. Final stress also occurs in exclamations and in a few unassimilated Spanish loans.

[31] Trisyllabic words have initial stress.

[32] Stressed monosyllables are non-clitic function words (no monosyllabic content words occur).

[33] Citation forms of verbs have final stress. Domain of penultimate stress is phrase.

b. *Weight contrast* (3): Milpa Alta (Whorf 1946), Nengone (Tryon 1967b), Piro[36] (Matteson 1965).

However several of these languages employ productive final stress to mark specific (lexical or functional) categories, in which penultimate stress is excluded. (Outside these categories these languages have no exceptions to penultimate stress.) In Imbabura Quechua and Piro, final stress marks exclamatory forms. It marks vocatives in Piro and Warao, validator suffixes in Imbabura Quechua, citation forms of verbs in Suriname Arawak, and imperatives and focus forms of nouns in Sanuma Yunumama. Categorial final stress arguably involves catalectic morphemes, as I hope to show in section 3. This indicates that these systems may employ catalexis after all.

Taking into account the remarks on Iraya Mangyan, English, and the languages of (15), the survey's results improve to 93% (53/57). The residue of four languages where uniformity cannot be upheld, are Sibutu Sama, Yanam Yanomama, Milpa Alta, and Nengone.

2.3 Final stress in quantity-insensitive systems

The third correlation predicted by Kiparsky's theory is more indirect. It says that quantity-insensitive systems with (fixed or predominant) final stress should have sub-minimal words. The intermediary assumption linking quantity-insensitivity and catalexis is that quantity-insensitive systems have a strong preference to be trochaic, as shown by Hayes (1991). If this correlation holds final stress in a quantity-insensitive system must be due to final syllable catalexis. If syllable catalexis is switched 'on' (either generally or idiosyncratically), such a system should freely tolerate monosyllabic words.

This typological prediction receives complete confirmation from the eleven systems with fixed final stress which occurred in my survey. See (16):

(16) Afghan Persian (Bing 1980), Canela-Krahô (Popjes and Popjes 1986), Chatino (Gleason 1955), French (Schane 1968), Nii (Stucky and Stucky 1973), Shiriana[37] (Migliazza and Grimes 1961), Sobei (Sterner 1975), Tajik (Rastorgueva 1963), Urubu-Kaapor (Kakumasu 1986), Weri (Boxwell and Boxwell 1966), Yali/Deni (Fahner 1979).

An interesting example is Tajik (Rastorgueva 1963), an Iranian language, which has monosyllabic content words as well as fixed final stress in content words. Monosyllabic

[34] The absence of a word minimum is questionable, since monosyllables are lengthened (there is no underlying length contrast). Final stress marks the vocative, and occurs in some unassimilated Spanish loans.

[35] In the Sanima dialect, verbs have final stress. Focus is also expressed by final stress, and the deletion of final unstressed vowels produces forms with surface final stress.

[36] Exclamatory forms and vocatives have final stress. Vowel length occurs, but is apparently ignored by stress (but see Yip 1992). Domain of penultimate stress is phrase.

[37] Final words in pause groups have penultimate stress. Curt Rice points out that this follows if catalexis is switched 'off' at the level of the phrase group.

function words are never stressed, but polysyllabic function words, mostly adverbials and interjectives, have penultimate stress. See (17):

(17)	a.	dúd	'smoke'	e.	vále	'but'
	b.	ocán	'iron'	f.	xólo	'now'
	c.	ocangúr	'iron-worker'	g.	albátta	'of course'
	d.	ocangarón	'iron-workers'			

This can be interpreted as presence of final syllable catalexis in content words. Function words need not fulfill the universal minimum word requirement, and therefore require no catalexis. But a polysyllabic function word may nevertheless be stressed. In function words, the trochee is assigned without catalexis, which results in penultimate stress. The hidden trochaic nature of the system reveals itself where catalexis does not obscure it.

The prediction extends to quantity-insensitive systems in which final stress is only predominant, and to 'window' systems where stress falls unpredictably on any syllable lying in a two or three syllable final window. Again, the prediction that such systems should have sub-minimal words is corroborated. 87% (13/15) of such systems have sub-minimal words.

(18) a. *Sub-minimality* (13): Flamingo Bay Asmat (Voorhoeve 1965), Biangay (Dubert and Dubert 1973), Guayabero (Keels 1984), Kaiwa (Bridgeman 1971), Karam (Biggs 1963), Macuxi (Carson 1981), Modern Greek (Malakouti-Drachman and Drachman 1981), Modern Hebrew (Bat-El 1989), Nimboran (Anceaux 1965), Kunjen (Sommer 1969), Samo (Shaw and Shaw 1977), Tagalog[38] (French 1988), Usan (Reesink 1984).

b. *Rigid minimality* (2): Balangao[39] (Shetler 1976), North Carolina Cherokee[40] (Bender and Harris 1946).

However, both languages of (18b) are doubtful cases. For North Carolina Cherokee, the source does not explicitly mention a word minimum, and its 'rigid minimality' is only inferred from the lack of monosyllables in the source. What is more, the language fails to show phonologically active minimality. Words ending in a vowel undergo a rule of apocope, which may freely result into monosyllables when applied to disyllabic words. Presumably this language has no rigid minimality after all.

Balangao has a lexical length contrast. For this reason it is analysed with syllable catalexis, as the languages of (9d), such as Icelandic.

[38] The lack of a vowel length contrast is controversial, see Schachter and Otanes (1972).

[39] Underlying vowel length is restricted to a number of monosyllabic words, where two historical short vowels fused into one long vowel.

[40] Final stress is realized by a high tone. Word-final vowels may be deleted, in which case the high tone moves to the preceding vowel or consonant. In bisyllabic words such a deletion results in a monosyllable, which casts doubt on the presence of a word minimum.

3. Catalexis as a morpheme

This concludes the typology part of this paper. I now turn to some consequences of catalexis that are left unmentioned by Kiparsky (1991). The first is the option of catalexis as a morpheme.

If catalexis is the addition of a segmentally empty prosodic unit, one would expect cases where it constitutes a morpheme on its own, analogously to 'autosegmental' morphemes consisting of tone or nasality. In prosodic theory the morpheme status of bare moras is argued for by Lombardi and McCarthy (1991), who analyse morphological medial gemination in Choctaw as affixation of a mora. Interestingly, stress systems also provide evidence for morphemes consisting of a single mora or syllable. Potential cases are those where morphologically related forms are distinguished by the position of stress alone. Two languages will be discussed here, Toba-Batak and Tongan.

