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4 Word structure[1]

1 Introduction

This chapter provides an overview of phonology and morphology in Australian languages. Here, my focus is on the (segmental, suprasegmental) *form* of morphemes, rather than their meanings or functions (that is the domain of Chapter 5). I will also restrict the discussion to traditional (that is, autochthonous) Australian languages. Contact varieties are discussed in Chapter 9. In what follows, I firstly give a quick survey of the relevant literature from the 1970s up until now. In the ensuing sections, I provide a survey of some of the features which characterise Australian languages as a whole, in comparison to languages elsewhere in the world. I start with the segmental inventory in § 2 and phonotactics in § 3. The distinction between phonological and syntactic "words" is discussed in § 4, the prevalence of word minimality in § 5, the nature of word prosody § 6, and word structure in § 7. Section 8 discusses some of the more common segmentally-conditioned processes, such as assimilation. Section 9 discusses reduplication, with special reference to infixed reduplicants and the behaviour of "monogestural" clusters. Section10 surveys a number of long-distance dissimilation phenomena, not well-known to the field. Some particularly problematic issues for future research, such as segments or features located with respect to a syllabic (rather than skeletal) domain, are canvassed in § 10, along with the issue of sociolinguistic variation.

1.1 Phonology and Australian languages: the state of the field

The heyday of phonological investigation of Australian languages was undoubtedly the (late) 60s, 70s and 80s. During this time R. M. W. Dixon established the basic properties of phonotactics in Australian languages (1968, 1972, 1980),[2] which was further elaborated by Hamilton in a seminal, but as yet unpublished, work (1996). What Dixon showed was that the phonotactics of Australian languages cannot be easily accounted for in a prosodic model using the syllable as its primary unit. I discuss this further in § 3. Apart from these works, the only general survey of phonological patterns in

1 I would like to thank Mark Harvey, John Henderson, Rachel Nordlinger, and especially Erich Round for their comments on and examples for this chapter. Suggestions from an anonymous reviewer also led to significant improvements in the final version. Any remaining infelicities are of course my own responsibility. Thanks finally to Ben Volchok for his copyediting efforts.

2 Dixon (2002) is an updated version of Dixon (1980), and also has a chapter on phonology.

Australian languages is Evans (1995a). Since the 80s, there has been a notable decline in the number and quality of works in the phonology of Australian languages. Many recent grammars devote little attention to phonological description, often citing the availability of older grammars of the language as the reason for this decision. Extended studies of the phonology of particular languages can be found (in rough chronological order), for example, in Dixon (1968, 1972, 1977), Sommer (1969), Hale (1973, 1976), Yallop (1977), Donaldson (1980), Austin (1981), Heath (1984), Nash (1986), to here Evans (1995b, 2003), Henderson (1998), Breen and Pensalfini (1999), Baker (1999, 2008), Berry (1999), Blevins (2001b), Harvey (2002), Pensalfini (2003), Round (2009). Some important shorter works on phonological topics in Australian languages include: Sommer (1970), Wood (1978); Harvey (1991); Breen (1992, 2001); Blevins and Marmion (1994), Pensalfini (2000), Baker and Harvey (2003), Harvey and Baker (2005b).

Australian languages have perhaps been notable in phonological theory mainly for two reasons: their stress patterns, and their syllable structure. The descriptions of Pintupi (Hansen and Hansen 1969) and Maranunggu (Tryon 1970) have been regularly used as paradigm examples of left-aligned alternating trochaic stress, in such works as Hayes' (1995) important cross-linguistic survey of metrical stress patterns.[3] A few Australian languages provide some of the very slight evidence for the effect of onsets on stress pattern, e.g. Arrernte, first described in Strehlow (1944), has been important, Madhi Madhi (Hercus 1986), and also Djinang, according to Waters (1980). See e.g. Gahl (1996), Goedemans (1996), Berry (1999), Gordon (2005) for analyses, and Topintzi (2011), Blevins (1995) for reviews. Arrernte also features prominently in discussions of syllable structure, since it has a number of phonological patterns which appear to point to a VC(C) syllable, rather than the CV structure which has been claimed to be universal in some sense (Jakobson 1962, McCarthy and Prince 1986); see Breen and Pensalfini (1999); Henderson (1998) for detailed discussions of the phenomena and theoretical arguments (also Ch 3 of this volume), also Blevins and Marmion (1994); Blevins (2001a) for a proposal on the possible sources of initial-dropping. (The issue was first brought to the attention of phonologists by Sommer's (1970) paper on the Cape York language Oykangand.) Throughout this chapter I will (following Evans' 1995a lead) point out the theoretical significance of various of the phonological phenomena discussed here, many of which have been little-explored in the literature to date. Since this chapter necessarily must leave out many phenomena and individual languages, I have tried to emphasise what is unusual about Australian

3 It is worth noting, however, that the stress patterns described in these two works are unlike any other well-described Australian language. In these descriptions of Pintupi and Maranungku, complex words are stressed as if they have no internal structure. However, in all Australian languages, according to the available descriptions, the morphological structure of words is crucial to the location of metrical feet in the word; see § 6.1 for discussion. This characteristic feature of Australian languages is discussed in detail in § 0.

languages wherever possible. At the same time, I have focussed on patterns which are widespread amongst Australian languages, rather than limited, in an effort to get to the heart of what drives the phonological systems of speakers of these languages.

2 Segmental inventories

One feature of Australian languages which makes them rather different to other large geographical or genetic groups is their remarkable homogeneity (perhaps first noted by Voegelin et al. 1963),[4] a feature called "Concert" by Hamilton (1996). Among other effects, this makes historical reconstruction by the standard comparative method rather difficult in Australia (noted by several researchers, for instance Alpher 2004:103).

Segmental inventories (discussed also in Ch 3) in particular tend to be quite homogenous among Australian languages, with the exception of parts of Cape York.[5] Vowel systems in Australian languages tend to be extremely simple, often with just three distinctions in place/quality, sometimes with an additional length distinction. 4 and 5 vowel systems are not uncommon among non-Pama-Nyungan (NPN) languages, e.g. Ngandi (Heath 1978b). Systems larger than that are quite rare among Australian languages. Consonant systems in Australian languages elaborate place contrasts, particularly among coronals, but characteristically lack fricatives altogether (with some areally-focussed exceptions in Cape York and the Daly River region). Many languages of the northern central region (the "Top End") and Cape York in addition have a glottal stop (though it appears to operate differently in each of these two regions; see § 11 for discussion). Voicing contrasts are rare, but a number of languages have oppositions between "fortis" and "lenis" realisations of stops (see Ch 3). Table (1) sets out a typical but maximal phonemic inventory of consonants. Hamilton (1996) provides comprehensive data on the distribution of consonantal inventories in Australian languages.

Table 1: A typical Australian consonant inventory

	Labial	**Lamino-dental**	**Apico-alveolar**	**Apico-retroflex**	**Lamino-alveopalatal**	**Dorso-velar**
Stop	p	t̪	t	ʈ	c	k
Nasal	m	n̪	n	ɳ	ɲ	ŋ
Lateral		l̪	l	ɭ	ʎ	
Trill/tap			r			
Glide	w			ɻ	j	

4 Thanks to David Nash for this reference.

5 The Cape York languages have been shown to have developed from historic languages of the usual Australian type; see the papers in Sutton (1976).

It is useful to distinguish several manner classes among consonants, for the purposes of phonotactics, as well as phonological processes; these are shown in (1) with their traditional feature specifications in Chomsky and Halle (1968):

(1) a. Obstruents [–son, –cont] /p t ʈ ʈ̪ c k ʔ/
b. Sonorants [+son] /m n ɳ n̪ ɲ ŋ l ɭ ɭ̪ ʎ r ɻ w j /
c. Nasals [+son, –cont, +nas] /m n ɳ n̪ ɲ ŋ/
d. Continuants [+son, +cont] /l ɭ ɭ̪ ʎ r ɻ w j/[6]
e. Glides [–cons, –syll] /ɻ w j/

The acoustic and articulatory properties of these sounds are described in Ch 3. The basis for these natural classes is discussed in various works, including (Dixon 1980, 2002), (Hamilton 1996), (Baker 2008), etc. I discuss in § 8.1 some evidence for these natural classes in phonological processes.

The distinction between "apical" coronals and "laminal" coronals is a traditional one in Australianist linguistics, going back to at least Hale (1964); O'Grady (1964); and Dixon (1972). "Apical" refers to sounds made with the tongue tip, and "laminal" to those made with the blade: the area immediately behind the tip. See Ch3 for further discussion. There is abundant evidence for this distinction. In many Australian languages, apicals alternate or neutralise with each other in particular contexts. For example, in the vast majority of Australian languages, there is no apical contrast in word-initial position (Hamilton 1996). Most languages are reported as having apico-retroflex realisations of these neutralised segments in phrase-medial context, following a vowel, but apico-alveolar realisations otherwise (i.e. utterance-initially, and following consonants other than retroflex). To my knowledge, these languages have not been acoustically analysed for this reported behaviour. Similarly, the laminals are commonly neutralised in syllable-final position, with the lamino-palatal being the only possible member of the contrast. The coronals are commonly distinguished from "peripherals" (dorsals, labials) in the Australianist literature (e.g. Dixon 1980), partly because of consistent differences in phonotactic distribution, discussed below.

6 Throughout this chapter 'continuant' therefore refers to the set {vowels, liquids and glides}. I will refer to nasals, glottal stop and supralaryngeal obstruents collectively as 'non-continuants'. This follows Australianist practice (e.g. Morphy 1983), although the term 'continuant' receives various interpretations in the literature; see Mielke (2005) for recent discussion of the ambiguous behaviour of laterals and nasals for the feature [continuant].

3 Word phonotactics

As well as sharing a common set of phonemes, for the most part, Australian languages are also very similar phonotactically. The essential properties of the phonotactics of Australian languages are set out in Dixon (1980, 2002) and expanded in a thorough survey by Hamilton (1996), which also provides an analysis of these patterns in terms of acoustic and articulatory markedness constraints. One of the notable features of Australian languages is that their characteristic phonotactic patterns cannot easily be accounted for with the usual mechanism: syllabic licensing (e.g. Itô 1986). Dixon (1972: 272, 1977: 35, 1980: 159) and Hamilton (1996) advocate instead for the use of a word template of phonotactic positions for consonants, as shown in (2).[7]

(2) a. $C_{init}V(C_{inter}V)^{*}(C_{fin})$
b. $C_{init}V(C_1C_2V)^{*}(C_{fin})$
where,
C_{init} is a word-initial consonant
C_{inter} is an intervocalic consonant or monogestural cluster (see below)
C_{fin} is a word-final consonant
C_1 is a pre-consonantal consonant
C_2 is a post-consonantal consonant
and C_1C_2 are heterorganic

Specific phonotactic positions allow for characteristic ranges of consonant segments. In particular, the ONLY position which typically licenses the full range of contrastive consonant segments in Australian languages is the intervocalic position, which Hamilton (1996) labels "C_{INTER}". Other phonotactic positions—word onset, pre-consonantal, and post-consonantal (as well as codas in general)—characteristically license a smaller set of consonants. The set of post-consonantal segments can often be quite restricted.

It is relatively common for Australian languages to entirely restrict apicals from the C_{init} position, e.g. Paakantyi (Hercus 1986), Ngiyampaa (Donaldson 1980). Even in languages that allow some or all coronals in initial position however, the peripherals always occur at great frequencies in the lexicon (Hamilton 1996: 218). Apart from place phonotactics, there are clear asymmetries in the manner of articulation of consonants permitted in initial position. Stops, nasals and glides are found in word-initial position in all Australian languages. Liquids are very commonly highly restricted in this position however. Many languages do not allow the laterals at all (e.g. Yidiny, Dyirbal, Gumbaynggir: Hamilton 1996: 223). Only a small number of Australian languages al-

7 See Blevins (2003) for a discussion of the place of phonotactic constraints within phonological theory more broadly.

low the tap/trill /r/ in word-initial position (e.g. a number of Yolngu varieties such as Djambarrpuyngu: Heath 1980c, and Nunggubuyu/Wubuy: Heath 1984)[8]. In such languages, words with initial tap/trill are always heavily under-represented in the lexicon.

Many Australian languages do not allow consonants word-finally at all, or only for a certain class of words in the lexicon, e.g. (at least under some analyses) many of the Arandic languages, Anindhilyakwa (van Egmond 2012), Kayardild (Evans 1995b), and Diyari (Austin 1981). Dixon (1980) claims that this is a recent phenomenon in these languages. Warlpiri (Nash 1982: 175) is also like this, except that the lexical class of preverbs may be consonant-final just if they are immediately followed by an inflected verb. Some of these languages, e.g. Warlpiri, enforce vowel-finality by means of paragoge: epenthesis of a syllable to the ends of roots, often /pa/, or else a central or low vowel (as in Arandic, and Anindhilyakwa). Among languages which allow word-final consonants, the markedness of place features mirrors that in the word-initial position (first noted by Dixon 1980). That is, apical consonants are the least, and peripherals the most, marked, with laminals intermediate (Hamilton 1996: 228). The markedness of manner features is also somewhat reversed in word-final position. Continuants (especially liquids) and nasals are the most frequently encountered word-final segments, stops are uncommon. However, glides are also uncommon in word-final position (for summaries, see Dixon 1980: 169).

Australian languages are unusual in licensing a large number of heterorganic consonant clusters; in particular, those involving nasals and stops at different places of articulation (which are cross-linguistically rare, and typically targeted by assimilation processes) are common among Australian languages; see § 8.

Also notable is the fact that C_{INTER} primarily licenses single consonants, but also the full range of homorganic (nasal plus stop) clusters in a language. In many Australian languages with a set of lamino-dental consonants (contrasting with lamino-alveopalatal consonants), these are completely restricted from codas (e.g. Wubuy: Heath 1984: 20. See Dixon 1980 and Hamilton 1996 for discussion). However, lamino-dental nasals are entirely unrestricted just if they are in a medial homorganic cluster of nasal plus stop in such languages. Heterorganic clusters license a smaller range of segments, regardless of syllable position. Also, notably, homorganic clusters of liquid plus stop do not behave in the same way: these clusters are often highly restricted or illicit in Australian languages; for instance there are none at all in the lexicon of Ngalakgan (Merlan 1983). Hence, the characteristic of sharing a single oral gesture appears to be special in Australian languages. So we could say that the C_{INTER} position licenses single oral gestures (in the sense of Browman and Goldstein 1989 and follow-

8 This language is commonly referred to in the literature as 'Nunggubuyu' (following e.g. Heath 1984), and is also the typical term for this language used by neighbouring groups, e.g. Marra speakers. Many speakers of this language however prefer the term 'Wubuy' for the language itself. The term 'Nunggubuyu' transparently means 'Wubuy[-speaking] people'; see Heath (1982: 126).

ing work), rather than a particular set of segments (Hamilton 1996). There are other phonological processes which appear to single out the "monogestural" (nasal-stop) clusters from other consonantal clusters. These are examined at § 6.3 and § 9 (and see further Baker 2008: Ch 5, for discussion).

The phonotactics of bound morphemes are quite frequently different to those of roots. For example in Gooniyandi (McGregor 1990: 77), non-root morphemes are all consonant-initial and vowel-final, unlike roots (particularly lexical verb roots), which can often be consonant-final. It is not uncommon to find bound morphemes beginning in clusters in Australian languages, e.g. Warlpiri (Nash 1986), Warumungu (Simpson 1998), Yankunytjatjara (Goddard 1986), and suffixes with initial clusters are reconstructed for proto-Australian in Dixon (1980). None of these languages allows cluster-initial roots. Roots beginning in clusters are untypical even in prefixing languages, and only found with any degree of frequency in the phonologically aberrant languages of Cape York.

It is relatively common to find phonologically or phonotactically aberrant forms in certain parts of the lexicon. One notable class of exceptions to phonological generalisations is ideophones. For example in Yir Yoront (Alpher 1994, 2001), ideophones (which comprise 4% of the lexicon) admit non-speech sounds such as bilabial trills, and have radically different phonotactics to the ordinary (non-ideophonic) language, favouring stops word-initially and finally. In Ngalakgan, Merlan (1983) reports two words which begin in contrastive apico-alveolars, although all other apical-initial words in Ngalakgan alternate between alveolar and retroflex pronunciations depending on context. Notably, both exceptions are interjections. While onset clusters are very rare in Australian languages, it is not uncommon to find a small number of words in the lexicon which allow them, e.g. McGregor (1990: 71) reports three words of this kind in Gooniyandi, similarly Bundjalung (Crowley 1978). Onset clusters are however found as an areal feature in some languages of South Australia and Victoria (e.g. Yaraldi: MacDonald 1977), as well as NPN languages of the northwest (e.g. Worrorra: Clendon 2000, Bardi: Bowern 2004) and the phonotactically aberrant languages of Cape York (see papers in Sutton 1976). The classic case of phonetic, phonemic and phonotactic aberrancy is Damin, the artificial initiation language of Mornington Island (Hale 1973), which is unique in using all five phonation (phonetic initiation) types.

4 Prosodic words and syntactic words

Word structures in Australian languages are remarkable mainly for their uniformity and consistency. The vast majority of Australian languages minimally allow a set of suffixes to be attached to stems, and such attachment typically involves very little adjustment of the segments involved in the stem or the suffix. In addition, the word thus formed usually has a fully predictable meaning and grammatical function. We

can therefore describe Australian languages as classically "agglutinating", having characteristic "lego-like" word structures. Over seven eighths of the continent, only suffixes and enclitics are found, on the whole. In the remaining eighth (the area north from around Broome 4/5ths up the West Australian coast, and across to Borroloola in the western Gulf of Carpentaria), which includes the NPN languages, we find not only suffixes and clitics, but also pre-stem material of various kinds: variously labelled as "prefixes", "proclitics", and "incorporated", "compound" or "prepound" elements. I discuss the problem of morpheme classification (or ontology) in § 7.

In many NPN languages, some of these bound morphological entities have many word-like properties, apart from their general consistency of form and meaning. Firstly, as discussed in § 6, the characteristic metrical pattern of Australian languages is such that each morpheme constitutes its own metrical domain, a pattern which cannot easily be captured by the standard "cyclical" view of morphology, nor by the approaches that followed in Optimality Theory (Poser 1989; Baker 2008). Secondly, the edges of morphemes in Northern languages are characteristically associated with laryngeal effects—glottal stop and fortis stops—suggesting an origin for these segments as boundary signal gestures (Harvey 1991; Baker 2008: Ch 6). Finally, as is characteristic of polysynthetic languages generally, the words of NPN languages can have many of the semantic properties of phrases and clauses (see e.g. Baker 2008: Ch 7, Baker and Nordlinger 2008). This raises the issue of whether and to what extent the words of such languages are "phrase-like", and in turn, what it is that is stored in speakers' memories as lexical entries in these languages. It also raises the more general issue of the degree of correlation between what we might call "syntactic" words with words of other kinds: "prosodic" or "phonological".

A striking case is found in Arrernte, where Henderson (2002: 108) reports that it is possible to interrupt inflected verbs with parentheticals:[9]

(3) arəɳə **akwələ** l̪+eme
place **suppo** REFL+PRES
'supposedly sit down'
(Eastern/Central Arrernte: Henderson 2002: 108)

9 I have used Leipzig glossing standards throughout. Non-obvious abbreviations include the use of 1 for 1st EXCLUSIVE vs 12 for 1st INCLUSIVE person; CIRC circumstantive; FOC focus; IMM immediate; NP nonpast; PP past punctual; RPAST remote past. Note that I have represented linguistic forms throughout using standard IPA, rather than the orthographies of the source (which vary significantly). Voiceless symbols represent (single) stops, although voicing may be variable depending on language and position in word and utterance. For those languages with a stop contrast variously labelled 'fortis/lenis', 'long/short', 'geminate/singleton' I have represented the fortis/long/geminate series with double symbols (see Baker 2008 for discussion). The exception to this is Daly languages such as Ngan'gityemerri and Murrinh-patha, where voiceless and voiced symbols have something like their standard uses (see e.g. Reid 1990/2011 for discussion).

Henderson suggests that this might be taken as evidence that the inflected verb constitutes two grammatical words, rather than a single word. But if this is the case, then one of these words is lacking a root, consisting just of bound elements realising grammatical categories of the verb.

A similar mismatch between syntactic and prosodic words can be found in the "excorporation" construction of Ngalakgan (Baker and Harvey 2003: 14), where otherwise bound verb roots, as in (4a), can optionally appear externally to the rest of the verb word, as in (4b), leaving behind a word consisting just of inflectional prefixes and an inflected (but meaningless) erstwhile verb root /mi-/, which cannot otherwise appear independently; a similar phenomenon occurs in the related languages Dalabon (Evans et al. 2008: 97) and Rembarrnga (McKay 1975: 165).

(4) a. puru-worowk-miɲ
3pl-gallop-AUX.PP
'They galloped'

b. worowk puru-miɲ
gallop 3pl-AUX.PP
'They galloped'
(Ngalakgan: Baker and Harvey 2003: 14)

As in Arrernte, the string left behind by this process is not otherwise a syntactically independent constituent. In both cases, there is evidently some kind of (prosodic? morphological?) dependency involved, but it is unclear how we might describe the construction in morpho-syntactic terms. Even if we recognise /mi/ as a root, it does not seem appropriate, for instance, to call this "compounding" because of the inflectional material between the two roots. Constructions analogous to (4b) comprise the majority of inflected verb forms in a large range of Australian languages from the north central and northwestern area, from both PN and NPN families (e.g. Warlpiri, Jaminjung, Marra, Gurindji, Bardi, Gooniyandi, to name a handful; see Amberber, Baker and Harvey 2007 for general discussion of the properties of this construction).

Often in this kind of construction—which I call the "coverb construction" here, following Amberber, Baker and Harvey (2007)—there can be special phonological rules applicable to the boundary between the first element, the coverb, and the second element, the inflected finite verb. For instance, in Marra, final velar nasals in coverbs denasalise to stops when followed by an inflected verb beginning in a nasal:

(5) ɻaŋ=ŋa-ɲi → ɻak=ŋa-ɲi
hit-1sg-AUX.PP 'I hit him'
(Marra: Heath 1981: 43)

This rule does not apply to other morphological boundaries, such as that between a noun and a case suffix. In Warlpiri, word minimality (see § 5, below) applies differently to coverbs (called "preverbs" in the Warlpiri literature) than to any other word classes in the language (Nash 1986). As in many other languages (e.g. Bunuba: Rumsey 2000), preverbs are the only word class in which words can end in a consonant (e.g. /kaŋiŋ/ 'misperceiving', /paar/ 'into flight'); all other words of Warlpiri must be vowel-final (Nash 1982: 175). Notably, in this form preverbs must be immediately followed by an inflected finite verb root, in a structure morphologically similar to the Marra construction in (5). In other contexts—as adverbs, or preceding an auxiliary—such preverbs must take the epenthetic syllable /pa/.

