25. Current Issues in the Phonology of Australian Languages

NICK EVANS

Subject	Theoretical Linguistics » Pholonogy
Place	Australasia » Australia
DOI:	10.1111/b.9780631201267.1996.00027.x

0 Introduction

Between the 1960s and the early 1980s Australianist phonology saw its "classical" period, in which the main structural and phonetic characteristics of segmental systems were worked out properly, a large body of high-quality descriptions was produced for the first time, and many problems of morphophonemics and historical phonology were tackled. This phase is best represented by the surveys in Capell (1967), Dixon (1980), and Yallop (1982), as well as in the phonology chapters of many classic grammars written in this period.

The last decade has seen a shift of focus toward the more complex problems of nonlinear and metrical phenomena, which were often described in grammars of the classical period[1] but which the unavailability of adequate theoretical models kept somewhat marginalized. With few exceptions, however, there has been an unproductive bifurcation between descriptive work by field-workers, and theoretical analyses by phonologists "squatting in their theoretical cocoons" (Dixon 1977a, p. xvii); as a result, the potential for fruitful interplay between phonological theory and description has only been scratched. This demarcation of tasks contrasts with the fields of syntax and typology, which have benefited enormously from over 20 years of cross-fertilization between descriptivists, theoreticians, and practitioners strung out along the path between these poles.

I am therefore writing this article with two partially disjoint sets of readers in mind. On the one hand, I wish to make theoretical phonologists aware of many phonological properties of Australian languages that are of great interest to current theories of phonology; often the relevant data is buried in publications little-known outside Australia. On the other, I wish to encourage descriptively oriented Australianists to widen their brief by paying more attention to nonlinear phenomena: a welcome effect of recent theoretical developments has been to reveal a great deal of variation under the superficial phonological uniformity of Australian languages. As a general principle, wherever the choice has arisen I have elected to include more empirical material, rather than outlining its consequences for one theory or another.

1 Genetic Overview

All the indigenous languages of Australia, including the language of the Western Torres Strait, probably form a single genetic phylum, although relations between some are extremely remote and suggestive of a great time depth. There is no evidence for genetic relationships with languages outside Australia.

Seven-eighths of Australia (see fig. 25.1) is occupied by languages of the Pama-Nyungan family, including such well-known languages as Dyirbal, Warlpir, Diyari, Yidiny, and Ngiyambaa. The remainder is far more complex genetically, containing around 20 families, collectively known as non-

Pama-Nyungan.

There is a strong correlation between genetic and typological groupings. Pama-Nyungan languages are generally dependent marking, and use only suffixes; some make additional use of auxiliary clitic complexes. Non-Pama-Nyungan languages are head marking and generally use both suffixes and prefixes; in those such as Gunwinyguan and Tiwi, which are highly polysynthetic, their complex morphologies create complex rules of stress assignment.

While there were long-standing contacts with Papuan languages across the Torres Strait, and over the last few centuries with Austronesian languages on the north and northwest coast of Australia, the phonological effects of this were not substantial. The only clearcut example is the appearance of alveolar fricatives /s/ and /z/ in the Western Torres Strait language (see sec. 2.1).

2 Phonemic Inventories

Australian languages are remarkably homogeneous in their phonemic inventories – far more than in their grammar or lexicon. Detailed surveys of their phonemic systems are in Dixon (1980), Busby (1980), and Yallop (1982); Butcher (to appear b) is a thorough instrumental study of the phonetics of Australian sound systems, which are much more variable than their phonemic homogeneity would suggest.

A typical Australian consonant phoneme inventory is that for Kayardild,[2] given in table 25.1 Characteristically Ausralian are the presence of six paired stops and nasals, that can be grouped into pairs of peripheral, apical, and laminal articulations, the lack of a voicing contrast, the lack of fricatives, the presence of two "rhotics" (/r/ and /ɹ/), and a triangular vowel system with phonemic length. This table also illustrates the main symbols upon which I have standardized the rather variable orthographies now used for writing Australian languages.[3]