3.1 Toba-Batak

In Toba-Batak, an Austronesian language spoken on Sumatra (Nababan 1981, Percival 1981), stress is predominantly on the penult, but may also be final, cf. *árta* 'treasure' vs. *sortá* 'innocent'. There is no distinction of syllable weight. Being a quantity-insensitive language with lexical final stress, Toba-Batak is correctly predicted to have sub-minimal words, e.g. *rá* 'perhaps', *síp* 'quiet'. This pattern can be derived by a final trochee, with lexically marked final catalexis. Words formed from monosyllabic stems by prefixation have final stress, cf. *pa-síp* 'quieten'. That is, catalexis, inherently marked on monosyllabic stems, is preserved under derivation. Catalexis is a lexical property of particular suffixes which are always stressed, such as *-hu* 'excessively', e.g. *pa-hapal-hú* 'too thick', *pa-las-hú* 'too hard'.

One might be tempted to analyse Toba-Batak as an iambic system, with lexically marked extrametricality. However, the theory of catalexis excludes this option: the presence of sub-minimal words implies catalexis as a part of the analysis, so that the disyllabic window is analyzed in the most economical way by a trochee for penultimate stress plus final catalexis for final stress. (Notice that an iambic analysis with initial catalexis, to account for sub-minimal words, would also require lexically marked final extrametricality.)

There is independent evidence for the trochee as the basic foot. Firstly, there is no contrast of syllable weight in Toba-Batak. Lack of a weight contrast strongly correlates with trochaic feet (Hayes 1991). Secondly, the predominant location of stress in Toba-Batak is penultimate, rather than final. Thirdly, longer words display an iterative pattern of secondary stresses, which is clearly rightward trochaic, e.g. *párborúonnasída* (*pár*.*bo*).(*rú*.*on*).*na*.(*sí*.*da*) 'their relative on the distaff side'.

The interest of Toba-Batak resides in certain morphemes which lack segmental realization but are associated with stress shift. The passive may be marked by a stress shift to the final syllable (cf. *lápu* 'to smear', *lapú* 'be smeared'). In nominals, catalexis functions to form the vocative (cf. *ínaŋ* 'mother', *ináŋ* 'mother!'), and the honorific possessive (cf. *tahámmu* 'your hand (informal), *tahammú* 'your hand (honorific)'). In the theory of catalexis, these morphemes can be elegantly analysed as actually consisting of a catalectic syllable.

3.2 Tongan

A similar stress-shifting category occurs in Tongan, a Polynesian language (Churchward 1953, Feldman 1978, Poser 1985, Mester 1991, Prince and Smolensky 1993). Tongan has penultimate mora stress. The final syllable is stressed if heavy, otherwise the penult is stressed. There is a bimoraic minimum on content words. See (19).

(19)	a.	fále	'house'	d.	kumáa	'rat'
	b.	móhe	'to sleep'	e.	hahée	'to be like'
	c.	mohéha	'bed'	f.	kotokóo	'to cackle'

This pattern can be analysed by a moraic trochee at the right word edge.

When an enclitic particle is added, stress regularly 'shifts' rightward onto the new penult, as in (20):

(20)	a.	nófo	'to sit or dwell'	b.	nofó-ni	'to sit or dwell now'
	c.	?óku	(present tense marker)	d.	?okú-ne	(idem, plus 'me')

Churchward (1953:11) claims that long vowels are broken into two heterosyllabic short vowels in a stressed penult which precedes a final light syllable. An example is given in (21):

(21)	a.	húu	'to go in'	b.	hu.ú-fi	'to open officially'

If this description is correct, it shows that Tongan is a strictly mora-based stress system, in which stress must fall on the penultimate mora[41]. The breaking of the penult can be seen as a repair strategy to achieve penultimate mora stress without violating other constraints of the system.

To implement this idea, I will propose a constraint-based analysis within the Optimality Theory of Prince and Smolensky (1993). The following constraints hold, in hierarchical order.

Quantity-Sensitivity says that heavy syllables must form a bimoraic foot, in which the initial mora is the prominent one (Prince 1983, Kager 1992a). By *Syllable Integrity*, heavy syllables cannot be split between feet (Prince 1980, Rice 1992, Kager 1992a,c). The *Final Foot Constraint* states that the bimoraic stress foot must be in absolute final position, so that in effect stress falls on the penultimate mora. *Quantitative Integrity* says that underlying vowel length is preserved. Finally, *Vocalic Integrity* says that moras linked to the same vowel are part of the same syllable.

If the penult is heavy and the ultima is light, a moraic trochee on the penult would violate the Final Foot Constraint. Because of Syllable Integrity and Quantity-Sensitivity, stress cannot be shifted onto the second mora of the penult, so that a conflict arises between the

[41] The breaking of long vowels is disputed by Elbert (1988:14-15), quoting Albert Schütz: "in slow speech, there is a pitch change over vowels in that position -- rather a stairstep effect, with the higher pitch on the latter portion, making it sound like a geminate cluster with stress on the second portion. However, this pronunciation is either old-fashioned or especially formal."

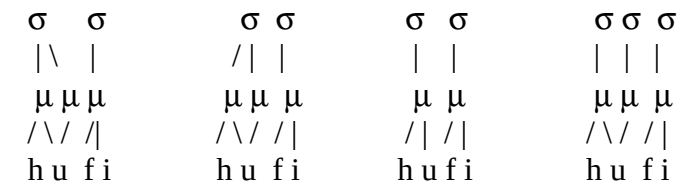
Final Foot Constraint and foot structure. This conflict is resolved by violating Vocalic Integrity, i.e. by vowel breaking. Vocalic Integrity must therefore be ranked lower than Quantitative Integrity.

In (22) I show different resolutions of *hu.úfi*, with constraints violations indicated. Square brackets mark foot boundaries, and parentheses syllable boundaries.

(22) a. [(húu)](fi) (23a; violates Final Foot Constraint)
b. (hu[ú)(fi)] (23b; violates Syllable Integrity and Quantity-Sensitivity)
c. [(hú)(fi)] (23c; violates Quantitative Integrity)
d. (hu)[(ú)(fi)] (23d; violates Vocalic Integrity)

The formal representations are given in (23):

(23) a. (*) . b. (* .) c. (* .) d. . (* .)