In a very interesting study, Evans et al. (2008) show how speakers of the GN language Dalabon can deliberately pause within complex words, so long as certain (prosodic and morphological) criteria are met.[10]

(6) a. kaʔ-. . . ɻak-. . . mijan
3sg/3sg- wood- get.FUT
'He will get firewood.'

b. ceʔ-. . . cark-. . . niŋijan
12- together- sit.FUT
'We will sit together.'
(Dalabon: Evans et al. 2008: 103)

Facts like those discussed in Evans et al. (2008) suggest that (some of) the internal structure of words is accessible to the consciousness of speakers. To my knowledge, the significance of examples such as these to morphological theory more generally has not been fully investigated.

5 The Minimal Word in Australian languages

Many Australian languages impose word minimality requirements: requirements that enforce a minimum length on words (Dixon 1980: 127). In all cases these conform to the generalisations for such constraints proposed by McCarthy and Prince (1986), that words be minimally binary at either the moraic or syllabic level. As a rough characterisation, Northern (NPN plus Yolngu) languages impose binarity at the moraic

10 I have simplified the glosses and translations in these examples, abstracting away from some details of the morphological analysis provided in Evans et al. (2008), which are not relevant to the point being made here.

level, while Pama-Nyungan languages tend to impose it at the syllabic level. There are, however, many PN languages which allow monosyllabic roots just if they are bimoraic (long) at the surface.

For example, in many Northern languages, monosyllabic roots are permitted in the lexicon, as in the Ngalakgan words illustrated in (7) and (8) below. Monosyllabic, open, roots must have long vowels at the surface, as in (7). Long vowels in Ngalakgan are in fact only found in this environment: in the realisation of roots with an underlying /CV/ form. Therefore, Baker (2008: 78) argues, vowel length is completely predictable in Ngalakgan, and need not be a feature of lexical entries.

(7) a. /ke/ [gee] *[ge] 'man's child'
b. /ce/ [ɟee] *[ɟe] 'nose'
(Ngalakgan: Baker 2008: 78)

This long vowel realization reflects the universal requirement that lexical words are minimally bimoraic (Selkirk, 1984: 343).[11] By contrast, monosyllabic CVC words with an oral coda consonant have a short vowel in their usual phonetic realization.

(8) a. /pot/ [bot] *[boot] 'fly'
b. /ɻok/ [ɻok] *[ɻook] 'pandanus'
(Ngalakgan: Baker 2008: 77)

We can therefore assume that oral codas are moraic in CVC words, and that the bimoraic minimum requirement is thereby satisfied. Bundjalung (Crowley 1978) is like Ngalakgan in allowing monosyllabic CVC roots, but here vowel length is contrastive.

In Warray (Harvey and Borowsky 1999), the facts are similar, except that CVC roots like those in (8) are also required to have long vowels at the surface (unlike Ngalakgan). Furthermore, as shown by Harvey and Borowsky (1999: 96), these roots must maintain their bimoraic status even after suffixation:

(9) a. [buːmlɪk]
/pum-lik/
ant.sp-LOC 'on the ant'

b. [gɛːlɪk]
/ke-lik/
paperbark-LOC 'on the paperbark'
(Warray: Harvey and Borowsky 1999: 96)

11 'Universal' in the Optimality Theory sense, whereby constraints can be observably true of a large number of languages, but nevertheless violated in some languages by higher-ranked constraints.

Harvey and Borowsky (1999) argue that the long vowel is required here because the root must be realised as a Prosodic Word in every context (i.e. regardless of affixation). Even in languages where monosyllabic words are permitted however, they tend to form a small minority of the lexicon. Crowley (1978) provides a figure of 5.3% for Bundalung, for instance, from a lexicon of around 900 roots. The figure in NPN languages is slightly higher, but not by much. Ngalakgan and some other Gunwinyguan languages are unusual in having a large proportion of monosyllabic roots; in Ngalakgan, monosyllabic words constitute around 17% of the lexicon.[12] Australian languages tend to have a preponderance of roots which are two or three syllables long. Roots longer than four syllables are rare (rarer than monosyllables, in many languages).

In a number of languages we observe phonological processes aimed at attaining the word minimum, either by expanding or, less often, contracting the underlying form. Monosyllabic roots loaned from English, such as *whip* are typically subject to vowel lengthening, and/or epenthesis, as in (10) (McManus 2008: 2). Here, the English loans are augmented with the meaningless syllable /pa/ commonly used to attain vowel-finality as well as minimum word-hood in a number of Australian languages.[13]

(10) a. ki:t-pa (< English 'gate')
b. ni:l-pa (< English 'nail')
(Martu Wangka: McManus 2008: 47)

In Nhanda, we similarly find not only lengthening but also final epenthesis, in order to avoid final illicit codas:

(11) a. wiipu< 'whip'
b. kaanu < 'gun'
(Nhanda: Blevins 2001b: 35)

Blevins notes that word-minimality alone would predict examples such as **kanu*, **wipu* which would serve to satisfy both constraints. Apparently epenthetic syllables do not "count" for the purposes of satisfying the word minimum.

Many PN in particular require words to be not just bimoraic, but disyllabic e.g. Nyawaygi (Dixon 1983; and see below).

The complex facts of Tangkic languages are discussed by Hale (1973), Evans (1995b), and Round (2009, 2011b and references therein). In these languages, there is a bimoraic minimum, which interacts with a general apocope constraint such that

12 If the lexicon is analysed into roots the figure is around 30%, although around half of these roots will occur only in morphologically complex forms (compounds and reduplications).

13 See McManus (2008) for a discussion of loanword adaptation in Australian languages generally.

the latter never over-rides the former (Wilkinson 1986; McCarthy and Prince 1986). This famous example of a phonological "conspiracy" was one of those that led to the development of Optimality Theory (and was a central example in the foundation work, Prince and Smolensky 1993; see Ch 7). The following examples (from Round 2011b: 331, following Hale 1973: 427, 438) illustrate Hale's "Augmentation" rule: which requires that roots which are underlyingly monomoraic be realised in bimoraic form at the surface. Unlike Warray, Lardil achieves this prosodic word minimum via epenthesis of a final syllable.

(12)	UR	Surface			UR	Surface		
	a.	/t̪er/	t̪era	'thigh'	f.	/jak/	jaka	'fish'
	b.	/ɻil/	ɻilta	'neck'	g.	/ɻelk/	ɻelka	'head'
	c.	/maɻ/	maɻt̪a	'hand'	h.	/t̪urk/	t̪urka	'black'
	d.	/wun/	wunta	'rain'	i.	/kaŋ/	kaŋka	'speech'
	e.	/kaɳ/	kaɳt̪a	'grass'	j.	/ɻu/	ɻuwa	'fat'

(Lardil: Round 2011b: 331)

Words in Lardil are also subject to Hale's (1973: 424) rule of "Apocope", which deletes final vowels:

(13)	UR	Surface	
	a.	/kaŋkaɻi/	kaŋkaɻ 'father's father'
	b.	/jalulu/	jalul 'fire'
	c.	/majara/	majar 'rainbow'
	d.	/wiṯewiṯe/	wiṯewiṯ 'open sea'
	e.	/ŋuku-ɻu/	ŋukuɻ 'water-FUT'
	f.	/ŋuku-weri/	ŋukuwer 'water-PRIV'

(Lardil: Round 2011b: 332)

Notably, Apocope does not apply to forms, such as those in (12), that would otherwise fail to meet the bimoraic minimum. It was facts such as these that led to the general realisation in the late 80s and early 90s that surface constraints on phonological representations were desirable, as a way of accounting for such "conspiracies" (Kisseberth 1970); see McCarthy and Prince (1995a: 322), Prince and Smolensky (1993/2004) for further discussion.

I know of no languages which have been reported specifically to fail to meet these word minima. However, some languages, such as Maranunggu (Tryon 1970), Marrithiyel (Green 1989), and Ngan'gi-tyemerri (Reid 1990), all from the Daly River area of the Northern Territory, appear to allow CV words.[14]

14 It is unclear from these descriptions whether vowels are long in these forms.

Characteristically, bound morphemes in Australian languages fail to meet word minima. This is true regardless of their productivity in the lexicon (as discussed in§ 6, which follows). In Martuthunira (Dench 1994: 37), for instance, "all lexical roots ... are at least dimoric. Dimoric roots may be monosyllabic, in which case they involve a long vowel, or disyllabic involving two short syllables". Bound morphemes, such as the 'effector' (ergative) and locative suffixes *-ŋku ~ -lu*, *-ŋka ~ -la*, may be monosyllabic, but do not involve long vowels. No Australian languages, to my knowledge, require bound morphemes to meet a bimoraic minimum. As discussed in§ 3, bound morphemes also commonly display distinct phonotactics from roots, allowing initial clusters, or restricting the availability of place and manner contrasts.

Martuthunira is also typical in having suffix allomorphy determined by the distinction between words which are "minimal" in this sense, versus those which are bigger. Words which are bimoraic (as defined above) take one set of allomorphs (-ŋku EFF, -ŋka LOC), shown on the left in (14) and words which are bigger take a distinct set (-lu EFF, -la LOC), as shown on the right.

(14)

ŋuu-ŋka	kaaɻa-la
face-LOC	hip bone-LOC
n̪aɳu-ŋka	malaɳu-la
sand-LOC	shade-LOC
muji-ŋku	mujiɻa-lu
dog-EFF	dingo-EFF
l̪aɳʈa-ŋku	miɳʈiɻimaʈa-lu
euro-EFF	goanna-EFF

(Martuthunira: Dench 1994: 38)

Many Pama-Nyungan languages, in particular, have similar systems of allomorphy determined by word size. The inflectional and derivational morphology of verbs in Yankunytjatjara (Goddard 1986: 181) is determined by whether verb stems have an even or odd number of morae. See § 10 for discussion of more complicated cases of allomorphy determined by word size or prosody.

While the bimoraic word minimum is typical of Australian languages, it does not always correspond to the ordinary metrical foot in Australian languages (see Garrett 1999 for elaboration of this point more generally). As discussed below, the vast majority of Australian languages show evidence only for a disyllabic trochee in metrical structure. Martuthunira is an example of this widespread pattern. If the word minimum is enforced by a correspondence between lexical roots and constituents of the Prosodic Hierarchy (as assumed by many phonologists, e.g. McCarthy and Prince 1986), then there is a mismatch between the constituent "metrical foot" as

determined by word minimality requirements on lexical roots, where this is a long CV syllable, compared to metrical foot structure in stress patterns, which is characteristically disyllabic, as discussed below.

6 Word prosody

The prosodic structure of Australian languages is currently an area in need of much greater empirical research, particularly in complex word structures. The phonetic realisation of stress, including the interaction between metrical structure and intonation, is described in Ch 3. Here, I limit my discussion to phonological discussions based primarily (in most cases) on auditory impressions.

It is almost universally the case that Australian languages have "fixed", predictable (i.e. not contrastive) stress patterns.[15] The majority of Australian languages have primary stress on the first syllable of the word or, if the beginning of the word and the stem are not contiguous, on the first syllable of the stem. A very common pattern is that illustrated by Nhanda, for which Blevins (2001b: 24) gives the following rules (and compare e.g. Dench 1981: 18 and Donaldson 1980: 42 for almost identical rules in Banyjima and Ngiyampaa, respectively):

> In monomorphemic forms, main stress is on the initial syllable, with secondary stress on following odd-numbered syllables, though never on the final syllable, unless the final syllable is closed or contains a long vowel. The alternating strong-weak pattern within the morpheme is broken up by long vowels, which bear secondary stress in non-initial position.

These rules are exemplified by the following monomorphemic words:[16]

(15)	míŋa	'ant'
	píʔi	'uncle'
	jítka	'coals'
	ŋúutu	'horse'
	úɖàa	'directly, soon'
	úudùu	'grass'
	ábaɭa	'child'
	kúʔaɭu	'good'
	ŋúutiju	'pregnant'
	índaɟi	'ribs'

15 The only well-described exception to this statement that I know of is Ndjébbana (McKay 2000).
16 Here and throughout I depart from standard IPA practice in using the acute accent to indicate primary stress, and the grave accent to indicate secondary (or lower levels of) stress.

kúl̪ìipu	‘bullock’
índàacu	‘big’
kánbàagu	‘little devil’
júgaŋga	‘yesterday’
ŋútulùŋ	‘kangaroo sausage’
káɖagàli	‘crooked, bent’
máŋiwìdi	‘red’
Múnimàja	[placename]
ṯ̪úmbil̪ìdi	‘stubborn’

(Nhanda: Blevins 2001b:24)[17]

As in Nhanda, many languages are described as having weaker stresses on alternating syllables after the first, with the common exception that the final syllable may not be stressed.[18] This has been interpreted as evidence for trochaic metrical structure, that is, left-headed disyllabic feet (see e.g. Nash 1986). Some authors (e.g. Blake 1979, on Kalkatungu) dispute the phonological reality of these secondary stresses, and regard only the initial stress as the result of phonological rules.

In the vast majority of languages for which we have descriptions, the morphological structure of words directly determines the distribution of stressed syllables. Based on fieldwork in the late 50s and early 60s, Ken Hale showed (1977) that the metrical pattern of Warlpiri was correlated with its morphological structure, in a famous minimal pair, shown in (16):[19]

(16) a. jápal̪a-ŋùl̪u ‘father’s mother-ELATIVE’
b. jápa-l̪àŋu-l̪u ‘person-also/even-ERGATIVE’
(Warlpiri: Hale 1977)

17 While having a typical Australian stress pattern, Nhanda is atypical in other ways, in having phonemic glottal stop, a stop voicing contrast, and historical loss of word-initial consonants.

18 Final stress, as in Nhanda, is relatively unusual among Australian languages. Blevins (2001b: 27) notes that final stress on closed syllables is limited to two examples in the corpus: /ŋútulùŋ/ ‘kangaroo sausage’, shown here, and a placename. Since, apart from placenames, final consonants are otherwise ‘extremely rare’ in Nhanda (Blevins 2001b:23), she suggests that the first probably derives from historical final vowel deletion.

19 As far as I can tell this is the earliest clear statement of the morphological principle governing stress distribution in Australian languages. Thanks to David Nash for tracking down and supplying Hale’s original typescript. There are two call-outs to footnotes in this paragraph (marked ‘[FN]’ on the original), but the footnotes themselves have not been preserved with the manuscript. One wonders about the contents of the footnote to paragraph (i), in particular, since the suggestion contained here, that stress patterns may be stored in lexical representations, goes against the standard generative view of the lexicon as ‘simply a collection of the lawless’ (DiSciullo and Williams 1987: 4).

Hale provides the following generalisations to account for this pattern (1977: 15–16):

> It is clear that the morphological make-up of words (indicated above by hyphenation) plays a role in determining the stress patterns which they exibit [sic]/ The correct stressing can be assigned by means of the following three principles:
> (i) Lexical stress:
> Di- and poly-syllabic morphemes are stressed on each non-final odd-numbered syllable, counting from the left. This stressing may, in fact, be associated with such morphemes as part of their underlying, or lexical, representations.[FN]
> (ii) Penultimate stress:
> At the word level, stress the penultimate of any sequence of three or more as yet unstressed syllables.[FN]
> (iii) Stress subordination:
> Within a word, initial stress is primary; all others are secondary.
> The first principle alone accounts for the difference in stressing between /yaparla-ngurlu/ [yáparlangùrlu] and the segmentally identical /yapa-rlangu-rlu/ [yáparlàngurlu].

Since Hale's fieldwork in the 50s and 60s, descriptions appeared of a number of Australian languages where essentially the same generalisation about the correlation between morphological structure and metrical structure was applicable e.g. Dyirbal (Dixon 1972: 274), Ngiyampaa (Donaldson 1980: 42); Diyari (Austin 1981: 31), Yankunytjatjara (Goddard 1986: 27), Martuthunira (Dench 1994: 43), Kayardild (Evans 1995b), Eastern Arrernte (Henderson 1998: 211), Nhanda (Blevins 2001b: 24–28); and for Warlpiri, (Nash 1986: 100), to name just a handful. This generalisation has stood the test of time, although to date we have few thorough descriptions of the metrical structure of Australian languages. We have even fewer for prefixing languages, which tend to have more complex word structures. The extensive descriptions that we do have however confirm that the generalisation is also true for them in its most important respects e.g. Ngan'gi-tyemerri (Reid 1990:89), Ngalakgan (Baker 1999, 2008), Jingulu (Pensalfini 2000, 2003), Limilngan (Harvey 2001), Bininj Gun-wok (Evans 2003).[20]

20 A recent publication by Goedemans (2010) purports to be a survey of stress patterns in Australian languages, but should be used with caution. Many of the sources are outdated by more recent work (for example, Hoddinott and Kofod's 1988 sketch description of Ngan'gikurunggurr is cited, rather than the extensive description of Reid 1990/2011), and much relevant recent work, e.g. Baker 1999/2008, even, remarkably, classic works such as Nash 1986 and Austin 1981, is unreported. It also has errors and claims which lack an evidentiary basis. Limilngan (along with many other NPN languages), for instance, is claimed to be a language with penultimate stress (Goedemans 2010: 65). This is a misrepresentation of the reported facts in Limilngan. Harvey (2001:32) clearly states that "The majority of trisyllabic uninflected words also [i.e., like words of other syllable lengths: BB] bear stess on their first syllable. Trisyllables WITH A HEAVY SECOND SYLLABLE ARE LIKELY TO SHOW PENULTIMATE STRESS" [emphasis mine]. The Limilngan stress pattern thus reported is therefore essentially identical to Ngalakgan (Baker 2008), contra Goedemans (2010).

Characteristically in prefixing NPN languages, the metrical domain is preferentially associated with the root, often leaving strings of prefixes unstressed, regardless of the size of the verb stem:

(17) a. ŋuruɳ-**ɻú**
12plO-burn.PR
'we're getting burnt'

b. ŋuruɳ-mu-**ɳé**
12plO-VEG-burn.PR
'It [sc. 'sun', VEG] burns us.'

c. ŋuruɳ-pu-pak-**pólk+pu+n**/
12plO-3pl-APPL-noise+HIT+PR
'they are making noise on us' (i.e. 'talking over the top of us')

d. jiriɳ-pi-pak-**wóc+ma**
1plO-3pl-APPL-steal+GET.PR
'they always steal from us
(Ngalakgan: Baker 2008: 169)

Languages vary in this regard however. In neighbouring, closely related Rembarrnga (McKay 1975), examples analogous to those in (17) take initial stress. In Ngan'gityemerri, we find that noun class markers can be internal or external to the metrical domain, leading Reid (1990) to classify the former as "prefixes" and the latter as "proclitics" (in triangulation with other morphological and phonological criteria).

Work initiated by Baker (1999) demonstrated that not all morphological relations are relevant to metrical structure, however. The contrast in example (18a-b) shows that inflectional suffixes on verbs do not constitute metrical domains, despite being polysyllabic in this case, unlike the bound dative pronominal clitic in (b). Examples (18b) and (19b) show that in Ngalakgan, as in Warray (discussed in the previous section), monosyllabic open (CV) roots must have a long vowel, regardless of affixation, suggesting that roots must always constitute Prosodic Words on their own. The (a) examples show that this requirement does not hold of verb roots: these do not undergo vowel lengthening when affixed.

(18) a. [ɟáŋana]
/ca+ŋana/
stand+FUT
'will stand'

b. [gèːŋíni]
/ke=ŋini/
son=1sgDAT
'my son'

(19) a. [bṓni] b. [bó:wi]
/pu+ni/ /po-wi/
hit+IRR river-LAT
'might hit' 'along the river'
(Ngalakgan: Baker 2008:103)

Patterns such as these led Baker (1999) to argue that there were essentially two kinds of morphological relations in complex words: those which can affect metrical structure, and those which cannot. The former correlate with open, productive morphological constituents (such as case suffixes and inflectional prefixes), which I call "word-level" (following Selkirk 1980; Borowsky 1990), the latter with closed, unproductive morphology such as that found in tense inflection and frozen compounds and reduplications, which I call "root-level". Baker and Harvey (2003) show that the distinction is relevant also to other Australian languages, such as Warlpiri.

In most Australian languages, case suffixes which are polysyllabic form their own domain for metrical structure, as we have seen. By contrast, the inflection of verbs for tense-aspect-mood categories in most Australian languages involves root-level relations: verbs fall into a number of conjugations with largely unpredictable morphological realisations of these categories (the Arandic languages, see e.g. Henderson 1998, 2002, are a notable exception). In most Australian languages, as in Ngalakgan, tense suffixes do not form a domain for metrical structure. Notably, in the small number of Australian languages where tense suffixation is productive in the same way as case suffixes (applying uniformly to any word of category "V"), as in Arrernte and Ngan'gityemerri, then these suffixes CAN constitute domains for stress (see e.g. Henderson 1998, Reid 1990/2011). The behaviour of word-level morphemes as phonological domains, for various phenomena, is a widespread and endemic characteristic of Australian languages, although it is difficult to account for in standard models of the morphology-phonology interface, because the domains so-formed are adjacent, not nested (Poser 1989; Baker 2005).

6.1 Apparent exceptions to morphologically-governed stress

Some widely-cited examples of stress in Australian languages appear to either violate the principle of morphologically-determined metrical structure or are described without reference to it. These descriptions all appear to predate the general acceptance of such a principle following the work of Hale, and are based on very minimal exemplification. Examples like these are the stress patterns described for Pintupi (Hansen and Hansen 1969), Maranunggu (Tryon 1970), and Garrwa (Furby 1974). In all three descriptions, words are presented without morphemic analysis. In the Garrwa description by Furby, we are presented with the following (1974:10).

> In Garawa primary stress ... is always on the first syllable of the phonological word ... Secondary stress ... occurs on the penultimate syllable of words with four or more syllables ... In words of six or more syllables tertiary stress occurs on every second syllable preceding the secondary stress but never on the second syllable.