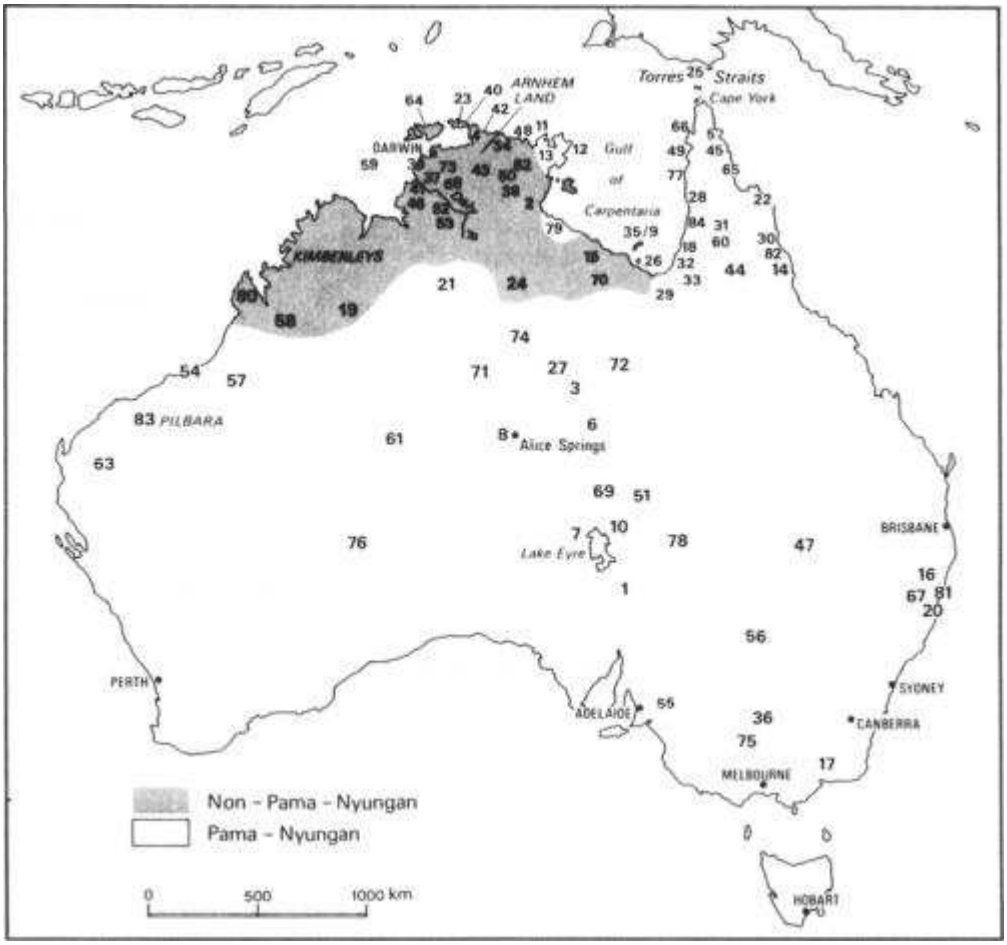


Figure 25.1 Map of Australia showing distribution of languages

Language locations, alternative names and primary sources

1 *Adnyamathanha* Schebeck (1974)
2 *Alawa* Sharpe (1972)
3 *Alyawarr* (Alyawarra) Yallop (1977)
4 *Amurdak* Handelsmann (1991)
5 *Anguthimri* Crowley (1981)
6 *Antekerepenh* (Antegerebenha) Breen (1977)
7 *Arabana* Hercus (1972)
8 *Arrernte* (Aranda) Wilkins (1989), Breen (1991)
9 *Damin* Hale (1973)
10 *Diyari* Austin (1981)
11 *Djambarrpuyngu* Wilkinson (1991)
12 *Djapu* Morphy (1983)
13 *Djinang* Waters (1980)
14 *Dyirbal* Dixon (1972)
15 *Garrwa* (Garawa) Furby (1972), Breen (to appear b)
16 *Gidabal* Geytenbeek & Geytenbeek (1971)
17 *Gippsland* Hercus (1986)
18 *Gog-Nar* Breen (1976)
19 *Gooniyandi* (Kuniyanti) McGregor (1990)
20 *Gumbaynggir* Eades (1979)
21 *Gurindji* McConvell (1988)
22 *Guugu Yimidhirr* Haviland (1979)
23 *Iwaidja* Pym & Larrimore (1979), Sayers & Pym (1977)
24 *Jingilu* (Djingili) Chadwick (1975)
25 *Kala Lagaw Ya* (Kennedy 1981), *Kala Kawaw Ya* Ford & Ober (1985) (two dialects of the Western Torres Strait language)
26 *Kayardild* Evans (in press)
27 *Kaytetye* (Kaititj, Kaytej) Koch (1980), Breen (1991)
28 *Kugu Nganhcara* Smith & Johnson (1985), MS.
29 *Kukatj* Breen (to appear)
30 *Kuku-Yalanji* (Gugu-Yalandji) Oates (1967), Patz (1982)
31 *Kunjen* Sommer (1969)
32 *Kurtjar* Black (1980)
33 *Kuthant* Black (1980)
34 *Kunparlang* Coleman (1982)
35 *Lardil* Hale (1973)
36 *Maḏimaḏi* Hercus (1986)
37 *MalakMalak* Birk (1976)
38 *Mangarayi* Merlan (1982)
39 *Maranungku* Tryon (1970)
40 *Marrgu* Evans field notes
41 *Marrithiyel* Green (1989)
42 *Mawng* (Maung) Capell & Hinch (1970)
43 *Mayali* Evans (1991)
44 *Mbabaram* Dixon (1991)
45 *Mpakwithi* Crowley (1983)
46 *Murrinhpatha* (Murinbata) Walsh (1979), Street & Mollinjin (1981)
47 *Muruwari* Oates (1988)
48 *Ndjébbana* (Djeebbana) McKay (1979, 1984), McKay & Coleman (to appear)
49 *Ntra?ŋiṯ* Hale (1976a)
50 *Ngalakan* Merlan (1983)
51 *Ngamini* Austin (1988b)
52 *Ngan´gityemerri* Reid (1990)
53 *Ngankikurungkurr* Hoddinott & Kofod (1988)
54 *Ngarla* Geytenbeek (1992)
55 *Ngarrinjerri* Johnson (1986)
56 *Ngiyambaa* Donaldson (1980)
57 *Nyangumarda* (Nyangumarta) Hoard & O'Grady (1976), Sharp 1986, Geytenbeek (1992)
58 *Nyigina* Stokes (1982)
59 *Paccamal* (Bajjamal), (Ford 1990)
60 *Olgolo* Dixon (1970b)
61 *Pintupi* Hansen & Hansen (1969)
62 *Rembarrnga* (Rembarnga) McKay (1975)
63 *Tharrgari* Klokeid (1969)
64 *Tiwi* Osborne (1974)
65 *Umpila* Harris & O'Grady (1976)
66 *Uradhi* Crowley (1983)
67 *Waalubal* Crowley (1978)
68 *Wagiman* Cook (1987)
69 *Wangkanguru* Hercus (1972)
70 *Wanyi* Breen (to appear b)
71 *Warlpiri* Nash (1986)
72 *Warluwarra* Breen (1971)
73 *Warray* Harvey (1986)
74 *Warumungu* Simpson & Heath (1982), Simpson (1992)
75 *Wergaia* Hercus (1986)
76 *Western Desert* Douglas (1964)
77 *Wik-Mungkan* Sayers (1974, 1976, 1977)
78 *Yandrruwandha* Austin (1988b)
79 *Yanyuwa* Kirton & Charlie (1979)
80 *Yawuru* Hosokawa (1991)
81 *Yaygir* Crowley (1979)
82 *Yidiny* Dixon (1977a, 1977b)
83 *Yindjibarndi* Wordick (1982)
84 *Yir-Yoront* Alpher (1973, 1991)