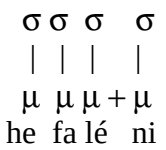
Interestingly, Boumaa Fijian (Dixon 1988, Hayes 1991), a related language, resolves the conflict by shortening the penult rather than by breaking it. This process is known as trochaic shortening (see Prince 1990). The Fijian situation reflects a reversal of the relative rankings of two constraints. In Fijian, Quantitative Integrity is ranked below Melodic Integrity.

The actual evidence for catalexis comes from the so-called definitive accent. Definite phrases always begin with a definite article (*he, e*) or a pronoun (e.g. *he?ene*). Their end may be marked in either of two ways. Firstly, when an enclitic demonstrative marker (*ni* or *na*) is present, stress falls on the final syllable of the lexical word that precedes it. See (24a). This is fully parallel to the penultimate stress pattern of non-definite phrases (see again 20). Secondly, when no demonstrative marker is present, stress is shifted onto the final syllable of the rightmost lexical word (24b-d). It is this type of construction that I wish to draw attention to, because here the final mora is stressed as though an empty enclitic were present.

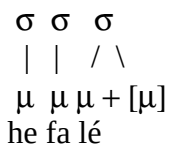
(24) a. he falé ni ‘this house’
b. he falé ‘the house’
c. he fale akó ‘the school building’
d. he fale ako fo?oú ‘the new school building’

My analysis runs as follows. Definite phrases are associated with a monomoraic suffix as part of their morphology, which has two allomorphs. If the phrase is demonstrative, the suffix is spelled out segmentally (as *ni* or *na*). Elsewhere, the suffix has the form of a segmentally empty (catalectic) mora. This adds weight to the preceding syllable, which attract stress. See (25b).

(25) a.



b.



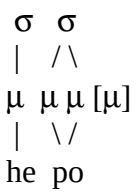
A catalexis-based account of definitive accent highlights the representational similarities between definite phrases with overt enclitics, and bare definite phrases.

As expected, breaking of long vowels may be induced by the definitive accent. Two cases are to be considered. Firstly, long vowels in the final syllable of a lexical word are broken before a demonstrative marker, e.g. *he po.ó ni* 'this night'. The analysis of these cases is similar to that of *hu.úfi* in (23).

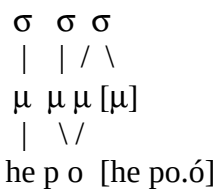
Secondly, and even more interestingly, breaking also occurs in the final syllable of a bare definite phrase: *he po.ó* 'the night'. Breaking of phrase-final long vowels under definitive accent is easily accounted for under the assumption that bare definite phrases have a catalectic mora suffix. There are two additional constraints involved, both of which rank higher than Melodic Integrity. Mora Licensing says that moras require prosodic licensing. That is, a catalectic mora must adjoin to the syllable to its left. Bimoraic Maximality says that syllables are maximally bimoraic. Tongan, as most other languages, does not allow trimoraic syllables.

Affixation of the empty mora to a final bimoraic syllable produces a syllabification conflict. The catalectic mora needs prosodic licensing, but cannot be syllabified as the third mora of the phrase-final syllable. The conflict is resolved by vowel breaking, making the three moras distribute over two syllables. Breaking is the only way to license the catalectic mora.

(26) a.



b.



Finally, vowel breaking occurs in one more context, which is also predicted by the analysis. Long vowels in the penult of monomorphemic words surface as unbroken when the light syllable that follows has definitive accent in a bare definite phrase. See (27b,d). But outside definitive accent, the bimoraic penult must be broken. Again, this follows from the relative ranking of Quantitative and Vocalic Intergrity below the Final Foot Constraint. See (27a,c).

(27)	a.	ma.á.ma	'lamp'	b.	he maa.má	'the lamp'
	c.	ta.á.u	'befitting'	d.	he taa.ú	'the befitting'

Summarizing, this analysis unifies all types of long vowel breaking: penultimate breaking before enclitics, penultimate breaking before the definitive accent, and final breaking

under definitive accent. Final breaking only differs from the other types by a catalectic triggering mora, instead of a segmentally specified one. The analysis also unifies definitive accent by a moraic affix, which is possibly catalectic.

4. Korafe

Catalexis offers interesting results for Korafe (Farr and Farr 1974), a language of Papua New Guinea[42]. Korafe is a so-called window system, where stress falls unpredictably on the first or second syllable. Sub-minimal words occur. See (28).

(28)	a.	nó	(name of snake)	e.	ríri	'steps'
	b.	oká	'lime, lime pot'	f.	óka	'fish'
	c.	oróro	'blood'	g.	óroro	'clans'
	d.	atóvembo	'father-in-law'	h.	bósivara	'porpoise'

As a preliminary analysis, the initial syllable may be extrametrical, subject to lexical marking. A syllabic trochee is constructed initially. To account for sub-minimality and the final stress in disyllabic words, I assume final syllable catalexis.

An interesting puzzle resides in perturbation of stress before the genitive/locative affix *-da*. No perturbation occurs in disyllabic stems with second-syllable stress (*oká -okóda* 'of the lime'), which I will refer to as type-a stems. Type-b disyllabic stems have initial stress in isolation, and shift stress to the second syllable before *-da*, see (29). Type-c disyllabic stems also have initial stress in isolation, but retain initial stress throughout, see (30). Crucially, (perturbing) type-b stems cannot be distinguished from (non-perturbing) type-c stems on phonological grounds.

(29)	a.	ríri	'steps'	rirí-da	'on the steps'
	b.	éva	'sea'	evá-da	'of the sea'
	c.	kúta	'sweet potato'	kutá-da	'of the sweet potato'
	d.	íji	'sun'	ijí-da	'of the sun'

(30)	a.	óka	'fish'	óka-da	'of the fish'
	b.	ígo	'turtle'	ígo-da	'of the turtle'
	c.	fúka	'pig'	fúka-da	'of the pig'
	d.	jígi	'lice'	jígi-da	'of the lice'

A preliminary account of the three-way contrast in disyllabic stems is the following. Type-a stems, which have second-syllable stress throughout, have lexically marked initial extrametricality. The analysis crucially involves final catalexis. Type-b stems, which have initial stress in isolation, and second-syllable stress before *-da*, also have lexical initial extrametricality. But for some mysterious reason, initial extrametricality has effect in the derived form only, while it fails to affect the stem in isolation. Finally, type-c stems, which have initial stress throughout, have no initial extrametricality.

[42] A more elaborate analysis of Korafe stress is presented in Kager (1992d).