Furby provides the following to exemplify this generalisation.[21]

(20) a.	jámi	'eye'
b.	púŋala	'white'
c.	wácimpàŋu	'armpit'
d.	kámalarìŋi	'wrist'
e.	jákalàkalàmpa	'loose'
f.	ŋánkirikìrimpàji	'fought with boomerangs'
g.	ŋámpalàŋinmùkuŋìna	'at our many'
h.	náriŋinmùkuŋìnamìra	'at your own many'
i.	nímpalàŋinmùkunàŋimìra	'from your own two'

(Garrwa: Furby 1974: 10)

Based on this description, Garawa is presented as a paradigm example of a particular stress type by Hayes (1995), and many others. In this case, the metrical structure is captured by a word-initial assignment of primary stress, combined with trochaic feet built from right to left, with the secondary assigned to the head of the rightmost foot.

The danger of examples like this (and similarly with others discussed below), is that it suggests that morphological complexity in words is irrelevant to the distribution of metrical structure, in contrast to the existing analyses of Australian languages which suggest in every case that metrical structure is crucial to stress assignment.

What I suggest in this case is that, while the stress patterns reported here by Furby are in all probability accurate, that the associated generalisation misrepresents the real nature of metrical structure in the language. While example (d) above, suggests that there is a secondary penultimate stress preference, the question is whether this can over-ride the morphological structure of words. The lack of morphological analysis in the original document makes this difficult to determine.

The structure of Furby's morphologically-complex examples is as follows:[22]

21 I have changed the orthography to use the standard IPA symbols, as with other examples in this chapter. Furby represents three levels of stress, with all stressed syllables apart from the initial and penultimate represented as tertiary stressed. I have eliminated this difference in the example since it is not relevant to the point made here.

22 Thanks to Ilana Mushin, the author of a recently published grammar of the language (Mushin 2012), for help with these examples. She notes that these examples are highly unusual, and she herself has never encountered them in many years of primary fieldwork with native speakers. Furthermore there are some oddities with the morphology and/or translations of some of the examples.

(21) a. ŋampala-ŋi-nmuku-ɲina
12pl-DAT-PL-LOC

b. ŋankirikirimpa=ji
fight with b.=PAST

c. nari-ŋi-nmuku-ɲina-mira
you(pl)-DAT-PL-LOC-INTENS

d. nimbala-ŋi-nmuku-naɲi-mira
2du-DAT-PL-ABL-INTENS

What is notable about these examples is that, once we see the morphological analysis, it is clear that the stress pattern is exactly as we would predict: with a secondary stress on the first syllable of every polysyllabic morpheme. This rule accounts for most of the stressed syllables, as shown in (22). The syllables indicated with underlining are those which in many Australian languages would be subject to a common "repair" strategy which assigns metrical prominence to the second in a string of three unstressed syllables (Hale's "penultimate stress" rule, cited above). The only form which deserves extra comment is the form in (b). Ilana Mushin has not encountered the verb in this form, but only in the form /ŋankirrimpa/ (same meaning), which would appear to be the basis for the form in (b), apparently a reduplicated form. If this is the case, it is very common to find that reduplicated strings in Australian languages (even where frozen) attract metrical prominence as if they were morphologically complex. This principle would lead to metrical prominence on the underlined *i* in the antepenultimate syllable of the stem. Stress on this syllable would in turn entail stress on the final syllable of the stem, as indicated.

(22) a. ŋámpala-ŋi-nmùku-ɲìna
12pl-DAT-PL-LOC

b. ŋánkiriki-rimpa=ji
fight with p.=PAST

c. nári-ŋi-nmùku-ɲìna-mìra
you(pl)-DAT-PL-LOC-INTENS

d. nímpala-ŋi-nmùku-nàɲi-mìra
2du-DAT-PL-ABL-INTENS

In order to test whether penultimate stress is truly the relevant generalisation, regardless of morphological structure (as implied by the Furby description), we would need

to look at a word that ended in a disyllabic suffix followed by a monosyllabic one. Furby's generalisation (and the commonly accepted view) would be that the penultimate syllable would be stressed regardless of morphology, as shown in (23a). This is not in fact what we find. In (23b) (Ilana Mushin p.c.), we find that stress follows the regular Australian pattern, of being regularly associated to the initial syllables of polsyllabic morphemes.[23]

(23) a. *wáwara-mukù-ɲi
child-PL-DAT
b. wáwara-mùku-ɲi

The description of Pintupi presents similar difficulties. As with the Garrwa material, the generalisation is based on a handful of examples, including apparently complex words (but with no morphological analysis). The stress patterns provided by Hansen and Hansen (1969) do not accord with the descriptions of other dialects of the Western Desert language (of which Pintupi is a named variety), as found, for example in Yankunytjatjara (Goddard 1986: 27).[24] The description of Yankunytjatjara stress in Goddard is essentially identical to that of Warlpiri as in Nash (1986), where, as we would expect, the initial syllable of each polysyllabic morpheme in a word is associated with metrical prominence. The description of Maranunggu (Tryon 1970), the evidentiary basis for a claim that this language has a trochaic stress system which allows final syllable stress (as opposed to the majority of Australian languages), is based on a mere four examples.

The nature of metrical structure in Australian languages, and its relationship with word structure, is an area deserving of much more detailed investigation than has hitherto been available. While I have not addressed the interesting issue of text-to-tune alignment in song language here (which has received even less attention), it is notable that in many cases it appears that musical (rhythmic, i.e. isochronous) beats do not correspond with prominent syllables in speech (see e.g. Turpin 2008).

6.2 Second syllable stress and "initial dropping"

Apart from the characteristic patterns discussed here, there are some other stress patterns to be found in Australian languages which are less common, but which appear to recur throughout the continent. This is the tendency for second syllable stress, broadly construed. Second syllable stress is a marginal stress type amongst the world's languages (Hayes 1995: 73), but among Australian languages it is found

23 Confirmed also by Gavan Breen (p.c. 24th July 2002).

24 Ken Hansen (14th June 2001) stands by his description of stress in Pintupi, and claims that Pintupi (at least when he worked with speakers) is not like other varieties of Western Desert in this respect.

in several regions, and is associated with dramatic phonological changes, originally documented for Cape York languages in Hale (1964). The Arandic group of languages is synchronically best-described with this kind of stress pattern. In general, words beginning in consonants take primary stress on the initial syllable, while those beginning in vowels take primary stress on the second syllable (at least optionally). The best way to analyse this pattern is the subject of some debate. Henderson (1998: 209) favours an iambic analysis (while noting that this is not without problems), relying on an abstract analysis of all words being underlyingly vowel-initial and exhaustively syllabifiable into VC syllables (following earlier proposals by Breen 1990, and Breen and Pensalfini 1999, cf. also Yallop 1977 for an early move in this direction; see Ch 3 for further discussion). Example (24) shows surface vowel-initial forms, in Arandic orthography, underlying phonemic (and syllabic) analysis, and surface pronunciation(s). Example (25) shows surface consonant-initial forms, with their abstract underlying VC analysis.

(24)	a.	ampe 'child'	/amp/	[ɐ́mbɐ] ~ [ɐmbɐ́]
	b.	ampere 'knee'	/amp.áɻ/	[ɐmbáɻə]
	c.	amperneme 'burn+PRES'	/amp.áɳ.əm/	[ɐmbáɳəmɐ]
	d.	arrernelheme 'put+REFL+PRES'	/ar.áɳ.əl̪.ə̀m/	[ɐrə́ɳəl̪ə̀mɐ]
(25)	a.	the '1sg:ERG'	/əṯ/	[ṯə́]
	b.	theme 'poke+PRES'	/əṯ.ə́m/	[ṯə́mɐ]
	c.	theleme 'pour+PRES'	/əṯ.ə́l.əm/	[ṯə́ləmɐ]
	d.	thelelheme 'pour+REFL+PRES'	/əṯ.ə́l.əl̪.ə̀m/	[ṯə́ləl̪ə̀mɐ]
		(Eastern Arrernte: Henderson 1998: 210)		

The second-syllable stress pattern is strongly associated with the loss of initial consonants in several groups of Australian languages.[25] Initial consonant loss is reconstructed in the history of the Arandic subgroup by Koch (1997). The first extensive demonstration of this relationship was Hale (1964), who argued that initial consonant (or syllable) loss in the Northern Paman group was associated with second syllable stress in those languages, along with a number of other phonological changes (see examples 108–109). Similarly, Dixon (1970) showed that initial-dropping and stress shift were both present in the Mbabaram language of the Cairns rainforest. Crowley (1976) demonstrates that the Nganyaywana language of the New England highlands can be related to the neighbouring languages through initial consonant and syllable

25 Capell (1956: 100) is apparently responsible for relating Arandic languages to their neighbours through historical initial consonant and syllable loss, and for making the connection between this process and the second syllable stress preference.

loss.[26] Blevins and Marmion (1994) discuss initial dropping in the West Australian language Nhanda, proposing pragmatic, articulatory and perceptual mechanisms which can account for this recurring tendency in Australian languages; they argue that second syllable stress is not a factor (Nhanda has word-initial stress, as we have seen). For a general discussion of initial consonant loss in Australian languages, see Blevins (2001a). See (108) for some examples of historical initial syllable loss in Northern Paman.

6.3 Quantity

While quantity is a common parameter of metrical systems cross-linguistically, it appears to play little role in the metrical structures of most Australian languages, at least, according to the descriptions available. However, it is relatively common for the position of long vowels to be restricted to initial syllables, as in Djambarrpuyngu and other Yolngu varieties: Wilkinson (1991); Morphy (1983); Heath (1980a); also Warlpiri (Nash 1986), Umpila (Harris and O'Grady 1976: 166), Yankunytjatjara (Goddard 1986: 24) which is also the most typical position for primary stress in words, or else to metrically prominent syllables, as in Yidiny (Dixon 1977; Nash 1979; Hayes 1995, among others). Just a few Australian languages appear to have quantity-sensitive stress, to the extent that the location of a heavy syllable in a word can be both unpredictable and disturb the regular metrical structure. These systems have been described for Yidiny (Dixon 1977), Ngiyampaa (Donaldson 1980), Martuthunira (Dench 1981), varieties of Bundjalung (Sharpe 2005), Nhanda (Blevins 2001b), Yukulta (Ganggalida) (Keen 1983:198), and Kayardild (Evans 1995b: 79). In all these languages, it is long vowels which attract stress, closed syllables do not appear to behave in the same way. Most recently, closed syllable weight has been described for a number of Northern languages (Baker 2008) including Ngalakgan and Bininj Gun-wok (which both lack

26 Crowley (1976: 25) found the evidence from stress to be inconclusive ('The rules for stress placement are largely unknown, but the Nganyaywana forms in the Court notebooks carry stress on the first syllable—how general this rule is, is not known'. Blevins (2001a: 484) points out that just two forms are cited with stress in the Court notebooks, both 'consistent with a stress-shift analysis, since the first syllable has been lost in its entirety'. Radcliffe-Brown's original fieldnotes on Nganyaywana (1929–1930) record a number of items with stress (indicated with a raised apostrophe preceding the stressed syllable), including the following: *a'tenə* 'man' (compare Mathews 1903 'tana', from which Crowley 1976: 37 reconstructs /daŋa/), *i'lumerə* 'wallaroo', *i'lambei* 'eaglehawk', *ka'ranga'rang* [placename], *(i)m'bungə* 'spotted bandicoot', *(i)'myandə* [unidentified marsupial], *i'rongə* [section name] and finally, the language itself: "Anewan (a-'ne-wan) a tribe of New England around Armidale and Guyra. (sometimes nga-'ne-wan)". Indeed, second syllable stress appears to be entirely consistent in the language recorded by Radcliffe-Brown, except where attracted to the initial syllable by a long vowel (as in *'a:pa:ng* 'father'). The Radcliffe-Brown material on Enneewin (which includes phrases) appears to have been unused by the existing descriptions of this language.

contrastive vowel length). I discuss the Ngalakgan pattern here, since it has received less attention than the (famously labyrinthine) Yidiny problem.[27]

The facts in Ngalakgan are these. In roots containing only light syllables, we find that stress is initial, as is typical of Australian languages. This pattern is shown in (26), with trisyllabic roots.

(26) a. /pícuʈu/ 'big wind'
b. /wáʈija/ 'multiparous woman'
c. /céraʈa/ 'women's ceremony'
d. /cílara/ 'unidentified tree sp.'
e. /kámala/ 'sky'
f. /múnaŋa/ 'European'
g. /múwaʈa/ 'canoe'
h. /ŋúɭiri/ 'black duck sp.'
i. /wálama/ 'face'
(Ngalakgan: Baker 2008: 179)

However, when the medial syllable is closed, stress is penultimate, rather than initial. Thus, the medial syllable appears to be heavy for stress.

(27) a. /puʈólkoʔ/ 'brolga'
b. /miɻárppuʔ/ 'crab'
c. /luŋúrwa/ 'vine sp.'
d. /moɳócpor/ 'mud cod'
e. /waɻúrkku/ 'club'
f. /kaʈájkkaʔ/ 'stringybark tree'
g. /purúʈci/ 'water python'
i. /cipáŋma/ [personal name]
(Ngalakgan: Baker 2008: 179)

So far, these facts are unremarkable (although unusual, in the Australian context, in involving a closed syllable rather than a long vowel). What makes Ngalakgan, and other Australian languages, different from languages elsewhere in the world, is the behaviour of syllables which are followed by homorganic (monogestural) clusters. These crucially fail to make the preceding syllable heavy whether they are nasal-stop clusters (28) or geminates (29):

27 For theoretical analyses of Yidiny, see e.g. Hayes (1995, 1999) and Crowhurst and Hewitt (1995) and references cited therein. Gooniyandi (McGregor 1990) is described as having both closed syllable and long vowel quantity-for-stress, but it is unclear from the available description how general this pattern is.

(28) a. /ŋóloŋkoʔ/ *Eucalyptus camaldulensis* ('river redgum')
b. /cákanta/ 'female plains kangaroo'
c. /ŋúruɳʈuc/ 'emu'
d. /káɻaŋkàŋaŋì̀ni/ 'macropod sp.'

(29) a. /móɭoppoɭ/ 'shovelhead catfish'
b. /cápatta/ 'freshwater tortoise sp.'
c. /cáruʈʈu/ 'female agile wallaby'
d. /mánappuɲ/ 'echidna' (spiny anteater)
e. /móroʈʈinʔ/ 'wild cassava'
f. /kámakkun/ 'properly'
(Ngalakgan: Baker 2008: 180)

The Ngalakgan pattern of quantity-sensitivity for stress is also found in neighbouring languages such as Marra and Wubuy, as well as Bininj Gun-wok (Baker 2008: 181). Apart from these Australian languages, this pattern appears not to be found in other languages of the world. It is particularly problematic for the Moraic Theory of stress and syllable quantity (e.g. Hayes 1989; see Baker 2008, Davis 2011 for discussion). In (Baker 2008), I link it to other facts in Ngalakgan and neighbouring languages to argue that "monogestural clusters" are syllabified as onset clusters in this and other Australian languages (and cf. Evans 1995a and Nash 1979 for further discussion).

7 Word structure and polysynthesis

While some of the NPN languages are polysynthetic on the order of Athabaskan languages, on the whole they have the characteristic agglutinative structures of Pama-Nyungan languages. In (30), for example, we see a Ngalakgan verb which includes the ordinary (i.e. otherwise independent) noun /ŋariɲ/ 'hand', and which in turn is construed as a bodypart of the object argument cross-referenced on the verb with pronominal prefixing.[28] This noun will have the same form regardless of the verb which incorporates it. Similarly, the argument prefixes shown in these examples are the same for all verbs (depending only on transitivity). Likewise, the adverbial bound "prefixes" such as /piʈic-/ 'nearly' and /caʔ-/ 'now' do not have alternate morpho-phonemically determined forms, nor do the "enclitics" such as /=ŋkore/ 'for us'.

28 This kind of noun incorporation structure—where pronominal verb agreement cross-references the 'possessor' of an incorporated bodypart—is commonly found amongst Northern languages (see e.g. Chappell and McGregor 1996, Baker et al. 2010 for an analysis).

(30) /jiriɳ-**ŋariɲ**-kuɭ?-kuɭ?-meɻiɲ/
1plO-hand-DIST-jab-do.PC
'It [pandanus leaves] kept on jabbing our hands.'

(31) /ɳun-**piʈic**-ŋariɲ-pe+ɲ/
2sgO-nearly-hand-bite+PP
'[It: dog] nearly bit your hand.

(32) /ɳuku-**waɳa**-pak-wakke+na/
1sgS/2plO-still-APPL-return+FUT
'I might still come back to you (pl.).'

(33) /ŋu-mu-**ca?-**koric=**ŋkore**/
1sgS-VEG-now-grind.PR-12plDAT
'I'm grinding it now for us, I'm grinding it for us.'
(Ngalakgan: Baker 2008:66, 165, 141)

Such word structures raise the issue of how we are to classify these various morphological components, particularly with respect to their phonological status. Most of the NPN languages characteristically have a set of forms labelled "prefixes" which index arguments of the verb, as in examples (30)–(33) above. Many of them, particularly the Gunwinyguan (GN) group, also have a set of forms likewise labelled "prefixes" which perform a range of functions: quantifying arguments, expressing manner and time, or discourse-related focusing functions. The Ngalakgan verbs above again provide some examples, following are some more:[29]

(34) a. ŋa-**molk**-naŋ kuɲ
1sg-stealthily-see.PP kangaroo
'I saw the kangaroo in hiding [i.e. stealthily].'

b. pari-**kak**-ɻej
3pl-by.night-go.PI
'They travelled by night.'
(Bininj Gun-wok: Evans 2003: 532–533)

29 In general, Australian languages only appear to have a range of incorporated adverbial and quantifying elements if they also incorporate nouns. But not all languages that have noun incorporation also have incorporated adverbs. Indeed, only the Gunwinyguan languages as a group, as well as Tiwi (Osborne 1974) and Enindhilyakwa (argued to be a Gunwinyguan language by van Egmond 2012) appear to have this feature to any degree of elaboration.

c. ŋu-**kariʔ**-ɻiṭi
2sg-in.vain-come.PP
'You came too late.'
(Ngandi: Heath 1978b: 84)

One of these languages is Wubuy, where we find a prefix /ŋarak-/ labelled MULT(iple) which quantifies over arguments of the verb.[30]

(35) wu-**ŋara**-ʈapaliɲ
NEUT-MULT-emerge.PP
'They (devils: NEUT class) all came out'
(Nunggubuyu/Wubuy: Heath 1980b: 231)

Heath (1984: 463), discussing these quantifying/derivational "prefixes" in Wubuy, notes that:

> There is no sharp distinction between verbal derivational affixes (especially prefixes like COMIT and MULT) on the one hand, and compound elements on the other. For example, the rule ... inserting Epenthetic morpheme /ŋu-/ at morpheme boundaries (before a stop) treats derivational prefixes and [compound] initials alike (distinguishing them from pronominal prefixes).

Wubuy, like other GN languages, freely incorporates or compounds a range of noun stems with both adjectives and verbs. In (36), for example, the same verb /ɻapala-/ 'emerge' incorporates (i.e. compounds with) the nominal stem /jinak/ 'head'. As a consequence, the final stop of /jinak/ hardens the initial segment of /ɻapala-/ to surface /ʈ/ and itself deletes (see § 8.1 for discussion of opaque processes such as these).

(36) ni-**jina**-ʈapaliɲ
3M-head-emerge.PP
'his head came out'
(Heath 1980b: 152

When a verb begins in an underlying stop however, as in (37) with the verb /pura-/ 'sit', the meaningless string /ŋu-/ (an "empty morph") is inserted before the stem. The same process affects adjectives (which also incorporate and compound with preceding stems).

30 Heath (1984) represents this morpheme as /ŋaraG-/, where the 'G' symbol is an archiphoneme representing the fact that a morpheme conditions hardening in a following morpheme-initial segment (here underlying /ɻapaliɲ/ hardens to /ʈapaliɲ/, as in the following example). Since this archiphoneme has exactly the same surface phonology as an underlying regular phoneme /k/ I have gone with the simpler analysis here. See § 8.1 for discussion of this process in Wubuy and other languages.

(37) wiŋi-**jina-ŋu**-puri
3FDU-head-Ø-sit.PC
'their heads sat'
(Heath 1980b: 95)

Notably, it is not just lexical roots such as /jinak/ which require the following empty morph, but also (as Heath points out) the quantifying "prefixes" such as /ŋarak-/, as shown in (38a).

(38) a. wuu-**ŋara-ŋu**-puri[3PL-MULT-Ø-sit.PC
'they all sat'

b. *wuu-**ŋu**-puri
3PL-Ø-sit.PC
'they sat'
(Nunggubuyu/Wubuy: Heath 1980b: 249)

This process, then, classes non-inflectional "prefixes" such as MULT together with bound stems, such as incorporated nouns, and distinguishes them from inflectional prefixes, such as /wuu-/ ~ /wuru-/ in (38b), which do not condition the empty morph /ŋu-/.

Apart from the morpho-phonological behaviour of "prefixes", it is also the case that, as noted in Baker (2008: 143), such forms are commonly attested as both independent words (39), (41) and bound morphemes (40), (42). The same is true of Bininj Gun-wok (Evans 2003: 488), Rembarrnga (McKay 1975: 178), Ngandi (Heath 1978b) and other GN languages. As independent words, these adverbs and quantifiers have their own primary stress (all examples were naturally occurring; example (42) is originally from Merlan 1983: 56).

Independent word

(39) /mácci Ø-póʈewk-me+n **ɳámulu** ku-Ø-ɻápon-ci/
indeed 3sg-bad-be+PR really NP-3sg-go+PR-NEG
'Because he's sick and he really can't get around.'

Prefix

(40) /ku-caʔ-**ɳàmulu**-ɻú+ŋa/
NP-now-really-burn+FUT
'[It] will really get cooking now.'

Independent word

(41) /**mála** jiri-ɳáŋa+n/
group 1plS-sit+PR
'We sit *as a group*.'

Prefix

(42) /puru-**màla**-máɲi+cci+niɲ/
3plS-COLL-get+RR+PC
'They gathered, collected themselves.'
(Ngalakgan: Baker 2008: 143)

Furthermore, these elements can on occasion carry focal accent, as in the following exchange between two speakers (also from Ngalakgan):

(43) a. jánaʔ-kan-pa cun-wùni-kkóro munku-máj?
what-DAT-INTERR 2/1sg-give.EVIT-PRNEG VEG.TOP-food
'Why won't you give me any food?'

b. máko! ŋiɲ-**cáʔ-**wo cácapaɻɲ?!
no![31] 1mS/2mO-IMMED-give.PP yesterday
'No! I just *gave* you [some] yesterday!'
(Ngalakgan: Baker 2008: 144, fieldnotes)

These examples show that, like lexical stems (nouns and verbs), these adverbial/quantifying stems can have word-like properties (of prosodic and syntactic independence).

In Baker (2008), I propose that there are just three classes of morphemes in Gunwinyguan languages: affixes, free stems, and bound stems. The class of "bound stems" encompasses elements which have been classified elsewhere as "prefixes" and "clitics". If we distinguish those bound elements which realise obligatory grammatical categories such as tense, agreement/argument indexing, case, noun class, and number, then the class of affixes is relatively small and coherent in NPN languages, it consists just of these grammatical category-realising elements. The class of "bound stems" is both larger and more diverse.

Some bound stems behave as "true" (phrasal) clitics (Zwicky 1985), in that they attach to words outside the last affix. Such forms are typically not distinguishable from other bound stems except in this characteristic. In other groups of Australian languages, it is more straightforward to identify a class of "clitics", normally these are "true" clitics in Zwicky's sense in that their distribution is syntactically determined. For instance, the case markers in Arrernte are true clitics, which attach to the ends (i.e. right edge) of NPs (Henderson 2002: 109); for example the dative case marker /=ək/ in (44) below, where RC marks the relative clause constituent:

31 The interjection *mako*, like *au contraire* in French, negates a preceding assertion, hence the gloss.

(44) [aɣəl̪ əltərk [akəṯ=al̻ il+ək]$_{RC}$=**ək**]$_{NP}$ arəɳ+əm+ələ
/aɣəl̪ ltərk [akəṯ=al̻ il+ək]$_{RC}$=**ək**]$_{NP}$ arəɳ+əm+əl/
ground hard clear=RC TRANS+PST=**dat** place+PRES+SS
'... and putting (them) on the hard ground that they had cleared'
(Eastern Arrernte: Henderson 2002: 109)

The complex facts represented by the structure of words in NPN languages have often been captured by means of the "template" in Australian languages (see Simpson and Withgott 1986, Nordlinger 2010 for arguments in favour of the template approach). Templates run into problems in the (unusual) cases where alternative orders of bound morphemes are possible, as in, for example, Murrinh-Patha (Nordlinger 2010), Arrernte (Henderson 1998: 216, 2002: 108) and Rembarrnga (McKay 1975: 92). They also have difficulty with the much bigger problem of the apparent flexibility of complex words in Australian languages: the ability for speakers to incorporate or interpolate elements within the structure, apparently with some freedom in certain cases (as in the Arrernte example (3) above).

8 Segmentally- and phonotactically-conditioned alternations

Australian languages are remarkable mainly for the scarcity of phonological processes, in particular assimilation, in what would otherwise be classic conditioning environments in other languages of the world, such as nasals preceding stops of a different place of articulation. For example, in Bundjalung the Dative suffix /-ku/ and Desiderative suffix /-ki/ attach freely to nominal stems, but such attachment has no effect on the final segments of these stems:

(45) a. ca:cam-ku 'child'-DAT
b. jaraman-ku 'horse'-DAT
c. kacalka:ɲ-ki 'tea'-DESID
(Bundjalung: Crowley 1978: 61)

This is in contrast to the majority of the world's languages, where nasals standardly assimilate in place of articulation to a following stop. The consistent failure of assimilation in such contexts marks out Australian languages as special, for reasons that are still being investigated. Butcher (2006) suggests that speakers of Australian languages are motivated by a "place of articulation imperative", which drives phenomena such as this.

Here I survey some of the main phonological processes of the standard kind: those which are conditioned by the segmental environment. I start with some of the

common assimilation processes found in Australian languages. Apart from the alternations discussed in § 8.1, which might be regarded as assimilation of manner, assimilation processes are in general confined to coronal segments, both as trigger and target. Other kinds of assimilations are rare.

A few languages in Australia show widespread interactions between consonants and vowel quality. I also examine processes where vowels condition vowel quality, apicals condition [±anterior] (retroflexion), and nasals condition nasality. These latter processes may involve non-local environments under a traditional segmental view, but are local under an autosegmental analysis (e.g. Ní Chiosáin and Padgett 2001) and have been analysed in terms of Correspondence Theory in later models of phonology (e.g. Rose and Walker 2004). However, the correct analysis of these patterns is still a matter for inquiry. It is not at all clear for instance how Optimality Theory should or might account for these "non-local" patterns.

8.1 Continuant-stop alternations

One very common set of alternations in Australian languages is that between sonorant continuants (hereafter simply "continuants") and homorganic stops, which can be referred to generally as "continuant-stop alternations". These alternations appear to be motivated in part at least by the Syllable Contact Law (Murray and Vennemann 1983), as well as by the cross-linguistically common pattern of stop-weakening in intervocalic or inter-continuant environments (Lavoie 2001; Gurevich 2004). Languages vary in the extent to which these patterns have become lexicalised, and in the range of morphological structures affected. In some languages, such as Kayardild, Worrorra, Mawng and Wubuy, these alternations are a dominant force in the lexicon and the morphology, adding a great deal to the phonological and morphological complexity of such languages.

In Wubuy (Heath 1984: 62), for example, all suffixes and stems having continuant-initial forms in the environment of a preceding continuant (as in (46a, c) also have a stop-initial form in the environment of a preceding non-continuant (stop or nasal, as in (46b, d).

(46) a. a-l̪akuɭa-**r**uc
NEUT.OBL-lip-LOC
'on the lip'

b. a-l̪aaɲ-**t**uc
NEUT.OBL-chin-LOC
'on the chin'

c. jii-kuʈarku-**w**uj
FEM.OBL-brolga-DAT
'to brolga'

d. jii-waajin-**k**uj
FEM.OBL-emu-DAT
'to emu'

(Wubuy: Baker 2009

The Syllable Contact Law has received various interpretations, but in Murray and Vennemann's (1983: 520) statement the definition is:

> The preference for a syllabic structure **A$B**, where **A** and **B** are marginal segments and **a** and **b** are the consonantal strength values of **A** and **B** respectively, increases with the value of **b** minus **a**

One way of interpreting this proposal is that sequences of consonantal segments *xy* between two syllables are dispreferred where the "strength" of *y* is less than that of *x*. Many Australian languages show evidence of this kind of general constraint, which can often be characteristed as avoidance of sequences of non-continuant followed by continuant.

The complete set of alternations in Wubuy is shown in Table 2. As this table shows, continuants are paired with the nearest (in place terms) non-continuant in the inventory. In Wubuy, as in all Australian languages with this kind of alternation, the pattern is "structure-preserving" in Kiparsky's (1985) sense: it does not involve allophones which are not already present as phonemes in the inventory.

Table 2: Paired continuant ~ stop alternations in Wubuy, following Heath (1984)

continuant		**non-continuant**
w	↔	**k**
j	↔	c
l̪	↔	t̪
ɻ	↔	ʈ
r	↔	t
w	↔	**p**

As Heath (1984) notes, this kind of system presents a problem: the labio-velar glide /w/ is paired with two distinct phonemes /k/ and /p/. The vast majority of stems and suffixes beginning in /w/ allow only one of /p/ or /k/ as the hardened realisation.[32] Accordingly, speakers must know which stop to pair with /w/. Heath's (1984: 14) representational solution is to distinguish /w ~ p/ from /w ~ k/ with a subscript: /w_1/ is /w ~ k/ and /w_2/ is /w ~ p/. We find exactly analogous situations of unrecoverability of contrasts in other Australian languages: several varieties of the Yolngu dialect chain (e.g. Dhuwal/Dhuwala: Wood 1978, Wilkinson 1991), the Worrorran languages (Clendon 2000), Bardi (Bowern 2004), Ndjébbana (McKay 2000), Kayardild (Evans 1995b; Round 2009), Gurindji (McConvell 1988), Mangarrayi (Merlan 1982) and others. Historically, it is relatively clear that such alternations are the result of lenition pro-

32 A few verb stems and incorporated nouns appear to allow both variants (Heath 1984: 16; subsequently confirmed by my own fieldwork with native speakers).

cesses applying between continuants and also (sometimes) in stem- or suffix-initial position. In Wubuy and the Yolngu varieties at least, the processes are in fact a "chain shift": weakening of fortis stops to lenis stops, and lenis stops to continuants, as the following comparative data show. Ngandi preserves essentially the proto-Gunwinyguan system of fortis-lenis stop oppositions (Harvey 2003), also found in Bininj Gunwok, Ngalakgan and most other members of the family. But in Wubuy, as Heath shows (1978a), lenis stops lenited to continuants, leaving a single stop category. Essentially the same process affected some varieties of Yolngu (Wilkinson 1991), as well as members of many other Australian groups (e.g. Iwaidjan: Evans 2000).

(47) Ngandi-Wubuy continuant & stop correspondences (Baker 2009)

	Ngandi	**Wubuy**	**Correspondences**
'tongue'	ṯakkuɭa	ḻakuɭa	ṯ : ḻ , kk : k
'country'	ṯawal	ḻaal	ṯ : ḻ , w : Ø
'female antelopine roo'	kaɳʈalppuru	(w)aaɳʈalpuru	k : w, pp : p
'kurrajong sp.; string therefrom'	paɭkur	(w)aɭwur	p : w, k : w
'male'	paɭca	waɭja	p : w, c : j
'Strychnine tree'	paɭppuɭʔ	wumpaɭpuɭ	pp : p
Paperbark (Melaleuca) sp.	parccaɻaj	warcaɻa	p : w, cc : c

The existence of two stop series in the proto-language from which Ngandi and Wubuy descend, and in proto-Yolngu, meant that not all stops were eliminated from the surface. As Heath argues, even though the historic source of this alternation is lenition, we cannot analyse it this way synchronically, because sychronically there is a contrast between stops and continuants in stem-initial position between continuants (48). Continuant-initial stems, such as /juɻa-/ 'transport' in (48a), alternate with stop-initial forms (49a), following stops and nasals, but stop-initial stems, such as /cuɻa-/ 'push' don't alternate with continuant-initial forms; rather, they undergo insertion of the empty morph /ŋu-/ (discussed above in § 7), as shown in (49b).[33]

(48) a. [ŋajuɻaŋi]
/ŋa-**juɻaŋi**/
1sg-transport.PC
'I took it away'

b. [ŋacuɻaŋi]
/ŋa-**cuɻaŋi**/
1sg-push.PC
'I pushed it'

33 The contexts in which epenthesis applies overlap, but are not coextensive, with the environments in which hardening applies; see Heath (1984: 35, 62) for the details.

(49) a. [nuɲcuɻaɳi]
/nun-**juɻaɳi**/
2sg-transport.PC
'you took it away'
(Wubuy; Baker 2009)

b. [nu-**ŋu**-cuɻaɳi]
/nun-ŋu-**cuɻaɳi**/
2sg-EPENTH-push.PC
'you pushed it'

In order to preserve this contrast, we would need to regard the segments in stop-initial stems (as in (b)) as an underlying series of fortis stops, which do not lenite, in opposition to a series of underlying lenis stops, as in (a), which do.

This is essentially the solution which has been adopted by much of the literature on Yolngu languages (e.g. Wilkinson 1991; Morphy 1983; Wood 1978, etc.), apparently primarily for the reason that there are still Yolngu varieties which maintain the fortis/lenis contrast, and so the proposed underlying fortis/lenis system maintains inter-variety systematicity. It is questionable however whether this leads to a more psycholinguistically real description. As demonstrated by Chong (2011), both Wubuy and Yolngu can be described with the same formal apparatus, despite the fact that the Wubuy pattern is described as "hardening" and the Yolngu one as "lenition" in the sources. There are complications in the Yolngu data, among which is the important issue of sociolinguistic variation in the application of lenition according to context and morpheme, which are largely undescribed (though see Amery 1985, a significant early sociolinguistic study of these varieties). This is certainly an area which deserves more investigation; see § 11.

Paired continuant-stop alternations are rather common in Australian languages. Similar systems are found in the Iwaidjan languages (Mawng, Iwaidja), a number of related NPN Kimberley languages (Bunuba, Gooniyandi, Worrorra, Ungarinyin), Tangkic languages (Kayardild, Lardil), Southern Daly (Ngan'gi-tyemerri, Murrinh-Patha), languages of the Gulf and Barkly (Marra, Wambaya), and a number of Pama-Nyungan languages including Yindjibarndi, Martuthunira, to name a few (see Round 2010, 2011a for surveys). These systems of alternation vary in a number of ways: in their degree of lexicalisation or productivity, the syllabic positions which are targetted, and the degree to which alternations are constrained by morphology. What they generally have in common however is that (as noted above) they are structure preserving, and therefore (potentially) result in neutralisations. In both respects, as well as in targetting the feature [continuant], they are typologically rather unusual among lenition processes, broadly conceived. Gurevich (2004: 3) for instance argues that, according to her survey of 153 languages, neutralisation as an outcome of lenition appears to be avoided most (92%) of the time, for obvious reasons. The classic type of lenition pattern, as exemplified by Spanish for instance (Harris 1969), produces new phonetic variants as an outcome. In Spanish, these are the fricative allophones of voiced stops. These allophones, because they are new phonetic variants, do not result in neutralisation with existing phones in the language. Australian languages characteristically do not exemplify this pattern (except in-so-far as in many languag-

es, there is wide variation in the realisation of intervocalic stops, including approximated variants: see Ch 3).[34] Instead, we find alternations apply between pre-existing phones of the languages, typically stops and continuants (liquids and glides), as well as Ø. In some cases, we find among the alternating continuants segments which were probably not pre-existing, historically, such as the dental approximants of Bunuba and Yindjibarndi, the dorsal approximants of Iwaidja, Mawng, and Kaytetye, and the fricative phonemes found in Northern Paman languages (Hale 1964). However, such segments, if they once had the status of phonetic allophones, now in every case are in contrast in at least some environments with other (phonetically similar) consonants. For example, in Iwaidja, /k/, realised as [g] intervocalically, contrasts with /ɣ/ in this environment:

(50) a. calakaɻac 'fish spear'
b. mulaɣa 'hermit crab'
(Iwaidja: Pym and Larrimore 1979)

In all cases of stop-continuant alternation with which I am familiar, it is also the case that the alternations result in words that respect the phonotactic constraints on the lexicon (that is, of monomorphemic roots). In Wubuy, for instance, there are no morphemes (roots or affixes) that contain clusters of stop or nasal followed by continuant (Heath 1984: 26). Thus, the hetero-morphemic stop-continuant alternations enforce uniformity of phonotactic sequences across roots and complex words, similarly in Yolngu, Iwaidja, Kayardild and other languages.

Languages with this kind of stop-continuant alternation are typically those in which we find the rare cases of opacity (Kiparsky 1971, 1976), such as in Wubuy. In Wubuy, as we have seen, morpheme-initial continuants harden after non-continuants in morpheme-final position. Another rule in Wubuy (Heath 1984: 72) eliminates all /k/s preceding consonants from the surface, leading to phonological opacity: a situation in which the conditioning environment for an alternation is not apparent in the surface form.[35]

34 One could argue that this kind of pattern exemplifies non-structure preserving lenition, of the Spanish kind. It is not clear to me that these two sets of phenomena (while clearly related, historically) have the same kind of synchronic status. Lenition in Spanish is generally described as a categorical (that is, phonological) realisation of voiced stops in particular environments. Approximation of medial stops in Australian languages which have it appears to be non-categorical. However, the articulatory properties of stops in various contexts has not been systematically examined for any Australian languages, to my knowledge.

35 I have used double slashes here to enclose the underlying, abstract form. While Heath (1984:72) claims that the rule is exceptionless, its synchronic status is unclear. In recent fieldwork with speakers, Baker (2009) finds that the rule does not apply to recent loanwords such as 'truck', 'swag', 'work' (N.). It also applies variably to inputs such as 0.

(51) //a-maṭalak-ruc// → /amaṭalatuc/
NEUT.OBL-beach-LOC 'at the beach'
(Wubuy: Baker 2009)

In traditional serial, rule-based terms, this is a situation of counter-bleeding opacity, a kind of input-output relationship with which Optimality Theory has particular difficulty (see Baković 2007 for discussion). Cases like this are not very difficult to find among Australian languages (e.g. Bunuba, Rumsey 2000:78; Ungarinyin, Rumsey 1978: 31). Since this kind of opacity has been argued to be unstable (Kiparsky 1976), it would be very interesting to investigate the synchronic status of these relationships further. See also § 11 for the interaction between continuant-stop alternations and glottal stop.

The relationship we find between stop-continuant alternations and phonotactics in the lexicon of Wubuy appears to be widespread in Australian languages (for example, Bunuba: Rumsey 2000, Djambarrpuyngu: Wilkinson 1991). I know of no cases in Australia where the phonotactics of root-internal clusters is more permissive (in the relevant respects) than that generated by stop-continuant alternations.

8.2 Vowel harmony

Apart from a few scattered instances of local segmental assimilation, many of the segmentally-conditioned phonological alternations in Australian languages are *non-local*. Vowel harmony is found in a number of Pama-Nyungan as well as non-Pama-Nyungan languages, e.g. Bardi (Bowern 2004), Nyangumarta (Sharp 2004), Ngandi (Heath 1978b), Gaagadju (Harvey 1992:123), Wambaya (Nordlinger 1998), Wagiman (Wilson 1999:174), and Jingulu (Pensalfini 2003). There is evidence of historical vowel harmony in the prefixal agreement systems of many non-Pama-Nyungan languages (e.g. Bininj Gun-wok: Evans 2003; Ngalakgan and Rembarrnga: Baker 2004; Wubuy: Heath 1984). A well-studied example is Warlpiri, described at length in Nash (1986) and also analysed (in an OT framework) in Harvey and Baker (2005b). The Warlpiri harmony patterns are interesting from a theoretical point of view, because they provide evidence of both opposing changes (/u/→/i/ and /i/→/u/) and opposing directionality/control (both rightward and leftward spreading, and both stem-controlled and affix-controlled) in a single language. Affix-controlled vowel harmony is also found in Jingulu (Pensalfini 2003), from suffixes, and Bardi (Bowern 2004), from prefixes. Both of these are difficult to account for in current models of vowel harmony, which characteristically rely on the "strength" of stems to control directionality of harmony (Baković 2000).

Other cases of vowel harmony prove difficult for a unified account of the harmonising features. In prefixing languages of the north, it is not uncommon for noun class-marking prefixes to harmonise with their stems, e.g. Ngan'gityemerri. In (52) we

see the 'animal' class prefix harmonises with a following mid-front vowel in the stem, but is otherwised realised as /a-/, as in (53):

(52) e-men'giŋ 'goanna sp.'
e-ɸeri 'bluetongue'
e-lele 'curlew'

(53) a-miŋalak 'bony bream'
a-calmer 'barramundi'
a-ti 'cod'
a-ɸura 'mussel'
(Ngan'gityemerri: Reid 1990: 85)

Reid (1990) argues that we must use [±back] as well as [±high] to account for the distribution. But this analysis won't work for the otherwise similar 'body part' class marker. (54) shows that the class marker is /da-/ with back and low vowels, but harmonises to *both* high and non-high front vowels, as in (55).

(54) da-camu 'cheek'
da-muj 'eye'
da-wajir 'forehead'
da-pur 'bum [i.e. bottom]'

(55) de-pi 'head'
de-çi 'nose'
de-ceŋ 'tongue'
de-me 'hand'
(Ngan'gityemerri: Reid 1990: 85)

Furthermore, other class markers, such as /wa-/ 'male', fail to harmonise at all. Reid (1990: 86) also shows that the morphological and prosodic status of the class marker is crucial: where class markers are realised as semi-independent proclitics, they fail to harmonise. In (56), the class marker is a prefix on /melpe/ but a proclitic on any modifiers, such as /jeji/. Accordingly, it harmonises with the stem in the first instance but not the second.

(56) e-melpe a=jeji
ANIM-flat ANIM=other
'another stingray'
(Ngan'gityemerri: Reid 1990: 86)

Such patterns are problematic for models without a distinction between full and partial underspecification.

8.3 The phonology of coronals

A number of Australian languages provide evidence of interactions between vowels and coronal consonants. These fall into two principal groups: retroflex interactions with front vowels, and vowel-conditioned allophony in laminals. I consider these in turn.[36]

Interactions between front vowels and following retroflex segments are found in a number of languages. In the Australian language Yankunytjatjara, for example, there is an alternation of apical-initial verb suffixes depending on the final vowel of the stem (Goddard 1986: 178). If the final vowel of the stem is /i/, the initial apical of the suffix is alveolar, otherwise it is retroflex.

(57) a. paca-ɳu 'bit-past'
b. uɳʈu-ɳu 'push-past'
c. witi-nu 'hold, grab-past'
(Yankunytjatjara: Goddard 1986: 178)

In another Australian language, Martuthunira, there is a similar alternation. The Future suffix from the L-conjugation, /-ɲiɲci/, varies between alveolar and retroflex realisations following stem-final /i/. It is otherwise invariably retroflex.

(58) a. cawa-ɲiɲci [ɟawaɳiɲʄi]
suck-FUT
b. cawi-ɲiɲci ~ -niɲci [ɟawiniɲʄi] ~ [ɟawiɳiɲʄi]
bite.at-FUT
(Martuthunira: Dench 1994: 41–42)

A related alternation occurred historically in the Australian language Rembarrnga (McKay 1975, Saulwick 2003), where the front vowel /i/ became the corresponding central vowel preceding retroflexes.[37] In this case the related languages Ngalakgan and Dalabon preserve the original vowel quality.

36 This section draws on material in an unpublished manuscript co-authored with Mark Harvey, and used with permission.

37 See Flemming (2003), for a recent theoretical proposal about these interactions.

(59) a. Ngalakgan /malawiʈiwiʈi/ ‘whistling kite’
Rembarrnga /malawiʈiwiʈi/ ~ /malawuʈiwuʈi/ ‘whistling kite’
b. Dalabon /kiŋʔkiŋ/ ‘catfish sp.’
Rembarrnga /kiŋʔkiŋʔ/ ‘catfish’
(sources: Merlan 1983, McKay 1975, Saulwick 2003)

The evident motivation for these alternations lies in the incompatibility between the high front vowel and the retroflex consonant (Catford 1977, Gafos 1999:140–141, 213). Steriade (2001: 226–227), for instance, proposes that there is a “conflict between the gesture of tongue body fronting and raising (for [i]) and the curling back of the tongue tip required for [ʈ]”. In all of these examples there is an instance of this conflict between (arguably) a laminal gesture for [i] and a following sublaminal gesture. This conflict can be resolved in two ways. The laminal gesture may be replaced by a dorsal gesture, as is the case with the vowel backing in Rembarrnga (also found in historical changes in Dravidian languages). Alternatively, the apical consonant may be realised as an alveolar, as is the case in Yankunytjatjarra and Martuthunira. Other related phenomena are discussed at length in Harvey (2011).