The perturbation puzzle can now be phrased as follows: final catalexis has been found necessary for type-a stems, those with consistent second-syllable stress. But general final catalexis incorrectly predicts final stress for the perturbing (type-b) stems in isolation, since these have an initial extrametrical syllable.

The puzzle is solved if we assume that final catalexis is lexically governed in Korafe, just as initial extrametricality. All possible options are attested. Firstly, type-a stems (*oká-okáda*) have extrametricality as well as catalexis. See (31a-b). Secondly, type-b stems (*ríri-rírída*) have extrametricality, but no catalexis. When such a stem occurs as a word in isolation, a conflict arises between extrametricality and the universal word minimum requirement. Hayes (1991) and Mester (1992) argue on the basis of Latin that the conflict is resolved at the expense of extrametricality. Carrying over this assumption to Korafe, I will assume that initial extrametricality is revoked when the resulting metrical domain is shorter than the proper disyllabic trochee.

This explains initial stress in type-b stems when these occur in isolation (see 31c). But latent extrametricality in these stems becomes activated when the disyllabic base is expanded by *-da* (see 31d).

(31) a. (* .) b. (* .)
<σ> σ [σ] <σ> σ σ (loss of non-peripheral catalexis)
o ká o ká da

c. (* .) d. (* .)
σ σ <σ> σ σ (revoked syllable extrametricality)
rí ri ri rí da

Finally, type-c stems (*óka-ókada*, not shown in 31) simply lack initial extrametricality. Presence of catalexis cannot be established here, as it would not affect the construction of an initial trochee.

This analysis of Korafe provides strong evidence for catalexis, as well as for revokation of extrametricality, as argued for by Hayes (1991) and Mester (1992).

Finally, I wish to point out a problem for an analysis based on the weak prohibition on degenerate feet (Hayes 1991). This option is motivated in Korafe by the presence of sub-minimal words. Let us also assume that type-a and type-b stems have initial extrametricality, to account for *oká-da, rirí-da,* as in my analysis. In type-a stems which occur in isolation, extrametricality of the initial syllable leaves sufficient material to construct a strong degenerate foot on the final syllable, correctly predicting *oká*. However, it is completely unclear what causes initial stress in perturbing type-b stems in isolation (r¡ri). Since degenerate feet are allowed in main-stressed positions, initial extrametricality need not be revoked here, which incorrectly predicts **rirí*. Clearly, the three-way contrast in disyllabic stems cannot be captured under a Hayesian analysis with a degenerate foot parameter.

5. Conclusions

To wind up the paper I will draw some conclusions. Firstly, we have seen that catalexis is strongly supported by various sorts of typological evidence. This evidence resides in

correlations between word minimality effects and stress patterns in a large number of languages of different types, including initial stress languages, penultimate stress languages, and final stress languages. Secondly, I have argued that catalectic elements can constitute morphemes on their own, similarly to 'autosegmental' morphemes consisting of tone, etc. This claim was illustrated for Toba-Batak and Tongan. Thirdly, I have argued that catalexis can be present on a lexically marked basis, much as extrametricality. This claim has illustrated for Toba-Batak and Korafe.

Finally it is important to point out that these results are, to some degree at least, independent of the precise way in which catalexis is formalized. An interesting alternative to Kiparsky's (1991) representation of catalexis as an empty prosodic category, is a representation as a position on the metrical grid. The main motivation for a grid representation is that it avoids the problem of how to block the automatic spreading of melodic material onto catalectic elements. Grid representation predicts that catalexis (and extrametricality if formalized analogously) affects metrical phenomena only, and should be inaccessible to purely melodic principles. The consequences of this approach are explored in Kager (1992d).

Acknowledgements

Special thanks go to Sharon Inkelas, Paul Kiparsky, Dominique Nouveau, and Curt Rice for their useful comments on earlier versions of this paper. Also to Chris Golston, Mike Hammond, Bruce Hayes, Tracy King, Alan Prince, Mieke Trommelen, Mark Verhijde, and Wim Zonneveld, for various sorts of help. This research was supported by the Linguistic Research Foundation, which is funded by the Netherlands organization for scientific research, NWO.

References

Adelaar, Willem F.H. (1977). *Tarma Quechua: Grammar, Texts, Dictionary*. Peter de Ridder Press, Lisse.

Allison, E.J. (1979). "The phonology of Sibutu Sama: A language of the Southern Philippines". In: C. Edrial-Lusares and A. Hale (eds.), *Studies in Philippine Linguistics, Volume 3, No. 2*. Linguistic Society of the Philippines and Summer Institute of Linguistics.

Anceaux, J.C. (1965). *The Nimboran Language* (Verhandelingen van het Koninklijk Instituut voor Taal- Land- en Volkenkunde, Deel 44). Martinus Nijhoff, 's-Gravenhage.

Ariste, Paul (1968). *A Grammar of the Votic Language* (Indiana University Publications, Uralic and Altaic Series, Vol. 68). Humanities Press, New York.

Árnason, Kristján (1985). "Icelandic word stress and metrical phonology", *Studia Linguistica* 39, 93-129.

Austin, Peter (1981). *A Grammar of Diyari, South Australia*. Cambridge University Press, Cambridge.

Bat-El, Outi (1989). *Phonology and Word Structure in Modern Hebrew*. Unpublished Ph.D. dissertation, Department of Linguistics, UCLA.

Bender, Ernest, and Zellig S. Harris (1946). "The phonemes of North Carolina Cherokee", *International Journal of American Linguistics* 12.1, 14-21.

Biggs, Bruce (1963). “A non-phonemic central vowel type in Karam, a ‘Pygmy’ language of the Schrader Mountains, Central New Guinea”. *Anthropological Linguistics* 5.4, 13-17.

Bing, Janet Mueller (1980). “Linguistic rhythm and grammatical structure in Afghan Persian”, *Linguistic Inquiry* 11.3, 437-463.

Blake, Barry J. (1979). “Pitta-Pitta”. In: R.M.W. Dixon and B.J. Blake (eds.), *Handbook of Australian Languages, Volume I*, 182-242. John Benjamins, Amsterdam.

Borgman, Donald M. (1990). “Sanuma”. In: D.C. Derbyshire and G.K. Pullum (eds.), *Handbook of Amazonian Languages, Volume 2*, 15-248. Mouton-De Gruyter, Berlin.