8.3.1 Apical “harmony”

In a number of Australian languages, we find apicals in an earlier position in the word affecting the retroflex realisation of apicals in a later position. I have referred to this as “apical harmony” here although the realisations that result can be either in agreement or not, in fact, for apical sub-place features.

Firstly, apical harmony affects the phonotactics of roots. For instance in Bunuba (Rumsey 2000: 47), where apicals do not contrast word-initially, the realisation in this position is “generally apico-alveolar unless there is a /ʈ, ɳ/ or /ɭ/ in a subsequent syllable (interestingly /ɻ/ does not have the same effect)”. Rumsey provides the following examples:

(60) a. /tumuru/ [ˈdumɤru] ‘chest’
b. /tuɭu/ [ɖuɭu] ‘heart’
(Bunuba; Rumsey 2000: 47)

Evans (2003: 86) reports a similar phenomenon in Bininj Gun-wok. Following a vowel-final prefix, stem-initial apicals are alveolar, unless there is a following retroflex consonant.

(61) ŋa-na+ŋ [ŋanaŋ] *[ŋaɳaŋ]
1sg-see+PP
'I saw it'
(Bininj Gun-wok: Evans 2003:86)

Stem-initial apicals are retroflex if the following consonant is retroflex:[38]

(62) kari-taɳʔpu+n [gariɖaɳʔbun] *[garidaɳʔbun]
12pl-hit.close+NP
'we hit them close up'
(Bininj Gun-wok: Evans 2003: 86)

Apart from lexical harmony, in a number of languages (e.g. Kaytetye, Arrernte, Martuthunira) we find that suffixes with an initial apical show alternations between alveolar and retroflex realisations conditioned by preceding apicals in the stem; see Harvey (2011) for examples and discussion. In Eastern and Central Arrernte for example, according to Henderson (1998:168), suffixes with apicals are realised (optionally) as retroflex if the preceding segment in the stem is apical (alveolar or retroflex) and the intervening vowel is schwa.

(63) a. /ak-əl/ [ɐkə́lɐ]
head-LOC
b. /amp-əl/ [ɐmbə́lɐ]
child-LOC
c. /aʎ-əl/ [ɐʌə́lɐ]
boomerang-INST
d. /ən̪-əl/ [n̪ə́lɐ]
this-LOC
e. /at-əl/ [ɐtə́ɭɐ] ~ [ɐtə́lɐ]
clod-INST
f. /əʈʷ-əl/ [uʈə́ɭə] ~ [uʈə́lə]
clod-INST
(Eastern Arrernte: Henderson 1998: 168)

Henderson (1998: 168) states that the realisation with the retroflex alternant in (63) is more usual following stressed schwa.

In Martuthunira (Dench 1994: 41), the initial apical laterals and nasals of four bound morphemes alternate between alveolar and retroflex realisations. This alterna-

38 Further research is required to determine at what distance a following retroflex can affect a stem-initial apical.

tion is conditioned both by preceding apicals in the stem, and also by the intervening vowel: "retroflex realisation is preferred if the final syllable of the stem to which the morpheme is attached includes an apical lateral or nasal. This tendency is strongest where the preceding apical is alveolar and agrees in manner with the morpheme-initial consonant." Where the intervening vowel is /i/, however, the alveolar realisation is preferred.[39]

(64) a. kampa-laji
cook-FUT
b. nhawu-laji
see-FUT
c. waŋka-laji
speak-FUT
d. ŋaja-laji
cry-FUT
e. puɳʈa-laji
swim-FUT
f. ŋaraɲi-laji
get.stuck-FUT
g. cinari-laji
ask-FUT
h. kuɳʈa-l̪aji
show.respect-FUT
i. ʈanta-l̪aji
crawl-FUT
(Martuthunira: Dench 1994)

In Jingulu, there is an alternation between consecutive apicals which in some ways is the converse of that found in Kaytetye, Arrernte, and Martuthunira:

> All suffixes which have realisations containing [-anterior] (retroflexed) coronal nasals (such as Ergative/Focus/feminine /-ɳi/ and Dative /-ɳa/) also have realisations with [+anterior] coronal nasals. The generalisation is that the non-retroflexed form follows syllables containing apical (anterior and retroflexed, for instance, but not palatal) stops and nasals (whether retroflexed or not), while the retroflexed form follows any other consonant. (Pensalfini 2003)

(65) a. taparaŋi-ɳi
'pelican-ERG'

39 The examples in 0 are constructed from the description in Dench (1994). The generalisation here summarises Dench's description who characterises it as a tendency, noting that there is some variation from this pattern in actual realisations.

b. puliki-ɳi
'cow-ERG'
c. punturu-ɳa
'food-DAT'
d. timana-ni
'horse-ERG'
e. ɲinti-na
'that(m)-DAT'
f. cami-ɳi-ni
'that(m)-ERG-FOC'
(Jingulu: Pensalfini 2003)

The sublaminal realisation is the default realisation of these suffixes. The alveolar realisation appears only when there is a preceding apical stop or nasal. As in Bunuba and Martuthunira, continuant approximants (such as the tap in example (c)), do not apparently condition this alternation. The reasons for the difference in behaviour of stops, nasals (and possibly laterals) from continuants such as /r/ and /ɻ/ for processes such as these have not, to my knowledge, been investigated.

8.3.2 Lamino-palatals and preceding high front vowels

Like apicals, laminals in a number of Australian languages evince alternations conditioned by neighbouring vowels. In particular, we find that lamino-palatal realisations are favoured by high front vowels. In Ngiyampaa, neutralised laminals in suffix-initial position alternate according to the preceding vowel in the stem. A high front vowel conditions the lamino-palatal realisation, otherwise, we find the lamino-dental:

(66) a. mura-t̪ul 'spear-DIM'
b. muru-t̪ul 'road-DIM'
c. miri-cul 'dog-DIM'
(Ngiyampaa: Donaldson 1980: 58)

In unpublished work, Harvey and Baker (2005a) suggest that such patterns argue against the traditional (SPE) sub-classification of coronals in terms of [±anterior] and [±distributed] since the same context (preceding /i/) conditions both [–anterior] /c/ in Ngiyampaa (66), as well as [+anterior] /n/ in Yankunytjatjara (57); see Hamilton (1994) for similar arguments.

We also find examples where laminals condition particular allophones of vowels. For example in Arrernte (Henderson 1998: 35, 42), lamino-palatals condition high front realisations of preceding vowels (67b), (68b), c which can otherwise be realised in lower or more central positions (67a), (68a).

Arrernte vowel allophony

(67) /i/

a.	/amir/	[ɐˈmɛːrɐ]	‘spearthrower’
b.	/ampiɲ/	[ɐmˈbiːɲə]	‘side, region’

(Henderson 1998: 35)

(68) /ə/

a.	/aɲc-əm/	[ɐɲˈɟəmɐ]	‘climb+PRES’
b.	/aɲcəɲ/	[ɐɲˈɟiɲə] ~ [ɐɲˈɟɪɲə] ~ [ɐɲˈɟə̠ɲ ə]	‘grey-haired’
c.	/apəc-əm/	[ɐˈpɪɟəmɐ]	‘come+PRES’

(Henderson 1998: 42)

9 Reduplication

Australian languages evince a very wide range of reduplication patterns, most of which have been described in a survey by Fabricius (1998). Many, but not all, of these reduplication patterns can be described using McCarthy and Prince’s (1986, 1995a) proposals that reduplicants constitute “authentic constituents of the prosodic hierarchy”, which is to say syllables, feet, or prosodic words. As in other languages, reduplicants interact in interesting ways with other requirements on morphemes, such as the distribution of long vowels (Yolngu, Lardil), or of “boundary signals” such as glottal stop (Ngalakgan, Rembarrnga, Ngandi). These patterns deserve further research.

The phonological behaviour of the reduplicant and base can depend on the nature of the morphological relationship between them. In Ngalakgan, reduplication at the “word-level” (see § 6) involves attaching a copy of the form /C_1V_1ʔ-/ to the beginning of the base, as shown in (69):

(69)

a.	[màa̰máŋiɲ]	[máŋiɲ]
	/**maʔ**-maŋ+iɲ/	/maŋ+iɲ/
	DIST-get+PC	get+PC
	‘got here and there’	‘got’
b.	[wàa̰wáŋgiɲ]	[wáŋgiɲ]
	/**waʔ**-waŋkiɲ/	/waŋkiɲ/
	DIST-one	one
	‘one at a time’	‘one’
c.	[jìḭjippúɲɟa]	[jippúɲɟa]
	/**jiʔ**-jippuɲca/	/jippuɲca/
	INTENS-long.ago	long.ago
	‘a very long time ago’	‘a long time ago’

(Ngalakgan: Baker 2008: 105)

Baker (2008: 105) argues that these reduplicants constitute Prosodic Words, since they require vowel lengthening, like open, monosyllabic Prosodic Words in general and attract their own stress; see § 5.[40] Whereas word-level reduplication is productive, and (apparently) available to all verbs, numerals and adverbs, root-level reduplication is restricted to the paradigms of certain CV verb roots. It fulfils particular Tense-Aspect-Mood categories in the verb, in particular, the simple Present, and the Past Punctual (Baker 2008: 106). These reduplicants do not display vowel lengthening, and the whole word is stressed as a single domain, unlike the examples in (69), which are stressed like productive compounds.

In the vast majority of languages (cross-linguistically), reduplication applies as a bound morpheme attached immediately to its base, with no intervening material. Arrernte reduplication (Henderson 1998, 2002) is unusual in two respects. Firstly, phonologically-derived reduplicants combine with segmentally-prespecified affixes to form reduplicated constructions with particular meanings such as /REDUP-əlp/ 'attenuative' and /REDUP-əp/ 'frequentive' which then attach to the base. Secondly, some clitics may also intervene between the reduplicant and the base (or alternatively, follow both), as in the following example.

(70) əjʷəlpə-anəmə-ujər-əɭəɳə ~ əjʷəlpə-ujər-əɭəɳə-anəmə
ATTEN-then-disappear-DIFFSUBJ ATTEN-disappear-DIFFSUBJ-then
'and then (the water) ran out'
(Eastern Arrernte: Henderson 1998: 228)

See Henderson (2002) for general discussion of the behaviour of prosodic words in Eastern Arrernte.

9.1 Monogestural clusters and reduplication

It is not uncommon to find that monogestural clusters (in the sense defined above in § 3) behave differently to bigestural ones for the purposes of reduplication. One such pattern can be found in Yidiny (Dixon 1977; see also Nash 1979). Yidiny has a reduplication process which appears to target the first two syllables of nominals to form plurals. As Dixon notes (1977: 156), homorganic nasal-stop clusters are not treated in the same way as heterorganic clusters for this process. (71) provides examples of reduplications where syllable two is open. In these cases, the reduplicant is a copy of the first CVCV string of the stem.

40 Glottal stops do not count as codas, for the purposes of computing weight in Ngalakgan. See Baker (2008) for discussion, and § 11 on the behaviour of glottal stop more generally in Australian languages.

		Simple stem	*Reduplicated stem*
(71)	a.	puɲa	puɲa-puɲa
		‘woman’	‘women’
	b.	mulari	mula-mulari
		‘initiated man’	‘initiated men’

(Yidiny: Dixon 1977: 156)

When the second syllable is closed by a segment which is word-final, or part of a heteroganic cluster, the reduplicant copies the first CVCVC portion of the stem:

(72)	a.	ŋalal	ŋalal-ŋalal
		‘big’	‘lots of big [ones]’
	b.	kintalpa	kintal-kintalpa
		‘lizard sp.’	‘lizards’

(Yidiny: Dixon 1977: 156)

In (73), we see an example of a stem containing a homorganic cluster between second and third syllables. In these cases, Dixon states, reduplication treats the cluster in the same way as a simple onset, and the reduplicant is CVCV.

(73)	a.	kalampaɽa:	kala-kalampaɽa:
		‘march fly’	‘march flies’
	b.	macinta-n	maci-macinta-n
		‘walk.up-IMPER’	‘keep on walking up-IMPER’

(Yidiny: Dixon 1977: 156, 233)

The Yidiny reduplication pattern can be described simply if we regard monogestural sequences as onsets. In this case, the reduplicant copies the first two syllables of the word. In cases like /kindalpa/, the second syllable is closed by /l/, and hence this segment is included in the reduplicant. In cases like /kalampaɽa:/, the second syllable is open (according to this hypothesis), and hence no part of the labial nasal-stop cluster which follows is copied in the reduplicant.[41] Rather, the word reduplicates like other words with a simple segment between second and third syllables, e.g. /mulari/.

On this basis, Nash (1979) argues that Yidiny has a series of prenasalised stops which are treated as simple segments by the phonology. However, there is no sugges-

41 Note that this is not because of the phonotactics of /m/ or /n/: /m/ and /n/ are both licit word-final codas in Yidiny (Dixon 1977: 35), and clusters of any licit word-final consonant followed by any licit word-initial consonant are allowed across reduplication boundaries (1977: 36). So coda constraints along the lines of Itô (1986), for example, will not work here in deriving the differences between reduplicants.

tion from Dixon (1980) that the homorganic nasal-stop sequences found in Yidiny are any different from the typical clusters we find in other Australian languages, which have two timing slots. The available evidence on Yidiny suggests that it may syllabify monogestural sequences as onsets, as in Ngalakgan, but this does not necessarily mean that such sequences are segments.

Bunuba has a reduplication pattern that similarly appears to treat homorganic nasal-stop clusters as onsets. According to Rumsey (2000: 69), there are at least five distinct reduplication patterns, one of which involves a process whereby "the second syllable is repeated". In (74), it appears that the homorganic nasal-stop clusters counts as an onset for this process:

(74) a. kaɳʈaj 'bad, old' → kaɳʈajɳʈaj 'old ones'
(Bunuba: Rumsey 2000: 69)

Unfortunately, Rumsey provides no data or discussion on the behaviour of other clusters.

A similar distinction between monogestural and bigestural clusters is found in the reduplication pattern of Kugu Nganhcara (Smith and Johnson 2000: 382).[42] In Nganhcara, reduplication copies the first vowel and any following monogestural segment or cluster. In words with a simple segment between first and second syllables of the base, the reduplicant is a V_1C_2 copy of the base, as shown in (75). (The reduplicant is surrounded with angle brackets here.)

(75) a. t̪ena t̪<en>ena
'stand'
b. ŋaja ŋ<aj>aja
'I' (1sgNOM)
(Kugu Nganhcara: Smith and Johnson 2000: 382)

When the base contains a monogestural cluster between the first and second syllables, the whole cluster is copied in the reduplicant.

(76) a. muɲɟi m<uɲɟ>unɟi
b. jumpi j<ump>umpi
c. muŋga m<uŋg>uŋga
(Kugu Nganhcara: Smith and Johnson 2000: 382

Thus, in both cases, reduplication copies C_{inter}, a monogestural segment or cluster, in the terms introduced in § 3.

42 Kugu Nganhcara has a voicing distinction.

When what is between first and second syllables is a heterorganic cluster, reduplication copies only the first segment, if this is a stop, as shown in (77).[43]

(77) a. pukpe p<uk>ukpe
b. wegbe w<eg>egbe
(Kugu Nganhcara: Smith and Johnson 2000: 382

When the first segment of a heterorganic cluster is a nasal, then the nasal is copied as a homorganic cluster, as shown in (78):

(78) a. nunpa n<unt>unpa
b. t̪anpa t̪<ant>anpa
c. wunpa w<unt>unpa
d. uŋpa <uŋk>uŋpa
(Kugu Nganhcara: Smith and Johnson 2000: 382

This last process is optional. Thus /uŋpuŋpa/ is also a possible realisation.

Reduplication patterns similar to the Nganhcara one are found in a restricted (though widely distributed) number of Australian languages such as Mangarrayi (Merlan 1982), Jingulu (Pensalfini 2003), Alawa (Sharpe 1972), Ngarinyman and Gurindji (Jones 2000), Wambaya (Nordlinger 1998), Limilngan (Harvey 2001) all from the central and northern region of the Northern Territory, and, besides Nganhcara, some other languages of Cape York including neighbouring Kuuk Thaayorre (Gaby 2006: 22–24), and possibly Umpila (Harris and O'Grady 1976). In this pattern, reduplication infixes the first vowel and following consonant or consonant cluster after the first consonant of the stem (for theoretical analyses, see e.g. McCarthy and Prince 1986, 1993b; Davis 1988; Jones 2000; Crowhurst 2004). Where there is no stem-initial consonant, as in (78)d, the reduplicant is a prefix (see also discussion in Harvey 2001: 28). The examples in (79) are from Mangarrayi:

(79) a. maɭuka m<aɭ>aɭuka 'RDP-old man'
b. cimkan c<imk>imkan 'RDP-knowledgeable person'
(Mangarrayi: Merlan 1982: 216)

Note that this reduplication pattern creates a syllable (in the usual CV(C) sense) which does not exist in the base form. The Nganhcara pattern is a variant of this pattern. We can analyse it as a pattern that copies the first vowel and the following first gesture (rather than the following first cluster, as in Mangarrayi). Monogestural and bigestur-

43 Ian Smith (p.c.) has provided further information on this process. It appears that the pattern in 0 is restricted just to clusters of this type. Other heterorganic clusters behave like those in 0 or 0.

al clusters are thereby distinguished in this pattern. Monogestural clusters are treated as simple segments, as we have seen, and copied in entirety.

(80) a. muɲɟi m<uɲɟ>unɟi
b. ŋaja ŋ<aj>aja
(Kugu Nganhcara: Smith and Johnson 2000: 382)

Heterorganic clusters contribute only their first segment to the reduplicant, but the realisation of this segment differs according to the markedness of the cluster. The most marked clusters, with non-coronal non-nasal codas, allow only the first segment in the cluster to be realised between initial consonant and stem:

(81) a. pukpe p<uk>ukpe
(Kugu Nganhcara: Smith and Johnson 2000: 382)

When the heterorganic cluster has an initial nasal, the reduplicant realises this segment (optionally) as a homorganic cluster between initial consonant and stem:

(82) a. nunpa n<unt>unpa
(Kugu Nganhcara: Smith and Johnson 2000: 382)

Such patterns are difficult to describe in simple prosodic terms. For one thing, the reduplicant is not a syllable: it consists of a vowel plus following consonantal segments in the string: VC(C) (typical of infixing reduplication; see Yu 2007, for discussion). For another, the pattern either copies a whole cluster, or just the first segment in the cluster, depending on whether the cluster is monogestural or not. But such a consideration cannot be described in prosodic terms either: both kinds of cluster consist of a coda plus a following onset, under the usual analysis. The widespread occurrence of this kind of reduplication in Australian languages might suggest that the Arandic syllable type, VC(C), may be just an extreme phonologisation of an underlying tendency which is more general across the continent.

The neighbouring languages Wubuy and Anindhilyakwa share a relatively unusual reduplication pattern in which the template is conditioned by the initial segment of the stem: for stop-initial stems the template is CV (83a), for sonorant-initial stems it is a disyllabic portion of the base (b):

(83) a. /nu-puraŋi/ /nu-pu-puraŋi/
3msg-set.PC 3msg-RDP-set.PC
'he put it down' 'he kept putting it down'

b. /nu-l̪aŋarmaa/ /nu-l̪aŋa-l̪aŋarmaa/
3msg-set.PC 3msg-RDP-reach.PC
'he was reaching' 'he kept reaching'
(Wubuy: Heath 1984: 38)

Anindhilywakwa is particularly interesting with regard to the proposal that monogestural clusters behave like onsets, since these too function as "stops" for the purposes of the rule, conditioning CV reduplication, as shown in (84), like the stop-initial stems shown in (85), and in contrast to sonorant-initial stems, including those beginning with nasals, as in (86):

(84) a. a-mpə-mpawuɻa 'NEUT-RDP-few'
b. -ɳʈə-ɳʈarka- 'RDP-grab'

(85) a. wurə-pu-puŋkawa '3a-RDP-boss'
b. a-ci-cirku-wiʌara 'NEUT-RDP-river-middle'
c. -ʈ̪ə-ʈ̪ərəɳʈa- 'RDP-descend'
d. -ku-kuɻa- 'RDP-hook.fish'

(86) a. -mici-micikeeji- 'RDP-search'
b. -maɳʈə-maɳʈarka- 'RDP-point'
c. -ʌikpi-ʌikpi- 'RDP-float'
d. -reŋmə-reŋ+muŋkwaɻʈ̪ə- 'RDP-intestines+crawl' ('crawl due to sickness')
e. -wiʌu-wiʌaka- 'RDP-carry'
f. -ŋurkpə-ŋurk+pal̪a- 'RDP-mouth+wide' ('yawn')
g. -murkə-murkul̪a- 'RDP-lie.down'
(Anindhilywakwa: van Egmond 2012: 36)

van Egmond shows that, like Kugu Nganhcara (above), internal homorganic nasal-stop clusters are also treated differently by the reduplication pattern. Unlike heterorganic clusters (88), homorganic nasal-stop clusters are never split apart by the copying process (87):

(87) a. -ɻəɲci-ɻəɲcarkə- 'RDP-tease'
b. -maɳ̪ʈ̪ə-maɳ̪ʈarka- 'RDP-point'
c. -l̪aɳ̪ʈv-l̪aɳ̪ʈarka- 'RDP-think'
d. -l̪əmpə-l̪əmparr- 'RDP-force spear in'

(88) a. -merə-merku+wiʌara- 'RDP-middle of the day'
b. -mərə-mərk+paʌa- 'RDP-soft'
c. -merə-merk+pal̪v- 'RDP-rise of sun'
(Anindhilywakwa: van Egmond 2012: 36)

In the Cape York language Umpila (O'Grady 1976, Harris and O'Grady 1976), verbs undergo reduplication to form the Progressive. But the forms taken by this category of the verb are bewilderingly varied. Apart from the unusual nature of reduplication in Umpila, which appears to "skip" melodic segments in the copying process (Levin 1985), of interest to the present issue is the behaviour of homorganic nasal-stop clusters.

One common type can be described as copying the final syllable of the stem, in some cases with the "conjugation class" morpheme /l/ or an extra vowel position intervening (the Progressive form is shown on the right):[44]

(89)	a.	wuṉaa	wuṉaa-ṯa	'spear, shoot'
	b.	waaṯa	waṯa-ṯa	'go, walk'
	c.	wuuŋku	wuuŋku-ka	'stay'
	d.	jaaṉṯa	jaṉṯaa-l-ṯa	'be ashamed'
	e.	muuma	muuma-l-ma	'rub, knead'
	f.	ʔici	ʔici-i-ci	'get dry'
	g.	kumi	kumu-u-mi	'lose'
	(Umpila: Levin 1985: 147)			

However, other forms involving homorganic clusters display a different kind of copying, which appears to "skip" the stop element in the cluster:[45]

(90)	a.	ʔimpa	ʔimpa-l-ma	'wake up'
	b.	puṉṯa	puṉṯa-ṉa	'drink'
	c.	ŋaŋka	ŋaŋka-a-ŋa	'give, try'
	d.	piɲci	piɲci-ɲi	'take from'
	e.	ʔulntu	ʔulntu-nu	'knock'
	(Umpila: Levin 1985: 148)			

Levin (1985: 140) argues that the nasal portion of homorganic nasal-stop clusters is ambisyllabic, partly on the basis of their behaviour under stress. As in many Australian languages (e.g. Kukatj: Breen 1992), Umpila is described with a post-tonic gemination rule following stressed short vowels:

(91)	/ṯaku/	[ṯákku]
	(Umpila: Levin 1985: 136)	

44 There are other issues to do with vowel differences between stem and reduplicant, not discussed here.

45 The lamino-dental nasal+stop clusters in these examples are given as homorganic in Harris and O'Grady (1976: 176), although the orthography does not represent this consistently (and accordingly varies in Levin's presentation).

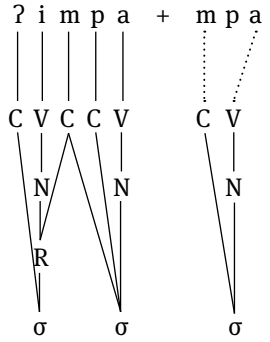
When what follows the tonic is a homorganic nasal-stop cluster, we find nasal gemination, rather than stop gemination:

(92) /puŋku/ [pṓŋŋku] 'knee'
(Umpila: Levin 1985: 137)

Levin argues that this follows if the nasal-stop cluster is a complex onset. In that case, as with the stop example in (91), the onset of the post-tonic syllable spreads to fill an empty skeletal position in the nucleus of the tonic (a rule enforcing long nuclei in stressed syllables, which, as is commonly the case in Australian languages, can be satisfied either by a long vowel, or by post-tonic gemination).

Given this, the reduplication rule applying in (90) can be analysed as one where a skeletal CV reduplicant affix copies melody from the end of the stem, left-to-right. The V portion can only be linked to a vowel. The first melodic segment encountered when linking the C portion is the nasal of the homorganic cluster, because this is syllabified both as coda to the preceding syllable and onset to the next. The stop following the nasal, lacking a skeletal position to link to, floats and is erased at the surface.[46]

(93)



(Umpila: Levin 1985: 149)

Note that homorganic clusters behave differently to heterorganic ones, which simply copy the final CV portion of the stem:[47]

46 The figure here is adapted, with slight changes, from Levin (1985:149). In particular, I have used a CV skeleton rather than an X one, and shown the syllabification of the reduplicant affix with dashed association lines, rather than solid. Neither of these affect the interpretation of the analysis.
47 Levin (1985) does not discuss why the forms in 0 containing nasal-stop clusters in the final syllable fail to undergo the same rule as those in 0.

(94) a. palpa palpa-pa ‘split’
b. kaalki kaalka-a-ki ‘sprinkle, baptize’
c. walki walka-a-ki ‘prevent, stop’
(Umpila: Levin 1985: 141, 147)

In sum, a number of Australian languages appear to have phonological patterns which distinguish monogestural clusters from clusters which do not consist of a single oral gesture. This special behaviour of monogestural clusters raises a number of questions however. If monogestural clusters are syllabified partially (Levin 1985) or fully (Baker 2008) in the onset, then this would appear to violate a strict version of the Syllable Contact Law, which we have seen is otherwise strongly visible in the phonology of Australian languages, including those with evidence of monogestural clusters behaving as onsets. In addition, while nasal-stop clusters are widely observed with this kind of ambiguous cluster/segment behaviour, and not just in Australian languages, stop-nasal clusters are exceedingly rare in this role, even though, as onsets, they would appear to satisfy the SCL more strictly.

10 Metrically- and prosodically-conditioned alternations, and long distance phenomena

As mentioned in § 5, number of Australian languages have allomorphic alternations in case suffixes conditioned by prosodic characteristics of the stem, in particular, whether it is disyllabic (or bimoraic) or longer. A well-known case is Warlpiri (Nash 1986), where disyllabic stems take one allomorph of the ergative and locative case suffixes, and stems longer than that take another allomorph, as with the Martuthunira example in (14). In Arrernte (Henderson 1998:205), the prosodic structure of the stem similarly conditions allomorphs of number suffixes. In this case, the analysis is complicated by the requirement to recognise the prosodic structure in terms of (underlying) VC(C) syllable units, rather than the usual CV. Note for example that roots consisting underlyingly of a single C or cluster (as in a) take the same allomorphs as those consisting of a VC(C), as in (b). Likewise, CVC roots like that in (c) take the same allomorphs as VC(C)VC roots as in (d). Henderson’s proposal is that the allomorph is selected on the basis of whether its first syllable would occupy the head of a foot, or not. Feet in Arrernte are implemented as disyllabic iambs. Trisyllabic stems can take the same allomorphs as C or VC(C) stems, as in (e).

(95) a. [t̪ərɛrəmɐ]
(əṯ.ər)(ir.əm)
th-errirr-eme ‘poke’-PL-PRES

b. [ɐt̪ərɛɾəmɐ]
(ɐt̪.ər)(iɾ.əm)
ath+errirr+eme ‘grind’-PL-PRES

c. [kɷŋəwaɾəmɐ]
(əkʷ.əŋ)(ew.aɾ)əm
kwern+ewarr+eme ‘swallow’-PL-PRES

d. [ɐkɷŋəwaɾəmɐ]
(akʷ.əŋ)(ew.aɾ)əm
akwern+ewarr+eme ‘insert’-PL-PRES

e. [ɐlwaːɾəŋəɾɛːɾəmɐ]
(alʷ.aɾ)(əŋ.ər)(iɾ.əm)
alwarrern+errirr+eme ‘leave for later’-PL-PRES
(Arrernte: Henderson 1998: 205)

More complex examples are those where it appears the prosodic or metrical structure of the stem can condition the realisation of phonemic contrasts (as opposed to allomorphs). In particular, the prosodic characteristics of the stem can condition what appear to be prosodic contrasts in segments, such as duration, “laryngealisation” and fortition. In Warumungu (Heath 1977; Simpson 1998), there is a complex (and not completely understood) series of alternations in the duration and fortition of segments depending on factors such as position in word in terms of number of syllables from a word or morpheme edge. Monosyllabic suffixes for instance predictably alternate between fortis (a) and lenis (b) realisations depending on whether a noun is trisyllabic or disyllabic.

(96) a. [bábulùku] ‘house’-DAT
/papulu-kku/

b. [mánugu] ‘country’-DAT
/manu-ku/
(Warumungu: Simpson 1998)

Similar alternations are found in the nearby Warluwarric languages (Breen 1971).

In a number of contiguous Gunwinyguan languages (Ngalakgan, Ngandi, and Rembarrnga) there is a process which similarly affects the fortis/lenis (or geminate/singleton) realisations of suffix-initial stops. According to the analysis in Baker (2008), this can be described in terms of the locations of “fortis clusters” and pitch accents in the word. All stop-initial suffixes in Ngalakgan have two allomorphs: one which is fortis (geminate-)initial, and another which is lenis (singleton-)initial. The geminate-initial forms are underlying, and have the widest distribution, shown in (97).

(97) a. [bʊ́lugikkạ]
/puluki-kkaʔ/
bullock-LOC (loan)
b. [ɟambʊ́ɻkkạ]
/campuɻ-kkaʔ/
sand-LOC
c. [jɛ́lɛkkạ]
/jele-kkaʔ/
hole-LOC
d. [láŋgakkạ]
/ɭaŋka-kkaʔ/
billabong-LOC
e. [ɟítnɪkkạ]
/citni-kkaʔ/
Sydney-LOC (loan)
(Ngalakgan: Baker 2008: 252)

If a stem contains a fortis cluster (a geminate, a cluster of two stops, or a cluster of glottal stop and oral stop) then a case suffix must be realised with an initial lenis (singleton) stop, shown in (98). To the extent that the alternation is determined segmentally (by the location of earlier fortis elements), it is conditioned non-locally in traditional terms.[48]

(98) a. [álakkogạ]
/alakko-kkaʔ/
later-LOC
b. [wáccigạ]
/wacci-kkaʔ/
sun-LOC
c. [jɛ́rkkegạ]
/jerkke-kkaʔ/
bottom-LOC
d. [ŋɔ́lkkogạ]
/ŋolkko-kkaʔ/
big-LOC

48 Baker (2008) doesn't discuss whether the process could be regarded as 'local' under the articulatory view of locality argued for in e.g. Gafos (1996). It is not clear whether there is any articulatory feature which could be regarded as being present throughout the string between trigger and target in these examples.

e. [bálkkugạ]
/palkku-kkaʔ/
string-LOC
(Ngalakgan: Baker 2008: 252

The reason I include the pattern in this section is because the alternation also depends on the location of pitch accents in the stem (a factor not recognised in earlier descriptions of these languages).[49] A pitch accent intervening between two fortis elements can "save" a geminate-initial suffix, (99a), which would otherwise be subject to the alternation, (99b). In (99a), the pitch accent is morpheme-internal (associated with the primary stress).

(99) a. [màrkkarálacci]
/markkarala-cci/
headband-PRIV
'(having) no headbands'
(Ngalakgan: Baker 2008: 257)

b. [jáppaɟi]
/jappa-cci/
sister-PRIV
'(having) no sisters'

Pitch accents can also be derived from the metrically strong positions associated with the initial syllables of morphemes, as is generally the case in Australian languages, as shown in (100).

(100) a. [ɟijàppaŋgíkkạ]
/cu-jappa=ŋki-kkaʔ/
F-sister-2MDAT-LOC
b. [jáppagạ]
/jappa-kkaʔ/
sister-LOC
c. [ɟumàrkkɛŋgíkkạ]
/cu-markke=ŋki-kkaʔ/
F-father's.sister-2MDAT-LOC
d. [márkkegọ]
/markke-kkoʔ/
father's.sister-DYAD
e. [nubʊ̀ɪppʊŋgíkkạ]
/ŋu-pujppu=ŋki-kkaʔ/
M-brother-2MDAT-LOC
(Ngalakgan: Baker 2008: 257)
f. [bʊ́ɪppugọ]
/pujppu-kkoʔ/
brother-DYAD

Other prosodically-based contrasts can be similarly affected by metrical structure, in morphological environments which induce alternations in the structure assigned to constituents of words. Yolngu varieties, including Gälpu (Wood 1978), Djapu (Morphy 1983) and Djambarrpuyngu (Wilkinson 1991), evince alternations of both vowel length and the distribution of glottal stops conditioned in this way.

49 Pitch accents are associated with metrically strong positions in Ngalakgan, but not all metrically strong positions are associated with pitch movements; see Baker (2008) for discussion.

Reduplication in Djambarrpuyngu, Djapu, and Gälpu is preposal and regularly introduces a glottal stop between reduplicant and stem, as shown in (101a-b). Some verb stems end in a glottal stop underlyingly, as in (c-d). When these verbs are reduplicated, only the glottal stop at the reduplication boundary is realised, the glottal stop in the base corresponds to surface zero.[50] This is therefore a rare example where greater phonological identity obtains between the underlying stem and the reduplicant, than between the underlying stem and the base of reduplication (as in the Klamath example discussed in McCarthy and Prince 1995b).

(101) a. [n̪ínaʔn̪ìna]
/n̪ɪnaʔ-n̪ɪna/
DIST-sit

b. [júːlŋuʔjùlŋu]
/juːlŋuʔ-juːlŋu/
DIST-person

c. [ŋálʔŋàljun]
/ŋalʔ-ŋalʔ-ju+n/
DIST-climb/rise-AUX+PR

d. [jámanaʔjàmanajun]
/jamanaʔ-jamanaʔ-ju+n/
DIST-poke.out.tongue-AUX+PR

(Djambarrpuyngu: Wilkinson 1991: 85)

Note that stress in reduplicative forms is initial, as in words in general. The change in stress pattern is reflected in the loss of underlying vowel length in the base in (b), and its retention in the surface reduplicant. Long vowels only occur in initial, stressed syllables in Djambarrpuyngu (Wilkinson 1991:44), where they contrast with short vowels.

Similar patterns of glottal alternation in suffixes are described for Ngandi (Heath 1978b) and Ngalakgan (Merlan 1983). The behaviour of glottal stop is furtherdiscussed in § 11.

10.1 Nasal cluster dissimilation phenomena

A number of Australian languages have processes which target nasals, particularly in clusters, following other nasals or nasal clusters in the word. The process is best described by McConvell (1988), for the Ngumpin group of languages of the central north. As shown in (102), suffixes beginning underlying (a) in nasal-stop clusters such

50 The stress in the surface representations is derived from the descriptions and representations in Wilkinson (1991: 62–63) and Wood (1978: 85–87). I have glossed the verb inflection affix /-ju+/ as an 'auxiliary'. The tense inflection of /-ju+n/ I have glossed as 'Present', which is one interpretation of the inflection (Wilkinson 1991: 336). I have glossed the reduplicant in Djambarrpuyngu examples as 'Distributive', since it appears to have this interpretation (Wilkinson 1991: 368). Like many other Australian languages, Djambarrpuyngu has both lexicalised and productive reduplication (1991: 121).

as the Locative /-ŋka/ delete the nasal when attached to stems containing nasal-stop clusters (b-c), whether these are homorganic or heterorganic.

(102) a. lutcu-ŋka 'on the ridge'
ridge-LOC
b. wiɲci-ka 'at the spring'
spring-LOC
c. pinka-ka 'at the river'
river-LOC
(McConvell 1988: 137)

Clusters internal to bound morphemes may also be targetted; (103a) shows the form of the Comitative suffix (with intervocalic lenition of initial /k/), (b) shows the form with deletion of internal nasal after the heteromorphemic nasal-stop cluster at the boundary:

(103) a. ŋaci-wuɲca 'with father'
father-COMIT
b. ŋaɻin-kuca 'lacking meat'
meat-COMIT
(McConvell 1988: 139)

The process only targets clusters in bound morphemes. Morpheme-final nasals are not affected, either in word sandhi, as in (a), or in complex words, as in (b).

(104) a. tampaŋ kariɲa 'he died' *tampa kariɲa
dead be.PST
b. nuŋkijiŋ-ku 'for a relation' *nuŋkiji-ku
relation-DAT
(McConvell 1988: 137)

Significantly, the process is non-local: it can apply across a number of intervening syllables containing only continuants (105).

(105) a. cawura-ɲ-kaɻi-wuca 'with another thief'
//cawura-ɲ-kaɻi-kuɲca//
steal-NOM-OTHER-COMIT

b. waɲci-waɭa-ku
//waɲci-waɭa-ŋku//
which-NOW-2sgOBL
(McConvell 1988: 140)

The process is blocked by intervening nasals and stops (106).

(106) a. ŋu-ŋantipa-ŋkulu ɲa-ɲa *ŋu-ŋantipa-kulu
AUX-1plOBL-3plSUBJ see-PST ‘they saw us’

b. paɳku-ʈi-ŋkura *paɳku-ʈi-kura
cross.cousin-KIN-ALL
‘towards a cross-cousin’

c. kuja-ŋka-ma-ŋku pa-ni *kuja-ŋka-ma-ku
thus-LOC-TOP-2sgOBL hit-PST
‘it was for that reason he hit you’

d. ŋu-n-cunu-ŋkuɭa juwa-ni *ŋu-n-cunu-kuɭa
AUX-2sgSUBJ-REFL-LOC put-PST
‘you put it on yourself’
(McConvell 1988: 141)

McConvell (1988) argues that the deletion rule must interact in specific ways with the lenition rule and a rule inserting epenthetic /–pa/ (as in Warlpiri). It must also apply to adjacent sequences of trigger and target, working from the beginning of the word.

A second, related, rule in these languages works with a similar set of triggers and environments, but in this case the target is nasals in a heterorganic cluster, which become denasalised to the corresponding stop. (107a) shows the underlying form of the 2sg Oblique clitic /-n/. (107b-c) shows the denasalised form following homorganic or heterorganic clusters in the stem. As with the deletion process, denasalisation is a non-local phenomenon, blocked only by stops and nasals between target and trigger.

(107) a. ŋana-n-pula ɲa-ɲa ‘who did you two see?’
who-2sg-DU see-PST

b. ɲampa-t-pula ɲa-ɲa ‘what did you two see?’
what-2sg-DU see-PST

c. ɲatcaŋ-pa-t-pula ɲa-ɲa ‘how many did you two see?’
how.many-EP-2sg-DU see-PST
(McConvell 1988: 145)

See McConvell (1988), for further discussion and differences between the languages in this group.

Similar processes are found in other languages of Australia, e.g. Kalkatungu (Blake 1979), Yankunytjatjara (Goddard 1986: 30), Nhanda (Blevins 2001b) (none of

these appear to allow the long-distance nasal cluster dissimilation process found in Gurindji, however).[51] Nasal cluster dissimilation, or something like it, has also had effects in historical language change. In the initial-dropping languages of Cape York, medial nasal-stop clusters in stems were retained as onsets (108), except where the original initial consonant was a nasal, in which case the erstwhile medial nasal was deleted (109):

	Proto-Northern Paman	Linŋiṯiɣ	
(108) a.	*kumpu	mpu	'urine'
b.	*wuntu	ntʳo	'to seek'
c.	*puŋku	ŋko	'knee'
(109) a.	*ŋampul	puy	12pl
b.	*ŋantu-na	tʳo-n	'where'
c.	*ŋuŋku	ko	'there'

(Linŋiṯiɣ: Hale 1964: 258)

11 Issues for future research

A number of phonological phenomena in Australian languages resist efforts to describe or account for them in traditional (generative) terms. On the one hand, there are two distinct segmental (or articulatory) phones which have been described as "prosodic" (in the Firthian sense), in that they appear to have effects which cannot be described in terms of the string. One of these is the glottal stop found in many languages of the Top End (see Harvey 1991, for a survey of the languages and phenomena involved).[52] The other, perhaps more surprisingly, concerns retroflexion (see Evans 1995a for an early flag of the problem, and 2003: 86). To conclude, I discuss the important issue of variation in phonology.

We have already met examples of glottal stop alternating with zero in § 5, with reference to Yolngu varieties. In many Top End languages, as discussed by Harvey (1991) and Baker (2008), glottal stop is characteristically found at morpheme boundaries, presumably as a kind of *Grenzsignal* ('boundary signal': Trubetzkoy 1969). It may be introduced by reduplication rules (as in Ngalakgan, Bininj Gun-wok, Yolngu and others), or be present contrastively in the initial position of suffixes. In either of these po-

51 For theoretical proposals on this and related phenomena, see e.g. Alderete (1997), Jones (2001), Blust (2012).

52 Some languages of Cape York (e.g. Yir-Yoront: Alpher 1991), as well as Nhanda in Western Australia (Blevins 2001b) also have a glottal stop phone. From the available descriptions, neither of these appear to display the same kinds of prosodic behaviour described here for Top End languages.

sitions, it may also be subject to alternations like those described for fortis segments in § 5. One particularly problematic aspect of the behaviour of glottal stop is that it often appears to be "invisible" to phonological patterns. For instance, as discussed by Harvey (1991; and see also Chong 2011), the presence of glottal stop is irrelevant to the outcome of continuant-stop alternations. For example, in the Djambarrpuyngu variety of Yolngu (Wilkinson 1991), we find that the following patterns (adapted from Chong 2011: 488). Example (110) shows the "lenition" context (where a continuant-initial realisation of the ergative suffix /-ṯu/ is favoured) and (111) the "hardening" context. Note that glottal stop can appear in both contexts, and has no effect on the alternation.

(110) a. kuɭkuʔ-ju fish-ERG
b. kuɭku-ju many-ERG

(111) a. warakanʔ-ṯu animal-ERG
b. ɻaŋan-ṯu paperbark-ERG
(Djambarrpuyngu: Wilkinson 1991, Chong 2011)

In stringwise terms then, it is just the segment preceding glottal stop which determines the continuant-stop alternation, making this another non-local process (as noted by Chong 2011).

The behaviour of laryngealisation is central to one highly productive process of verb inflection in Ngalakgan, and here again displays stringwise "invisibility". The open conjugation class of verbs forms the Future and Irrealis with affixes whose elsewhere (and historically-original) forms are /-ɻa/ ~ /-ja/ and /-ɻe/ ~ /-je/ respectively. The suffixes have these forms when they follow polysyllabic vowel-final stems, as in (112) below.

(112) [mungu] [munguɻa] ~ [munguja]
/munku/ follow-FUT
(Ngalakgan: Baker 2008: 53)

In consonant-final stems, these verb inflections are formed by geminating the final supralaryngeal consonant of the stem (Merlan 1983: 120; a cognate inflectional paradigm is found in Rembarrnga: McKay 1975). Example (113) demonstrates the pattern found with consonant-final stems, including stems derived from Kriol, as in the (d) example.[53]

53 The Irrealis inflection is identical to the Future, except that the vowel of the inflection is /e/ rather than /a/.

	Present	Future		
(113) a.	[buɭ]	[buɭɭa]	/puɭ/	‘drown-FUT’
b.	[wulup]	[wuluppa]	/wulup/	‘bathe-FUT’
c.	[maɳiɲ]	[maɳiɲɲa]	/maɳiɲ/	‘help-FUT’
d.	[laɪdɪmap]	[laɪdɪmappa]	/ɭajtimap/	‘set.alight-FUT’

(Kriol < English *light ‘im up*)

(Ngalakgan: Baker 2008: 53)

In the case of stems which have a final laryngealised sonorant, the inflection is realised as gemination of the final sonorant position. In these forms, the glottal constriction is relaxed before release of the sonorant, unlike laryngealised sonorants in codas (where glottal constriction is released after the oral constriction), and the sonorant closure duration is longer than in ordinary intervocalic sonorants.[54]

(114) a.	[maɳiɲ̄]	[maɳiɲ̄ɲa]
	/maɳiɲʔ/	/maɳiɲʔ-Ca/
	‘make’	‘make-FUT’
b.	[bawʊn̪]	[bawʊn̪na]
	/pawunʔ/	/pawunʔ-Ca/
	‘leave’	‘leave-FUT’
c.	[duɭ̪]	[duɭ̪lla]
	/ʈulʔ/	/ʈulʔ-Ca/
	‘set.alight’	‘set.alight-FUT’

(Ngalakgan: Baker 2008: 53)

The constriction of the sonorant is maintained throughout the glottal constriction, and is released as the onset of the following syllable.