Boxwell, Helen, and Maurice Boxwell (1966). “Weri phonemes”. In: S.A. Wurm (ed.), *Papers in New Guinea Linguistics, No. 5* (Linguistic Circle of Canberra Publications, Series A, No. 7), 77-93. The Australian National University, Canberra.

Breen, John G. (1973) “Bidyara and Gungabula: Grammar and vocabulary”, *Linguistic Communications* 8. Monash University, Melbourne.

Breen, J.G. (1981). “Margany and Gunya”. In: R.M.W. Dixon and B.J. Blake (eds.), *Handbook of Australian Languages, Volume II*, 274-393. John Benjamins, Amsterdam.

Bridgeman, Loraine I. (1971). “Kaiwa (Guarani) phonology”, *International Journal of American Linguistics* 27.4, 329-334.

Campbell, Lyle (1985). *The Pipil Language of El Salvador* (Mouton Grammar Library 1). Mouton, Berlin.

Cappell, A. (1984). “The Laragia language”. In: *Papers in Australian Linguistics, No. 16* (Pacific Linguistics, Series A, No. 68), 55-106. The Australian National University, Canberra.

Carlson, Lauri (1978). *Stress in Finnish*. Unpublished manuscript, MIT.

Carson, Neusa M. (1981). *Phonology and Morphosyntax of Macuxi (Carib).* Unpublished Ph.D. dissertation, University of Kansas.

Chadwick, Neil (1975). A *Descriptive Study of the Djingili Language* (Australian Aboriginal Studies, Regional and Research Studies, No. 2). Australian Institute of Aboriginal Studies, Canberra.

Chafe, Wallace L. (1977). “Accent and related phenomena in the Five Nations Iroquois languages”. In: L.M. Hyman (ed.), *Studies in Stress and Accent* (Southern California Occasional Papers in Linguistics, No. 4), 169-181. Department of Linguistics, USC, Los Angeles.

Chung, Sandra (1983). “Transderivational relationships in Chamorro phonology”, *Language* 59.1, 35-66.

Churchward, C. Maxwell (1940). *Rotuman Grammar and Dictionary*. Australian Medical Publishing Co.

Churchward, C. Maxwell (1953). *Tongan Grammar*. Oxford University Press.

Cohn, Abigail C. (1989). “Stress in Indonesian and bracketing paradoxes”, *Natural Language and Linguistic Theory* 7, 167-216.

Cohn, Abigail C. (1992). *The Initial Dactyl Effect and the Status of Degenerate Feet*. Ms. Cornell University.

Cole, Peter (1982). *Imbabura Quechua* (Lingua Descriptive Studies, Volume 5). North-Holland Publishing Company, Amsterdam.

Collinder, Björn (1949). *The Lappish Dialect of Jukkasjärvi: A Morphological Survey.* Almqvist and Wiksells Boktruckeri, Uppsala.

Counts, David R. (1969). *A Grammar of Kiliai-Kove*. University of Hawaii Press, Honolulu.

Cowan, H.K.J. (1965). *Grammar of the Sentani Language: With Specimen Texts and Vocabulary* (Verhandelingen van het Koninklijk Instituut voor Taal-, Land- en Volkenkunde, Deel 47). Martinus Nijhoff, The Hague.

Crowley, Terry (1981). "The Mpakwithi dialect of Anguthimri". In: R.M.W. Dixon and B.J. Blake (eds.), *Handbook of Australian Languages, Volume II,* 146-194. John Benjamins, Amsterdam.

Davis, Stuart (1984), "Squamish stress clash". In: S. Davis (ed.), *Studies on Native American Languages, Japanese, and Spanish* (Coyote Papers, Working Papers in Linguistics from A-Z, Volume 5), 2-18. University of Arizona, Tucson.

Dixon, R.M.W. (1972). *The Dyirbal Language of North Queensland*. Cambridge University Press, Cambridge.

Dixon, R.M.W. (1988). *A Grammar of Boumaa Fijian*. The University of Chicago Press, Chicago.

Douglas, Wilfred A. (1976). *The Aboriginal Languages of the South-West of Australia* (Australian Aboriginal Studies, Research and Regional Studies, No. 9). Australian Institute of Aboriginal Studies, Canberra.

Dubert, Raymond, and Marjorie Dubert (1973). "Biangay phonemes". In: A. Healey (ed.), *Phonologies of Three Languages of Papua New Guinea* (Workpapers in Papua New Guinea Languages, Volume 2), 5-36. Summer Institute of Linguistics, Ukurumpa, New Guinea.

Elbert, Samuel H. (1988). *Echo of a Culture: A Grammar of Rennell and Bellona* (Oceanic Linguistics Special Publications, No. 22). University of Hawaii Press, Honolulu.

Fahner, Christaan (1979). *The Morphology of Yali and Deni*. Unpublished Ph.D. dissertation, University of Leiden.

Farr, James, and Cynthia Farr (1974). "A preliminary Korafe phonology". In: *Three Studies in Languages of Eastern Papua* (Workpapers in Papua New Guinea Languages, volume 3). Summer Institute of Linguistics, Ukurumpa, Papua New Guinea.

Feldman, Harry (1978), "Some notes on Tongan phonology", *Oceanic Linguistics* 17, 133-139.

Franks, Steven (1987). "Regular and irregular stress in Macedonian", *International Journal of Slavic Linguistics and Poetics* 35-36, 93-142.

Franks, Steven (1991). "Diacritic extrametricality vs. diacritic accent: A reply to Hammond", *Phonology* 8.1, 145-161.

French, Koleen Matsuda (1988). *Insights into Tagalog Reduplication, Infixation, and Stress from Non-linear Phonology* (Summer Institute of Linguistics and The Univerity of Texas at Arlington Publications in Linguistics, Number 84).

Garvin, Paul L. (1948). "Kutenai I: Phonemics", *International Journal of American Linguistics* 14.1, 37-42.

Gault, Jo A. (1979). "Phonemics and morphophonemics of Sama Baangingi". In: *Papers in Philippine Linguistics, No. 9* (Pacific Linguistics, Series A, No. 50), 49-68. The Australian National University, Canberra.

Giegerich, Heinz J. (1985). *Metrical Phonology and Phonological Structure*. Cambridge University Press, Cambridge.

Gleason, Henry (1955). *Workbook in Descriptive Linguistics*. Holt, New York.

Granberry, Julian (1965). "Timacua I: Prosodics and phonemics of the Mocama dialect", *International Journal of American Linguistics* 22.2, 97-105.