Similarly, stems in which a final glottal stop follows a vowel behave just like vowel-final forms:

	Present	Future
(115) a.	[jukkạ]	[jukkạɻa] ~ [jukkạja]
	/jukkaʔ/	/jukkaʔ-ɻa/
	‘go.ahead’	‘go.ahead-FUT’
b.	[warʃạ]	[warʃạɻa]
	/warcaʔ/	/warcaʔ-ɻa/
	‘search’	‘search-FUT’

54 I have represented the FUT inflection as /-Ca/ here, i.e. a copy of the preceding supra-laryngeal consonant plus /a/. Reasons why the inflection should not be represented underlyingly as /-ɻa/ are provided in Baker (2008: 56).

c. [janạ] [janạɻa] ~ [janạja]
/janaʔ/ /janaʔ-ɻa/
'do.what?' 'do.what?-FUT'
(Ngalakgan: Baker 2008: 53)

What we do *not* get, following glottal-final stems, is gemination of the glottal:

(116) a. [jukkạ] *[jukkạʔa]
/jukkaʔ/ */jukkaʔ-ʔa/
'go.ahead' 'go.ahead-FUT'
b. [warɟạ] *[warɟạʔa]
/warcaʔ/ */warcaʔ-ʔa/
'search' 'search-FUT'
(Ngalakgan: Baker 2008: 53)

What this, and other patterns, demonstrates is that glottal stops do not participate in segmental processes in an expected fashion. Rather, they behave as if they occupied a different tier, in autosegmental terms, from the rest of the segmental phonology (Harvey 1991 puts forward an explicit proposal of this kind). Behaviour like this is straightforward to implement in an autosegmental model (e.g. Goldsmith 1990), but the problems of implementing an Optimality Theoretic one are not trivial (see Chong 2011 for discussion), and far from resolved.

Retroflex consonants in Australian languages exhibit behaviour which likewise can be difficult to account for in traditional stringwise terms. Retroflex consonants are traditionally regarded as a standard combination of active and passive articulator, together with a manner specification. However, the standard account fails to explain some of the special behaviour that retroflexes exhibit. We have already encountered the cases of apical harmony in roots in languages such as Bininj Gun-wok. Among place contrasts, only retroflexes appear to drive this kind of morpheme structure constraint in Australian languages, and similarly with the alternations discussed in § 8.2.1. As noted there, an account of this phenomenon requires "long-distance" consonant agreement or harmony constraints, a mechanism which appears to be used only fleetingly in the world's languages (Hansson 2001).

In some Australian languages, the retroflex gesture can appear to become "detached" from the segment which introduces it to an underlying form, and spread to other locations in the word. This has been described for Bininj Gun-wok (Evans 2003) and Ngalakgan (Baker 2008), but is in all probability present to some degree in other languages as well. To date, it has not received instrumental treatment, and the constraints on the pattern (if any) are unknown. In what follows, I report the Ngalakgan facts. The pronunciation forms provided below represent the typical pronunciations of all three native speakers that I worked with.

Firstly, the retroflex glide [ɻ], alone among consonants, can be syllabic (and cf. Evans 2003:86):

(117) a. /kiɳalk/ [gɻɳalk] 'white/straw-necked ibis'
b. /ʈuɻʔ/ [dˈɻ̃] 'sit down'
(Ngalakgan: Baker 2008: 62)

Further, an underlying postalveolar feature on a postvocalic segment can be realised as a PRE-vocalic onset, creating a surface obstruent-glide cluster (as in the majority of Australian languages, onset clusters are illicit in Ngalakgan, with the possible exception of homorganic nasal-stop clusters):

(118) a. /ʈaɻʔ [dɻa̠] 'tree (generic)'
b. /kiɳalk/ [gɻiɳalk] 'white/straw-necked ibis'
c. /kiɳʈar/ [gɻiɳɖar] 'cross cousin'
(Ngalakgan: Baker 2008: 62)

Perhaps more surprising is the shifting of retroflexion through an onset into the following vowel, as in (119):

(119) /malaʈiʔ/ [maladʑ̍] 'wedge-tailed eagle'
(Ngalakgan: Baker 2008: 62)

Evans (2003: 87) suggests that, for Bininj Gun-wok, retroflexion be treated as an autosegment linked to the syllable node, and realised as a curled-back tongue tip gesture whose realisation can be variably located on apicals and vowels within a syllable so-specified. The behaviour of retroflexion in languages (including English) has been correlated with perceptual duration of the cues to retroflexes (West 1999), and the subsequent difficulty of localising the source of these cues in a particular segment in the string (Ohala 1981); see Blevins (2004: 148) for discussion of the "long domain" effects of certain kinds of articulatory constrasts, including retroflexion. This kind of perception-driven phonological behaviour would no doubt benefit from further research on speech perception with speakers of Australian languages, an enterprise which is truly in its infancy (see Ch 3 for references to this work).

There are many other aspects of the phonology and word structure of Australian languages that deserve further treatment, but one final issue I would like to discuss is the relationship between sociolinguistics and phonology, a relationship which has barely been examined in the literature to date, although its presence lurks beneath the descriptions of many speech communities. I say "speech communities" here, rather than "languages", because this issue is closely bound up with the nature of multilingualism among speakers of Australian languages. There have been very few major works specifically devoted to an examination of the linguistic repercussions of mul-

tilingualism, but of those, we know that speakers appear to consciously manipulate sound patterns in order to achieve sociolinguistic effects. One of the best-described language areas where this kind of relationship can be observed is that of the Yolngu varieties in North East Arnhem Land. Wilkinson (1991) discusses the sociolinguistic and morpho-phonological patterns which differentiate two socially-defined speech varieties called "Dhuwal" and "Dhuwala" (the absolutive/locative form of the proximal demonstrative, used as way of referring to groups of related varieties by Yolngu speakers), which, broadly speaking, are differentiated from each other in that the Dhuwal varieties lack a final vowel which is present in the cognate Dhuwala variety. The Dhuwal-Dhuwala distinction cross-cuts the genetic division of Yolngu varieties into sub-groups, such that, within the group of varieties called "Dhuwal-Dhuwala", there are particular named lects which belong to one or the other of these speech types. For instance, Djambarrpuyngu is a Dhuwal variety which is more closely related to the Dhuwala variety Gupapuyngu than it is to Djapu (Morphy 1983), another Dhuwal variety in a different genetic sub-group (Wilkinson 1991: 13). Individuals identify themselves with one of these speech varieties on the basis of paternity, but in every case will co-exist in a speech community with roughly equal numbers of speakers of the other type. In the standard case, for instance, one parent of an individual will be a speaker of a Dhuwal variety, and the other will be a speaker of a Dhuwala variety, because these speech varieties are associated with inter-marrying moieties.

The following table (from Wilkinson 1991: 97) presents the forms of the proximal and distal demonstratives in four closely related Dhuwal-Dhuwala varieties of Yolngu, two from the western subgroup, and two from the eastern, showing the morpho-phonological reflexes of the distinction. In this case, both the Dhuwal varieties agree in the implementation of the distinction (although they do not, always). What is of special relevance here is those forms where vowel deletion applies variably: the ergative and dative case forms of the demonstratives. Here, the vowel is retained when other case markers or discourse clitics follow. And in this case, the vowel-final forms of the demonstratives (as with other exceptional vowel-final forms in Dhuwal varieties) condition the lenited forms of bound morphemes discussed in Chong (2011). This presents us with a puzzle: does the grammar of speakers of Dhuwal variety provide both forms (consonant-final and vowel-final), or is the vowel-final form derived by rule? If the former, then what prevents the occurrence of consonant-final forms preceding other bound morphemes (which is otherwise licit, e.g. for other case forms of these demonstratives)?

To my knowledge, this alternating behaviour has not even been extensively described, let alone accounted for. Likewise undescribed are the anecdotal reports that speakers of Yolngu varieties are able to manipulate the alternant forms of case suffixes and other morphology in order to achieve social ends (identification with particular clan lects, for instance). These kinds of investigations will no doubt provide very interesting evidence concerning the ability of humans to access morphological and phonological information consciously or semi-consciously.

Table 4: Some Dhuwal-Dhuwala morphological correspondences, following Wilkinson (1991:97)

Sub-group	Western	Eastern	Western	Eastern
Type	Dhuwala	Dhuwala	Dhuwal	Dhuwal
Lect name	Gupapuyŋu	Gumatj	Djambarrpuyŋu	Djapu
prox /t̪uwal/				
abs/loc	t̪uwala	t̪uwala	t̪uwal	t̪uwal
erg	t̪ijaŋu	t̪ijaŋu	t̪ijaŋ(u-)	t̪ijaŋ(u-)
dat	t̪ijakku	t̪ijakku	t̪ijak(ku-)	t̪ijak(ku-)
loc	t̪ijala	t̪ijala	t̪ijal	t̪ijal
all	t̪ippala	t̪ippala	t̪ippal	t̪ippal
dist /ŋuɳa/				
erg	ŋuɻuŋu	ŋuɻuŋu	ŋuɻuŋ(u-)	ŋuɻuŋ(u-)
dat	ŋuɻukku	ŋuɻukku	ŋuɻuk(ku-)	ŋuɻuk(ku-)
loc	ŋuɳala	ŋuɳala	ŋuɳal	ŋuɳal
all	ŋuɳawala	ŋuɳawala	ŋuɳawal	ŋuɳawal

12 Conclusion

Australian languages have historically been important in the development of key aspects of phonological theory (for instance, Hale's 1973 article on abstractness in Lardil, Nash's 1986 analysis of Warlpiri, Sommer 1970 on VC syllables in Kunjen and, for Arrernte, Breen and Pensalfini 1999, to name just a few). Partly this is because Australian languages exhibit some properties which are rather unusual, cross-linguistically. For instance, the "place of articulation imperative" (Butcher 2006) which preserves pre-consonantal place specifications, unlike the vast majority of the world's languages where assimilation is the norm in this context (particularly in the case of nasals), makes Australian languages stand out as different. These languages belong to one of just two major groups with the most elaborated series of coronal place contrasts (the other being Dravidian languages), whose behaviour—phonetically and phonologically—we are still trying to understand. Some of the strongest evidence for the association of prosodic constituents to morphological ones can also be found in Australia. This is again a consistent pattern which does not find a ready explanation in major theories of phonology or morphology (see Baker 2008). It appears to be linked with the characteristic "looseness" of morphological juncture which is common among Australian languages across the continent (see Evans et al. 2008 for a dramatic example). Lastly, Australian languages have an exorbitant number of long-distance phonological processes targetting nasality, retroflexion and marked laryngeal features which likewise defy easy explanation and whose theoretical consequences have barely been examined. For these reasons, and many others I

have not had space to mention here, the phonology of Australian languages deserves fuller investigation for what it can tell us about the human language capacity in general.

References

Alderete, John 1997 Dissimilation as local conjunction. *Proceedings of the North East Linguistic Society (NELS)* 27: 17–31.

Alpher, Barry 1991 *Yir-Yoront Lexicon: Sketch and Dictionary of an Australian language*. Berlin/New York: Mouton de Gruyter.

Amberber, Mengistu, Brett Baker and Mark Harvey 2007 Complex predication and the coverb construction. In: Jeff Siegel, John Lynch and Diana Eades (eds.), *Language Description, History and Development: Linguistic Indulgence in Memory of Terry Crowley* (Creole Language Library 30), 209–219. Amsterdam/Philadelphia: John Benjamins.

Amery, Robert 1985 *A new diglossia: Contemporary speech varieties at Yirrkala in North East Arnhem Land*. Canberra: Australian National University MA thesis.

Austin, Peter 1981 *A Grammar of Diyari, South Australia*. (Cambridge Studies in Linguistics 32.) Cambridge: Cambridge University Press.

Baker, Brett J 1999 *Word Structure in Ngalakgan*. Sydney: University of Sydney PhD thesis.

Baker, Brett J 2004 Stem forms and paradigm reshaping in Gunwinyguan. In: Claire Bowern and Harold Koch (eds.), *Australian Languages: Classification and the Comparative method* (Current Issues in Linguistic Theory 249) 313–340. Amsterdam/Philadelphia: John Benjamins.

Baker, Brett J. 2005 The domain of phonological processes. In: Ilana Mushin (ed.), *Proceedings of the 2004 conference of the Australian Linguistics Society*. http://hdl.handle.net/2123/112

Baker, Brett J. 2008 *Word Structure in Ngalakgan*. Stanford: CSLI Publications.

Baker, Brett J. 2009 Two opaque processes in Wubuy: Issues in learnability and the lexicon. Paper presented at OzPhon, UNSW Sydney, 4 December.

Baker, Brett J. and Mark Harvey 2003 Word structure in Australian languages. *Australian Journal of Linguistics* 23: 3–33.

Baker, Brett, Kate Horrack, Rachel Nordlinger and Louisa Sadler 2010 Putting it all together: Agreement, incorporation, coordination and external possession in Wubuy (Australia). In: Miriam Butt and Tracy H. King (eds.), *Proceedings of the LFG '10 Conference*, 64–84. Stanford: CSLI Publications. http://csli-publications.stanford.edu

Baker, Brett and Rachel Nordlinger. 2008 Noun-Adjective compounds in Gunwinyguan languages. In: Miriam Butt and Tracy H. King (eds.), *Proceedings of the LFG '08 Conference*, 109–128. Stanford: CSLI Publications.

Baković, Eric 2000 *Harmony, dominance and control.* Brunswick NJ: Rutgers University PhD thesis.

Baković, Eric 2007 A revised typology of opaque generalisations. *Phonology* 24(2): 217–259.

Berry, Lynn 1999 *Alignment and adjacency in Optimality Theory: Evidence from Warlpiri and Arrernte*. Sydney: University of Sydney PhD thesis.

Blake, Barry 1979 *A Kalkatungu Grammar* (Pacific Linguistics B-56). Canberra: Australian National University.

Blevins, Juliette 1995. The syllable in phonological theory. In: John A. Goldsmith (ed.), *The Handbook of Phonological Theory*, 206–244. Malden, MA: Blackwell.

Blevins, Juliette 2001a Where have all the onsets gone? Initial consonant loss in Australian Aboriginal languages. In: Jane Simpson, David Nash, Mary Laughren, Peter Austin and Barry Alpher (eds.), *Forty Years On: Ken Hale and Australian Languages* (Pacific Linguistics 512), 481–492. Canberra: Australian National University.

Blevins, Juliette 2001b *Nhanda: An Aboriginal language of Western Australia*. Honolulu: University of Hawai'i Press.

Blevins, Juliette 2003 The independent nature of phonotactic constraints: An alternative to syllable-based approaches. In: Caroline Féry and Ruben van der Vijver (eds.), *The Syllable in Optimality Theory*, 375–403. Cambridge: Cambridge University Press.

Blevins, Juliette 2004 *Evolutionary Phonology: The Emergence of Sound Patterns*. Cambridge: Cambridge University Press.

Blevins, Juliette and Doug Marmion 1994 Nhanta historical phonology. *Australian Journal of Linguistics* 14(2): 193–216.

Blust, Robert 2012 One mark per word? Some patterns of dissimilation in Austronesian and Australian languages. *Phonology* 29(3): 355–381.

Borowsky, Toni 1990 *Topics in the Lexical Phonology of English*. New York: Garland. [Revision of author's 1986 University of Massachusetts PhD dissertation.]

Bowern, Claire 2004 *Bardi verb morphology in historical perspective*. Cambridge MA: Harvard University PhD thesis.

Breen, Gavan 1971 *A description of the Waḷuwara language*.Melbourne: Monash University MA thesis.

Breen, Gavan 1990 The syllable in Arrernte phonology. MS., School of Australian Linguistics and Institute for Aboriginal Development, Alice Springs.

Breen, Gavan 1992 Some problems in Kukatj phonology. *Australian Journal of Linguistics* 12: 1–44.

Breen, Gavan 2001 The wonders of Arandic phonology. In: Jane Simpson, David Nash, Mary Laughren, Peter Austin and Barry Alpher (eds.), *Forty Years On: Ken Hale and Australian languages* (Pacific Linguistics 512), 45–69. Canberra: Australian National University.

Breen, Gavan and Robert J. Pensalfini 1999 Arrernte: A language with no syllable onsets. *Linguistic Inquiry* 30: 1–25.

Browman, Catherine P. and Louis Goldstein 1989 Articulatory gestures as phonological units. *Phonology* 6: 201–251.

Bermúdez-Otero, Ricardo 2011 Cyclicity. In: Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume and Keren Rice (eds.), *The Blackwell Companion to Phonology*, 2019–2048. Chichester, West Sussex: Wiley-Blackwell.

Butcher, Andrew 1995 The phonetics of neutralisation: The case of Australian coronals. In Jack Windsor Lewis (ed.), *Studies in General and English phonetics: Essays in Honour of J.D. O'Connor*, 10–38. London/New York: Routledge.

Butcher, Andrew 2006 Australian Aboriginal languages: Consonant-salient phonologies and the 'Place-of-Articulation Imperative'. In: Jonathan Harrington and Marija Tabain (eds.), *Speech Production: Models, Phonetic Processes, and Techniques*, 187–210. New York: Psychology Press.

Capell, Arthur 1956 *A New Approach to Australian Linguistics [Handbook of Australian languages, Part 1*] (Oceania Linguistic Monographs 1.) Sydney: University of Sydney Press.

Catford, J.C 1977 *Fundamental Problems in Phonetics*. Edinburgh: Edinburgh University Press.

Chappell, Hilary and William McGregor (eds.) 1996 *The Grammar of Inalienability: A Typological Perspective on Body Part Terms and Part-Whole Relation*. (Empirical Approaches to Language Typology 14.) Berlin: Walter de Gruyter.

Chomsky, Noam and Morris Halle 1968 *The Sound Pattern of English*. New York, Evanston and London: Harper and Row.

Chong, Adam 2011 Lenition in Gaalpu: An Optimality Theoretic analysis. *Australian Journal of Linguistics* 31(4): 473–490.
Clendon, Mark 2000a *Topics in Worora grammar*. Adelaide: University of Adelaide PhD thesis.
Clendon, Mark 2000b *A Grammar of Worora*. Halls Creek: Kimberley Language Resource Centre.
Crowhurst, Megan 2004 Mora alignment. *Natural Language and Linguistic Theory* 22: 127–177.
Crowhurst, Megan and Mark Hewitt 1995 Prosodic overlay and headless feet in Yidiŋ. *Phonology* 12: 39–84.
Crowley, Terry 1978 *The Middle Clarence Dialects of Bandjalang*. Canberra: Australian Institute of Aboriginal Studies.
Davis, Stuart 1988 Syllable onsets as a factor in stress rules. *Phonology* 5(1): 1–19.
Davis, Stuart 2011 Quantity. In: John Goldsmith, Jason Riggle and Alan C. L. Yu (eds.), *The Handbook of Phonological Theory,* 2nd edn., 103–140. Cambridge, MA: Blackwell.
Dench, Alan 1981 *Panyjima phonology and morphology.* Canberra: Australian National University MA thesis.
Dench, Alan 1994 *Martuthunira: A Language of the Pilbara Region of Western Australia.* (Pacific Linguistic C-125.) Canberra: Australian National University.
Di Sciullo, Anna-Maria and Edwin Williams 1987 *On the Definition of Word*. Cambridge, MA: The MIT Press.
Dixon, R. M. W. 1968 *The Dyirbal language of North Queensland*. London: University of London PhD thesis.
Dixon, R. M. W. 1972 *The Dyirbal Language of North Queensland*. Cambridge: Cambridge University Press.
Dixon, R. M. W. 1977 *A Grammar of Yidiny*. Cambridge: Cambridge University Press.
Dixon, R. M. W. 1980 *The Languages of Australia*. Cambridge: Cambridge University Press.
Dixon, R. M. W. 1983 Nyawaygi. In: R.M.W. Dixon and Barry Blake (eds.), *Handbook of Australian languages*, vol. 3, 431–525. Canberra: Australian National University Press.
Dixon, R. M. W. 2002 *Australian languages: Their Nature and Development*. Cambridge: Cambridge University Press.
Donaldson, Tamsin 1980 *Ngiyambaa: The Language of the Wangaaybuwan*. (Cambridge Studies in Linguistics 29.) Cambridge: Cambridge University Press.
Evans, Nicholas 1995a Current issues in the phonology of Australian languages. In: John A. Goldsmith (ed.), *The Handbook of Phonological Theory*, 723–761. Malden, MA: Blackwell.
Evans, Nicholas 1995b *A Grammar of Kayardild, with Historical-comparative Notes on Tangkic*. Berlin: Walter de Gruyter.
Evans, Nicholas 2000 Iwaidjan, a very un-Australian language family. *Linguistic Typology* 4: 91–142.
Evans, Nicholas 2003 *Bininj Gun-wok: A Pan-dialectal Grammar of Mayali, Kunwinjku and Kune.* (Pacific Linguistics 541.) Canberra: Australian National University.
Evans, Nicholas, Janet Fletcher and Belinda Ross 2008 Big words, small phrases: Mismatches between pause units and the polysynthetic word in Dalabon. *Linguistics* 46(1): 89–129.
Fabricius, Anne H [Dineen, Anne] 1998 *A Comparative Survey of Reduplication in Australian Languages*. Munich: Lincom Europa.
Flemming, Edward 2003 The relationship between coronal place and vowel backness. *Phonology* 20: 335–373.
Furby, Christine 1974 Garawa phonology. In: Christine E. Furby, Luise A. Hercus, and Christine Kilham, *Papers in Australian Linguistics 7* (Pacific Linguistics A-37) 1–11. Canberra: Australian National University.
Gaby, Alice 2006 *A Grammar of Kuuk Thaayorre*. Melbourne: University of Melbourne PhD thesis.
Gafos, Adamantios 1999 *The Articulatory Basis of Locality in Phonology*. New York: Garland.

Gahl, Susanne 1996 Syllable onsets as a factor in stress rules: The case of Mathimathi revisited. *Phonology* 13(3): 329–344.

Garrett, Edward 1999 Minimal words aren't minimal feet. In: Matthew Gordon (ed.), *UCLA Working Papers in Linguistics, 1: Papers in phonology 2,* 68–105. Los Angeles: University of California.

Goedemans, Rob W. N. 1996 An optimality account of onset sensitivity in QI languages. *The Linguistic Review* 13(1): 33–48.