Granberry, Julian (1990). "A grammatical sketch of Timacua", *International Journal of American Linguistics* 56.1, 60-101.

Gulya, J nos (1966). *Eastern Ostyak Chrestomathy* (Indiana University Publications, Uralic and Altaic Series, Vol. 51). Indiana University, Bloomington.

Halle, Morris, and Jean-Roger Vergnaud (1987). *An Essay on Stress*. MIT Press, Cambridge, Massachusetts.

Hansen, K.C., and L.E. Hansen (1969). "Pintupi phonology", *Oceanic Linguistics* 8.2, 153-170.

Harris, James W. (1983). *Syllable Structure and Stress in Spanish*. MIT Press, Cambridge.

Haviland, John (1979). "Guugu Yimidhirr". In: R.M.W. Dixon and B.J. Blake (eds.), *Handbook of Australian Languages, Volume I*, 26-180. John Benjamins, Amsterdam.

Hayes, Bruce (1980). *A Metrical Theory of Stress Rules*. IULC, Bloomington, Indiana.

Hayes, Bruce (1987). "A revised parametric metrical theory". In: J. McDonough and B. Plunket (eds.), *Proceedings of the North East Linguistic Society*, 17, Vol. I, 274-289.

Hayes, Bruce (1991). *Metrical Stress Theory: Principles and Case Studies*. Ms. UCLA. To be published by The University of Chicago Press.

Hercus, L.A. (1984). *The Baagandji Language* (Pacific Linguistics, Series B, No. 67). The Australian National University, Canberra.

Hercus, L.A. (1986). *Victorian Languages: A Late Survey* (Pacific Linguistics, Series B, No. 77). The Australian National University, Canberra.

Hint, Mati (1973). *Eesti Keele Sonofonoloogia I*. Essti NSV Teaduste Akadeemia, Tallinn.

Hoijer, Harry (1946). "Tonkawa". In: *Linguistic Structures of Native America* (Viking Fund Publications in Anthropology, Number 6), 289-311. Johnson Reprint Corporation, New York.

Hore, Michael (1981). "Syllable length and stress in Nunggubuyu". In: B. Waters (ed.), *Australian Phonologies: Collected Papers* (Work Papers of SIL-AAB, Series A, Volume 5), 1-102. Summer Institute of Linguistics, Australian Aborigines Branch, Darwin.

Hudson, Joyce, and Eirlys Richards (1978). "The phonology of Walmatjarri", *Oceanic Linguistics* 8.2, 171-189.

Hyman, Larry M. (1977). "On the nature of linguistic stress". In: L.M. Hyman (ed.), *Studies in Stress and Accent* (Southern California Occasional Papers in Linguistics, No. 4), 37-82. Department of Linguistics, USC, Los Angeles.

Inkelas, Sharon (1989). *Prosodic Constituency in the Lexicon*. Unpublished Ph.D. dissertation, Stanford University.

Itkonen, E. (1955). "Über die Betonungsverhältnisse in den Finnisch-Ugrischen Sprachen", *Acta Linguistica Academiae Scientiarum Hungaricae* 5, 21-33.

Jakobson, Roman (1962). "Contributions to the study of Czech accent". In: *Roman Jakobson, Selected Writings I: Phonological Studies*, 614-625. Mouton, The Hague.

Kager, Ren, (1989). *A Metrical Theory of Stress and Destressing in English and Dutch.* Foris, Dordrecht.

Kager, Ren, (1992a). "Alternatives to the Iambic-Trochaic Law". To appear in *Natural Language and Linguistic Theory*.

Kager, Ren, (1992b). "Are there any truly quantity-insensitive systems?". To appear in the *Proceedings of the Berkeley Linguistic Society*, 18.

Kager (1992c), "Shapes of the Generalized Trochee". To appear in the *Proceedings of the Eleventh West Coast Conference on Formal Linguistics.*

Kager, Ren, (1992d). *Stress in Windows*. Ms., University of Utrecht.

Kakumasu, James (1986). "Urubu-Kaapor". In: D.C. Derbyshire and G.K. Pullum (eds.), *Handbook of Amazonian Languages, Volume 1*, 326-403. Mouton-De Gruyter, Berlin.

Kálmán, Bela (1965). *Vogul Chrestomathy* (Indiana University Publications, Uralic and Altaic Seres, Vol. 46). Indiana University, Bloomington.

Keels, Jack (1984). "Fonologia y morfofonologia del Guayabero". In: *Sistemas Fonológicos de Idiomas Colombianos, Tomo V*, 125-152. Townsend, Lomalinda, Colombia.

Keen, Sandra (1983). "Yukulta". In: R.M.W. Dixon and B.J. Blake (eds.), *Handbook of Australian Languages, Volume III*, 190-304. John Benjamins, Amsterdam.

Kennedy, R.J. (1981). "Phonology of Kala Lagaw Ya in Saibai dialect". In: B. Waters (ed.), *Australian Phonologies: Collected Papers* (Work Papers of SIL-AAB, Series A, Volume 5). Summer Institute of Linguistics, Australian Aborigines Branch, Darwin.

Kerek, Andrew (1971). *Hungarian Metrics: Some Linguistic Aspects of Iambic Verse* (Indiana University Publications, Uralic and Altaic Series, Vol. 117). Indiana University, Bloomington.

Key, Mary R. (1968). *Comparative Tacanan Phonology: With Cavineña Phonology and Notes on Pano-Tacanan Relationships* (Janua Linguarum, Series Practica 50). Mouton, The Hague.

Kiparsky, Paul (1991). *Catalexis*. Ms. Stanford University and Wissenschaftskolleg zu Berlin.

Kirton, Jean F. (1967). "Anyula phonology". In: *Papers in Australian Linguistics, No. 1* (Pacific Linguistics, Series A, No. 10). The Australian National University, Canberra.

Koehn, Edward, and Sally Koehn (1986). “Apalai” In: D.C. Derbyshire and G.K. Pullum (eds.), *Handbook of Amazonian Languages, Volume 1*, 33-127. Mouton-De Gruyter, Berlin.

Kuipers, A. (1967). *The Squamish Language*. Mouton, The Hague.

Kuki, Hiroshi (1970). *Tuamotuan Phonology* (Pacific Linguistics, Series B, No. 17). The Australian National University, Canberra.

Lakó, G. (1957). “Nordmansische Sprachstudien”. In: J. Németh (ed.), *Acta Linguistica Academiae Scientiarum Hungaricae*, Tomus 6, 357-423. Akadémiai Kiadó, Budapest.