Goedemans, Rob W.N 2010 An overview of word stress in Australian Aboriginal languages. In: Rob Goedemans, Harry van der Hulst and Ellen A. van Zanten (eds.), *A Survey of Word Accentual Patterns in the Languages of the World*, 55–86. Berlin/New York: de Gruyter Mouton.

Goddard, Cliff 1986 *Yankunytjatjara Grammar*. Alice Springs: Institute for Aboriginal Development.

Goldsmith, John 1990 *Autosegmental and Metrical Phonology*. Oxford: Basil Blackwell.

Gordon, Matthew 2005 A perceptually-driven account of onset-sensitive stress. *Natural Language & Linguistic Theory* 23(3): 595–653.

Green, Ian 1989 *Marrithiyel: a language of the Daly River region of Australia's Northern Territory*. Canberra: Australian National University PhD thesis.

Gurevich, Naomi 2004 *Lenition and Contrast: The Functional Consequences of Certain Phonetically Conditioned Sound Changes*. New/London: Routledge.

Hale, Kenneth L. 1964 Classification of the Northern Paman languages, Cape York Peninsula, Australia: A research report. *Oceanic Linguistics* 3: 248–265.

Hale, Kenneth L. 1973 Deep-surface canonical disparities in relation to analysis and change: An Australian example. In: Thomas Sebeok (ed.), *Current Trends in Linguistics, Vol. 11*, 401–458. The Hague: Mouton.

Hale, Kenneth L 1976 Phonological developments in particular Northern Paman languages. In: Peter Sutton (ed.), *Languages of Cape York* (AAS: Research and Regional Studies 6), 7–40. Canberra: Australian Institute of Aboriginal Studies.

Hale, Kenneth L 1977. § 1.3 Elementary remarks on Walbiri orthography, phonology and allomorphy. 34pp. MS. Cambridge, Mass.: M.I.T.

Hamilton, Philip 1994 On the internal structure of the coronal node. In: Andreas Kathol and Michael Bernstein (eds.), *Proceedings of the Eastern States Conference on Linguistics (ESCOL) '93*, 129–140. Ithaca, NY: CLC Publications, Cornell University.

Hamilton, Philip 1996 *Phonetic constraints and markedness in the phonotactics of Australian Aboriginal languages.* Toronto: University of Toronto PhD thesis.

Hansen, Ken C. and Lesley E. Hansen 1969 Pintupi phonology. *Oceanic Linguistics* 8: 153–170.

Hansson, Gunnar Ólafur 2001 *Theoretical and typological issues in coronal harmony.* Berkeley CA: University of California at Berkeley PhD thesis.

Harris, Barbara P. and Geoff O'Grady 1976 An analysis of the progressive morpheme in Umpila verbs. In: Peter Sutton (ed.), *Languages of Cape York* (AAS: Research and Regional Studies 6), 165–212. Canberra: Australian Institute of Aboriginal Studies.

Harris, James W 1969 *Spanish Phonology*. (Research Monograph No. 54.) Cambridge, MA: MIT Press.

Harvey, Mark 1991 Glottal stop, underspecification, and syllable structure among the Top End languages. *Australian Journal of Linguistics* 11: 67–105.

Harvey, Mark 2001 *A Grammar of Limilngan.* (Pacific Linguistics 516.) Canberra: Australian National University.

Harvey, Mark 2002 *A Grammar of Gaagudju*. (Mouton Grammar Library 24.) Berlin: Mouton de Gruyter.

Harvey, Mark 2003 A reconstruction of Gunwinyguan phonology. In: Nicholas Evans (ed.), *The Non-Pama-Nyungan Languages of Northern Australia: Comparative Studies of the Continent's most Linguistically Complex Region* (Pacific Linguistics 552), 205–268. Canberra: Australian National University s.

Harvey, Mark 2011 Prepalatals in Arandic. *Australian Journal of Linguistics* 31(1): 79–110.
Harvey, Mark and Brett J. Baker 2005a Coronal place oppositions. MS. University of Newcastle, NSW and University of New England, NSW.
Harvey, Mark and Brett J. Baker 2005b Vowel harmony, directionality and morpheme structure constraints in Warlpiri. *Lingua* 115(10): 1457–1474.
Harvey, Mark and Toni Borowsky 1999 The minimum word in Warray. *Australian Journal of Linguistics* 19: 89–99.
Hayes, Bruce 1989 Compensatory lengthening in moraic phonology. *Linguistic Inquiry* 20: 253–306.
Hayes, Bruce 1995 *Metrical Stress Theory: Principles and Case Studies*. Chicago: University of Chicago Press.
Hayes, Bruce 1999 Phonological restructuring in Yidiny and its theoretical consequences. In: Ben Hermans and Marc Oostendorp (eds.), *The Derivational Residue in Phonological Optimality Theory* (Linguistik Aktuell/Linguistics Today 28), 175–205. Amsterdam/Philadelphia: John Benjamins.
Heath, Jeffrey 1977 Warramunga grammatical notes. MS. Canberra: AIATSIS.
Heath, Jeffrey 1978a *Linguistic Diffusion in Arnhem Land*. (AIAS Research and regional studies 13.) Canberra: Australian Institute of Aboriginal Studies.
Heath, Jeffrey 1978b *Ngandi Grammar, Texts, and Dictionary*. (AIAS new series 4.) Canberra: Australian Institute of Aboriginal Studies.
Heath, Jeffrey 1980a *Basic Materials in Ritharngu: Grammar, Texts and Dictionary*. (Pacific Linguistics B-62.) Canberra: Australian National University.
Heath, Jeffrey 1980b *Nunggubuyu Myths and Ethnographic Texts*. (AIAS new series 23.) Canberra: Australian Institute of Aboriginal Studies.
Heath, Jeffrey 1980c *Dhuwal (Arnhem Land) Texts on Kinship and Other Subjects with Grammatical Sketch and Dictionary*. (Oceania Linguistic Monographs 23). Sydney: University of Sydney.
Heath, Jeffrey 1981 *Basic Materials in Mara: Grammar*, *Texts*, *and Dictionary*. (Pacific Linguistics C-60.) Canberra: Australian National University.
Heath, Jeffrey 1984 *Functional Grammar of Nunggubuyu*. (AIAS new series 53.) Canberra: Australian Institute of Aboriginal Studies.
Henderson, John 1998 *Topics in Eastern and Central Arrernte grammar*. Perth: University of Western Australia PhD thesis.
Henderson, John 2002 The word in Eastern/Central Arrernte. In R. M. W. Dixon and Alexandra Aikhenvald (eds.), *Word: A Cross-linguistic Typology*, 100–124. Cambridge: Cambridge University Press.
Hercus, Luise 1986 *Victorian Languages: A Late Survey*. (Pacific Linguistics B-77.) Canberra: Australian National University.
Hoddinott, William G. and Frances M. Kofod 1988 *The Ngankikurungkurr language (Daly River area, Northern Territory)*. (Pacific Linguistics D-77.) Canberra: Australian National University.
Itô, Junko 1986 *Syllable theory in Prosodic Phonology*. Amherst MA: University of Massachusetts PhD thesis.
Jagst, Lothar 1975 Ngardilpa (Warlpiri) phonology. In: Margaret C. Sharpe, Lothar Jagst and David Birk, *Papers in Australian Linguistics No. 8* (Pacific Linguistics A-39), 21–57. Canberra: Australian National University.
Jakobson, Roman 1962 *Selected Writings 1: Phonological studies*. The Hague: Mouton.
Jones, Caroline 2000 Contiguity under infixation: Mangarrayi reduplication. In: Robert J. Pensalfini and Norvin Richards (eds.), *Papers on Australian Languages*, (MIT Working Papers on Endangered and Less Familiar Languages 2) 105–118. Cambridge, MA: MIT.

Jones, Caroline 2001 Licit vs. illicit responses in Meinhof's Rule phenomena. In Michele Feist, Steve Fix, Jennifer Hay and Julia Moore (eds.), *Proceedings of the 10th Student Conference in Linguistics (SCIL 10)*) (MIT Working Papers in Linguistics 37), 95–103. Cambridge MA: MIT.

Kiparsky, Paul 1971 Historical linguistics. In: William Orr Dingwall (ed.), *A Survey of Linguistic Science*, 576–642. College Park, Maryland: University of Maryland Press. [Reprinted in Paul Kiparsky. 1982. *Explanation in phonology*. Dordrecht: Foris.]

Kiparsky, Paul 1976 Abstractness, opacity, and global rules. In: Andreas Koutsoudas (ed.), *The Application and Ordering of Grammatical Rules*, 160–186. The Hague: Mouton de Gruyter.

Kiparsky, Paul 1985 Some consequences of lexical phonology. *Phonology* 2: 82–136.

Kisseberth, Charles 1970 On the functional unity of phonological rules. *Linguistic Inquiry* 1: 291–306

Lavoie, Lisa M 2001 *Consonant Strength: Phonological Patterns and Phonetic Manifestations*. New York/London: Garland Press.

Levin, Juliette 1985 Reduplication in Umpila. In: Diana Archangeli, Andrew Barss and Richard Sproat (eds.), *Papers in Theoretical and Applied Linguistics*, (MIT Working Papers in Linguistics 6), 133–159. Cambridge MA: MIT.

McCarthy, John and Alan Prince 1986 Prosodic Morphology. MS. Waltham MA: Brandeis University.

McCarthy, John and Alan Prince 1995a Prosodic Morphology. In: John Goldsmith (ed.), *A Handbook of Phonological Theory*, 318–366. Oxford: Basil Blackwell.

McCarthy, John J. and Alan Prince 1995b Faithfulness and reduplicative identity. In: Jill N. Beckman, Laura Walsh Dickey and Suzanne Urbanczyk (eds.), *Papers in Optimality Theory* (University of Massachusetts Occasional Papers 18), 249–384. Amherst, MA: Graduate Linguistic Student Association, University of Massachusetts.

McConvell, Patrick 1988 Nasal cluster dissimilation and constraints on phonological variables in Gurindji and related languages. *Aboriginal Linguistics* 1: 135–165.

McDonald, Maryalyce 1977 *A study of the phonetics and phonology of Yaraldi and associated dialects*.Canberra: Australian National University MA thesis.

McGregor, William 1990 *A Functional Grammar of Gooniyandi*. (Studies in Language Companion Series 22.) Amsterdam: John Benjamins.

McKay, Graham. 1975. *Rembarŋa: A language of central Arnhem Land*. Canberra: Australian National University PhD thesis. [Published 2011, Muenchen: Lincom Europa.]

McKay, Graham 1984 Stop alternations in Ndjébbana (Kunibidji). In: Kathleen Glasgow, Arthur Capell, Graham McKay, Rod Kennedy and David Trefry (eds.), *Papers in Australian Linguistics No. 16* (Pacific Linguistics A-68), 107–117. Canberra: Australian National University.

McKay, Graham 2000 Ndjébbana. In: R. M. W. Dixon and Barry Blake (eds.), *Handbook of Australian Languages volume 5*, 155–354. Melbourne: Oxford University Press.

McManus, Hope Eliza 2008 *Loanword adaptation: A study of some Australian Aboriginal languages*. Sydney: University of Sydney BA Honours thesis.

Merlan, Francesca 1982 *Mangarayi*. (Croom Helm Descriptive Grammars Series.) Amsterdam: North Holland.

Merlan, Francesca 1983 *Ngalakan Grammar, Texts, and Vocabulary*. (Pacific Linguistics B-89.) Canberra: Australian National University.

Merlan, Francesca 1994 *A grammar of Wardaman: A Language of the Northern Territory of Australia*. (Mouton Grammar Library 11.) Berlin/New York: Mouton de Gruyter.

Mielke, Jeff 2005 Ambivalence and ambiguity in laterals and nasals. *Phonology* 22: 169–203.

Morphy, Frances 1983 Djapu, a Yolngu dialect. In: R. M. W. Dixon and Barry Blake (eds.), *Handbook of Australian languages vol. 3*, 1–188. Canberra: Australian National University Press.

Murray, Robert and Theo Vennemann 1983 Sound change and syllable structure in Germanic phonology. *Language* 59: 514–528.

Nash, David G. 1979 Yidiny stress: A metrical account. *Proceedings of the Ninth Annual Meeting of the North Eastern Linguistics Society (NELS)/CUNY Forum 7–8*, City University of New York. New York: Routledge.
Nash, David G. 1982 Warlpiri verb roots and preverbs. In: Stephen M. Swartz (ed.), *Papers in Warlpiri grammar: In memory of Lothar Jagst*, 165–216. (Work Papers of SIL-AAB A6.). Darwin: Summer Institute of Linguistics.
Nash, David G. 1983 TESL and Warlpiri Children. *N.T. Bilingual Education Newsletter* 1: 6–24; 2: 47.
Nash, David G. 1986 *Topics in Warlpiri Grammar*. New York: Garland. [Revision of author's 1980 Massachusetts Institute of Technology PhD thesis.]
Ní Chiosáin, Máire and Jaye Padgett 2001 Markedness, segment realization, and locality in spreading. In: Linda Lombardi (ed.), *Segmental Phonology in Optimality Theory*, 118–56. Cambridge: Cambridge University Press.
Nordlinger, Rachel 1998 *A Grammar of Wambaya, Northern Territory (Australia)*. (Pacific Linguistics 140.) Canberra: Australian National University.
Nordlinger, Rachel 2010 Verbal morphology in Murrinh-Patha: Evidence for templates. *Morphology* 20(2): 321–341.
O'Grady, Geoffrey N. 1964 *Nyangumata Grammar*. (Oceania Linguistic Monographs 9.) Sydney: University of Sydney.
O'Grady, Geoffrey 1966 Proto-Ngayarda phonology. *Oceanic Linguistics* 5: 71–130.
O'Grady, Geoffrey 1976 Umpila historical phonology. In: Peter Sutton (ed.), *Languages of Cape York* (AAS: Research and Regional Studies 6), 61–67. Canberra: Australian Institute of Aboriginal Studies.
Ohala, John J. 1981 The listener as a source of sound change. In: Carrie S. Masek, Roberta A. Hendrick, and Mary Frances Miller (eds.), *Papers from the Chicago Linguistic Society* (Parasession on language behavior), 178–203. Chicago: Chicago Linguistic Society.
Pensalfini, Robert 2000 Suffix coherence and stress in Australian languages. In: John Henderson (ed.), *Proceedings of the 1999 Conference of the Australian Linguistic Society*. http://www.als.asn.au/proceedings/als1999/proceedings.html
Pensalfini, Robert 2003 *A Grammar of Jingulu, An Aboriginal Language of the Northern Territory*. (Pacific Linguistics 536.) Canberra: Australian National University.
Poser, William 1989 The metrical foot in Diyari. *Phonology* 6: 117–148.
Prince, Alan and Paul Smolensky 1993 [2004] Optimality theory: constraint interaction in generative grammar. Malden, MA: Blackwell.
Pym, Noreen and Bonnie Larrimore 1979 *Papers on Iwaidja Phonology and Grammar*. (Work Papers of SIL-AAB A2). Darwin: Summer Institute of Linguistics.
Radcliffe-Brown, A.R. 1929–1930 Fieldnotes from NSW. MS. Series number P129: E7, E9, F1. Sydney: University of Sydney.
Reid, Nicholas 1990 *Ngan'gityemerri, a language of the Daly River region*. Canberra: Australian National University PhD thesis. [Published 2011, Münich: Lincom Europa.]
Reid, Nicholas 1997 Class and classifier in Ngangityemerri. In: Mark Harvey and Nicholas Reid (eds.), *Nominal Classification in Aboriginal Australia* (Studies in Language Companion Series 37), 165–228. Amsterdam/Philadelphia: John Benjamins.
Rose, Sharon and Rachel Walker 2004 A Typology of Consonant Agreement as Correspondence. *Language* 80(3): 475–531.
Round, Erich 2009 *Kayardild morphology, phonology and morphosyntax*. New Haven CT: Yale University PhD thesis.
Round, Erich 2010 Widespread patterns of lenition in Australian indigenous languages. Paper presented at the 13th Australasian International Conference on Speech Science and Technology, Melbourne, 14–16 December.

Round, Erich 2011a Evolution(s) of some Tangkic morphophonology. Paper presented at the Australian Linguistic Society annual conference, Canberra, 2–4. December.

Round, Erich 2011b Word final phonology in Lardil: Implications of an expanded data set. *Australian Journal of Linguistics* 31(3): 327–350.

Rumsey, Alan 1978 A grammar of Ungarinjin with special reference to the structure of discourse. Chicago: University of Chicago PhD thesis. [Published 1982 as *An Intra-sentence Grammar of Ungarinjin, north-western Australia*. (Pacific Linguistics B-86.) Canberra: Australian National University.]

Rumsey, Alan 2000 Bunuba. In: R. M. W. Dixon and Barry Blake (eds.), *The Handbook of Australian Languages, volume 5*, 30–152. Melbourne: Oxford University Press.

Saulwick, Adam 2003 *A First Dictionary of Rembarrnga*. Maningrida, NT: Maningrida Arts and Culture.

Schultze-Berndt Eva 2000 *Simple and Complex Verbs in Jaminjung*. Nijmegen: Catholic University.

Selkirk, Elisabeth O. 1980 The role of prosodic categories in English word stress. *Linguistic Inquiry* 11: 563–605.

Selkirk, Elisabeth O. 1984 *Phonology and Syntax: The Relation between Sound and Structure*. (Current Studies in Linguistics 10.) Cambridge, MA: MIT Press.

Sharp, Janet 2004 *Nyangumarta: A Language of the Pilbara Region of Western Australia*. (Pacific Linguistics 556.) Canberra: Australian National University.

Sharpe, Margaret C. 1972 *Alawa phonology and grammar*. (AIAS 37.) Canberra: Australian Institute for Aboriginal Studies.

Sharpe, Margaret C. 2005 *Grammar and Texts of the Yugambeh-Bundjalung Dialect Chain in Eastern Australia*. Muenchen: Lincom Europa.

Simpson, Jane 1998 Warumungu. In: Andrew Spencer and Arnold Zwicky (eds.), *The Handbook of Morphology*, 707–736. Oxford: Blackwell.

Simpson, Jane and Margaret Withgott 1986 Pronominal clitic clusters and templates. In: Hagit Borer (ed.), *The Syntax of Pronominal Clitics* (Syntax and Semantics 19), 149–174. Orlando, FL: Academic Press.

Smith, Ian and Steve Johnson 2000 Kugu Nganhcara. In: R. M. W. Dixon and Barry Blake (eds.), *A Handbook of Australian Languages vol. 5*, 355–489. Melbourne: Oxford University Press.

Sommer, Bruce 1969 *Kunjen Phonology: Synchronic and Diachronic*.(Pacific Linguistics B-11.) Canberra: Australian National University.

Sommer, Bruce 1970 An Australian language without CV syllables. *International Journal of American Linguistics* 36: 57–58.

Steriade, Donca 2001 Directional asymmetries in place assimilation: A perceptual account. In: Elizabeth Hume and Keith Johnson (eds.), *The Role of Speech Perception in Phonology*, 219–250. San Diego: Academic Press.

Stevens, Kenneth N. 1998 *Acoustic Phonetics*. (Current Studies in Linguistics 30.) Cambridge, MA: MIT Press.

Strehlow, T. G. H. 1944 *Aranda Phonetics and Grammar*. (Oceania Monographs 7.) Sydney: University of Sydney. [Reprinted from *Oceania* 12.255–302; 13.71–103, 177–200, 310–61; 14.68–90, 159–81, 250–6.]

Sutton, Peter (ed.) 1976 *Languages of Cape York*. (AAS: Research and Regional Studies 6.) Canberra: Australian Institute of Aboriginal Studies.

Topintzi, Nina 2011 Onsets. In: Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume and Keren Rice (eds.), *The Blackwell Companion to Phonology*, 1285–1308. Blackwell Publishing.

Tranel, Bernard 1991 CVC light syllables, geminates, and Moraic Theory. *Phonology* 8: 291–302.

Trubetzkoy, Nikolay S. 1969 *Principles of Phonology*. Berkeley and Los Angeles: University of California Press. [Translation by Christiane A. M. Baltaxe of *Grundzüge der Phonologie*, 1939, Prague: Travaux du Cercle linguistique de Prague.]

Tryon, Darrell 1970 *An Introduction to Maranungku (Northern Australia)*. (Pacific Linguistics B-15.) Canberra: Australian National University.

Turpin, Myfany 2008 Text, rhythm and metrical form in an Aboriginal song series. In: *Proceedings of INTERSPEECH-2008*, 96–98.

van Egmond, Marie-Elaine 2012 *Enindhilyakwa phonology, morphosyntax and genetic position*. Sydney: University of Sydney PhD thesis.

Voegelin, C F, F M Voegelin, T Matsuda, Geoffrey O'Grady, and Stephen Wurm 1963 Obtaining an index of phonological differentiation from the construction of non-existent minimax systems. *International Journal of American Linguistics* 29(1): 4–28

Waters, Bruce 1980 Djinang phonology. In: Bruce E. Waters and Peter A. Busby, *Papers in Australian linguistics No. 14* (Pacific Linguistics A-60), 141–178. Canberra: Australian National University.

West, Paula 1999 Perception of distributed coarticulatory properties of English /l/ and /r/. *Journal of Phonetics* 27(4): 405–426.

Wilkinson, Melanie 1991 *Djambarrpuyŋu: A Yolŋu variety of northern Australia*. Sydney: University of Sydney PhD thesis.

Wilson, Stephen 1999 *Coverbs and Complex Predicates in Wagiman*. Stanford: CSLI.

Wood, Ray K. 1978 Some Yuulngu phonological patterns. In: Jean F. Kirton, Ray K. Wood, Luise Hercus, Chester S. Street, Harry P. Kulampurut, Dianne Buchanan and Bella Charlie, *Papers in Australian Linguistics No. 11* (Pacific Linguistics A- 51), 53–117. Canberra: Australian National University.

Yallop, Collin 1977 *Alyawarra: An Aboriginal Language of Central Australia*. (AIAS Research and Regional Studies 11.) Canberra: Australian Institute of Aboriginal Studies.

Yu, Alan C.L. 2007 *A Natural History of Infixation*. (Oxford Studies in Theoretical Linguistics 15.) Oxford: Oxford University Press.

Yu, Alan C. 2011 Contrast reduction. In: John Goldsmith, Jason Riggle and Alan C.L. Yu (eds.), *The Handbook of Phonological Theory* (2nd edn.), 291–318. Chichester, West Sussex and Malden, MA: Wiley.

Zwicky, Arnold M. 1985 Clitics and particles. *Language* 61: 283–305.