Lee, Jennifer (1987). *Tiwi Today: A Study of Language Change in a Contact Situation* (Pacific Linguistics, Series C, No. 96). The Australian National University, Canberra.

Lee, Kee-dong (1975). *Kusaiean Reference Grammar*. The University Press of Hawaii, Honolulu. (Originally published in 1940.)

Lichtenberk, Frantisek (1983). *A Grammar of Manam*. University of Hawaii Press, Honolulu.

Lithgow, Daphne (1977). “Dobu phonemics”. In: R. Loving (ed.), *Phonologies of Five Papua New Guinea Languages* (Workpapers in Papua New Guinea Languages, Volume 19), 73-96. Summer Institute of Linguistics, Ukurumpa, New Guinea.

Lombardi, Linda, and John McCarthy (1991). “Prosodic circumscription in Choctaw morphology”, *Phonology* 8.1, 37-72.

Lynch, John (1978). *A Grammar of Lenakel* (Pacific Linguistics, Series B, No. 55). The Australian National University, Canberra.

Lynch, John (1982). “South-West Tanna grammar outline and vocabulary”. In: J. Lynch (ed.), *Papers in Linguistics of Melanesia* (Pacific Linguistics, Series A, No. 64). The Australian National University, Canberra.

Malakouti-Drachman, Angeliki, and Gaberell Drachman (1981). “Slogan chanting and speech rhythm in Greek”. In: W.A. Dressler, O.E. Pfeiffer, and J.R. Rennison (eds.), *Phonologica 1980*, 283-292. Innsbruck.

Manning, Margaret, and Naomi Sanders (1977). “A tentative phonemic analysis of Ningil”. In: R. Loving (ed.), *Phonologies of Five Papua New Guinea Languages* (Workpapers in Papua New Guinea Languages, Volume 19), 49-72. Summer Institute of Linguistics, Ukurumpa, New Guinea.

Marsh, James (1969). “Mantjiltjara phonology”, *Oceanic Linguistics* 8.2, 131-152.

Matteson, Esther (1965). *The Piro (Arawakan) Language*. University of California Press, Berkeley.

McDonald, M. and S.A. Wurm (1979). *Basic Materials in Wangkumara (Galali): Grammar, Sentences and Vocabulary* (Pacific Linguistics, Series B, No 65). The Australian National University, Canberra.

McCarthy, John, and Alan Prince (1986). *Prosodic Morphology*. Ms., University of Massachusetts, Amherst, and Brandeis University, Waltham, Massachusetts.

McElhanon, K.A. (1970). *Selepet Phonology* (Pacific Linguistics, Series B, No. 14). The Australian National University, Canberra.

Mester, R. Armin (1991). *Some Remarks on Tongan Stress*. Ms., UCSC, Santa Cruz.

Mester, R. Armin (1992). "The quantitative trochee in Latin". To appear in *Natural Language and Linguistic Theory*.

Michelson, Karin (1988). *A Comparative Studu of Lake-Iroquoian Accent* (Studies in Natural Language and Linguistic Theory). Kluwer Academic Publishers, Dordrecht.

Migliazza, Ernest C. (1972). *Yanomama Grammar and Intelligibility*. Unpublished Ph.D. dissertation, Indiana University.

Nabanan, P.W.J. (1981). *A Grammar of Toba-Batak* (Materials in Languages of Indonesia, no. 6. Pacific Linguistics D37).

Nash, David G. (1980). *Topics in Warlpiri Grammar*. Unpublished Ph.D. dissertation, MIT.

Newman, Stanley (1944). *Yokuts Language of California* (Viking Fund Publications in Anthropology, Number 2). Johnson Reprint Corporation, New York.

Osborn, Henry A. (1966). "Warao I: Phonology and morphophonemics", *International Journal of American Linguistics* 32.2, 108-123.

Percival, W.K. (1981). *A Grammar of the Urbanised Toba-Batak of Medan* (Pacific Linguistics, Series B, No 76). The Australian National University, Canberra.

Pet, Willem J.A. (1979). "Another look at Suriname Arawak phonology", *International Journal of American Linguistics* 45.4, 323-331.

Phinnemore, Thomas R. (1985). "Ono phonology and morphophonemics". In: *Papers in New Guinea Linguistics, No. 22* (Pacific Linguistics, Series A, No. 63), 173-214. The Australian National University, Canberra.

Pike, Kenneth L. (1964). "Stress trains in Auca". In: D. Abercrombie, D.B. Fry, P.A.D. MacCarthy, N.C. Scott, and J.L.M. Trim (eds.), *In Honour of Daniel Jones*. Longmans, London.

Popjes, Jack, and Jo Popjes (1986). "Canela-Krahô". In: D.C. Derbyshire and G.K. Pullum (eds.), *Handbook of Amazonian Languages, Volume 1*, 128-199. Mouton-De Gruyter, Berlin.

Poser, William J. (1985), "Cliticization to NP and lexical phonology". In: J. Goldberg, S. MacKaye, and M.T. Wescoat (eds.), *Proceedings of the West Coast Conference on Formal Linguistics* 4, 262-272.

Poser, William J. (1989). "The metrical foot in Diyari", *Phonology* 6, 117-148.

Prince, Alan S. (1980). "A metrical theory for Estonian quantity", *Linguistic Inquiry* 11.3, 511-562.

Prince, Alan S. (1983). "Relating to the grid", *Linguistic Inquiry* 14.1, 19-100.

Prince, Alan S. (1990). "Quantitative consequences of rhythmic organization". In: K. Deaton, M. Noske, and M. Ziolkowski (eds.), *CLS 26-II: Papers from the Parasession on the Syllable in Phonetics and Phonology*. Chicago Linguistic Society, Chicago.

Prince, Alan S., and Paul Smolensky (1993). *Optimality Theory: Constraint Interaction in Generative Grammar*. Ms., Department of Linguistics, Rutgers Cognitive Science Center,

Rutgers University, and Department of Computer Science, Institute of Cognitive Science, University of Boulder at Colorado.

Rastorgueva, V.S. (1963). *A Short Sketch of Tajik Grammar*. Indiana University, Bloomington.

R,dei, K roly (1965). *Northern Ostyak Chrestomathy* (Indiana University Publications, Uralic and Altaic Series, Vol. 47). Indiana University, Bloomington.

Reesink, Gerard P. (1984). *Structures and their Function in Usan, a Papuan language of New Guinea*. Ph.D. dissertation, University of Amsterdam.

Reyburn, William D. (1954). "Quechua I: Phonemics", *International Journal of American Linguistics* 20.3, 210-214.

Rice, Curtis (1992). *Binarity and Ternarity in Metrical Theory: Parametric Extensions*. Docoral dissertation, The University of Texas at Austin.

Rubach, Jerzy, and Geert E. Booij (1985). "A grid theory of stress in Polish", *Lingua* 66.4, 281-320.

Schachter, Paul, and Fe T. Otanes (1972). *Tagalog Reference Grammar*. University of California Press, Berkeley.

Schane, Sanford (1968). *French Phonology and Morphology*. MIT Press, Cambridge, Massachusetts.

Schütz, Albert J. (1978). "Accent in two Oceanic languages", *Anthropological Linguistics* 20.4, 141-149.

Seiler, Hansjakob (1965). "Accent and morphophonemics in Cahuilla and in Uto-Aztecan", *International Journal of American Linguistics* 31.1, 50-59.

Senft, Gunter (1986). *Kilivila: The Language of the Trobriand Islands* (Mouton Grammar Library 3). Mouton de Gruyter, Berlin.

Shaw, R. Daniel, and Karen A. Shaw (1977). "Samo phonemes". In: R. Loving (ed.), *Phonologies of Five Papua New Guinea Languages* (Workpapers in Papua New Guinea Languages, Volume 19). Summer Institute of Linguistics, Ukurumpa, New Guinea.

Shaw, Patricia A. (1985). "Coexistent and competing stress rules in Stoney Dakota", *International Journal of American Linguistics* 51.1, 1-18.

Shetler, Joanne (1976). *Notes on Balangao Grammar* (Language Data, Asian-Pacific Series No. 9). Summer Institute of Linguistics, Huntington Beach, California.

Shukla, Shaligram (1981). *Bhojpuri Grammar*. Georgetown University Press, Washington, D.C.

Sluyters, Willebrord (1990). "Length and stress revisited: A metrical account of diphthongization, vowel lengthening, consonant gemination and word-final vowel epenthesis in Modern Italian", *Probus* 2.1, 65-102.

Solomon, Zomaya S., and Robert K. Headley, Jr. (1973). "The phonology of Modern Spoken Syriac", *Anthropological Linguistics* 15.3, 136-147.

Sommer, B.A. (1969). *Kunjen Phonology: Synchronic and Diachronic* (Pacific Linguistics, Series B, No. 11). The Australian National University, Canberra.

Sterner, Joyce K. (1975). “Sobei phonology”, *Oceanic Linguistics* 14.2, 146-167.

Street, Chester S. (1981). “The phonology of Murinbata”. In: B. Waters (ed.), *Australian Phonologies: Collected Papers* (Work Papers of SIL-AAB, Series A, Volume 5). Summer Institute of Linguistics, Australian Aborigines Branch, Darwin.

Strong, Clarice (1979). “The phonemics and morphophonemics of Tigwa Manobo”. In: C. Edrial-Lusares and A. Hale (eds.), *Studies in Philippine Linguistics, Volume 3, No. 2* Linguistic Society of the Philippines and Summer Institute of Linguistics.

Stucky, Al, and Dellene Stucky (1973). “Nii phonology”. In Alan Healey (ed.), *Phonologies of Three Languages of Papua New Guinea* (Workpapers in Papua New Guinea Languages, Volume 2), 37-78. Summer Institute of Linguistics, Ukurumpa, New Guinea.

Swadesh, Morris (1947). “The phonemic structure of Zapotec”, *International Journal of American Linguistics* 13.4, 220-230.

Thomson, N.P. (1975). “Magi phonology and grammar: Fifty years afterward”. In: T.E. Dutton (ed.), *Studies in Languages of Central and South-East Papua* (Pacific Linguistics, Series C, No. 29), 599-666. The Australian National University, Canberra.

Tryon, D.T. (1967a). *Dehu Grammar* (Pacific Linguistics, Series B, No. 7). The Australian National University, Canberra.

Tryon, D.T. (1967b). *Nengone Grammar* (Linguistic Circle of Canberra Publications, Series B, No. 6). The Australian National University, Canberra.

Tryon, D.T. (1970). *An Introduction to Maranungku* (Northern Australia) (Pacific Linguistics, Series B, No. 15). The Australian National University, Canberra.

Tweddell, Colin E., Thomas E. Tweddell, and Hazel A. Page (1974). “Iraya Mangyan phonology and Philippine orthography”, *Anthropological Linguistics* 16.7, 368-392.

Van den Berg, J.D. (1953). *Spraakkunst van het Banggais*. Martinus Nijhoff, The Hague.

Voorhoeve, Clemens L. (1965). *The Flamingo Bay Dialect of the Asmat Language*. H.L. Smits, ‘s-Gravenhage.

Walton, Charles (1979). “Pangutaran (Sama) phonology”. In: C. Edrial-Lusares and A. Hale (eds.), *Studies in Philippine Linguistics, Volume 3, No. 2*. Linguistic Society of the Philippines and Summer Institute of Linguistics.

Webb, Tom (1974). “Urii phonemes”. In: R. Loving (ed.), *Phonologies of Four Papua New Guinea Languages* (Workpapers in Papua New Guinea Languages, Volume 4), 45-96. The Australian National University, Canberra.

Whorf, Benjamin L. (1946). “The Milpa Alta dialect of Aztec”. In: *Linguistic Structures of Native America* (Viking Fund Publications in Anthropology, Number 6), 367-397. Johnson Reprint Corporation, New York.

Williams, Corinne J. (1980). *A Grammar of Yuwaalarraay* (Pacific Linguistics, Series B, No. 74). The Australian National University, Canberra.

Wonderly, William L. (1951). “Zoque II: Phonemes and morphophonemes”, *International Journal of American Linguistics* 17.2, 105-123.

Wood, R. (1988). “Some Yuulngu phonological patterns”. In: *Papers in Australian Linguistics, No. 11* (Pacific Linguistics, Series A, No. 51). The Australian National University, Canberra.

Wordick, F.J.F. (1982). *The Yindjibarndi Language* (Pacific Linguistics, Series C, No. 71). The Australian National University, Canberra.

Yip, Moira (1992). *On Quantity-Insensitive Languages*. Ms., Dept. of Linguistics, University of California, Irvine.