Most differences across Australian phoneme inventories comprise variations on the above theme – the apical and / or laminal series may be collapsed into one; the glottal stop or a seventh place of articulation may be added. Further lateral phonemes, or another rhotic, may be found, or fricatives, or some sort of stop contrast (fortis/lenis, short/long, etc.). Within the vowel system, length may be

eliminated, or the set may be reduced to two, or enlarged to anywhere up to 17. These variations are discussed in section 2.1 (consonants) and section 2.2 (vowels). In addition, various elements may combine into complex segments, such as prestopped nasals or prenasalized stops, and features like retroflexion or rounding may be spread or transferred; these possibilities are discussed in section 3.

CONSONANTS						
	PERIPHERAL	*APICAL*		*LAMINAL*		*PERIPHERAL*
	bilabial	*apico-alveolar*	*apico-post-alveolar (retroflex)*	*lamino-dental*	*lamino-palatal*	*dorso-velar*
stop	p	t	ʈ	ṯ	c	k
nasal	m	n	ɳ	ṉ	ɲ	ŋ
lateral		l				
trill		r				
approximant	w		ɻ		y	

VOWELS		
	front	back
high	i, i:	u, u:
low	a, a:	

Table 25.1 The Kayardild phoneme inventory

2.1 Consonant Inventories

Linear positions

Traditional Australianist terminology recognizes both active and passive articulators: "apical" and "laminal" series are first characterized in terms of both their active articulators (tongue-tip and tongue-blade)[4] and their passive articulators, i.e., by the point of contact. The Australianist term "peripheral" is identical to the standard term "non-coronal."

There is an enormous amount of evidence – from phonotactics, morphophonemics, diachronic changes, and synchronic variation – for these groupings. To begin with, in many languages that collapse the apical or laminal series, the allophones are in complementary distribution – lamino-palatal and lamino-dental phones are in complementary distribution in some dialects of Western Desert, conditioned by adjacent vowels, while in Wanyi apico-alveolar and apico-postalveolar phones are in complementary distribution. Often phonemic contrasts within a series are neutralized in certain positions – most languages neutralize the alveolar / retroflex contrast word-initially,[5] and some neutralize the lamino-dental / lamino-palatal contrast word-finally.

Many morphophonemic processes pick out one or another of these classes. In Kayardild, stem-final laminals of both series become apico-alveolars in the nominative; in Mayali iterative reduplications, inserted velar nasals dissimilate to apicals between peripheral-initial syllables (sec. 8). And descriptions of several languages (e.g., Muruwari and Ngiyambaa) report interspeaker or cross-dialectal variation within one of these classes – in Ngiyambaa "Keewong speakers say *munu*▪*ga* for 'elbow' and *mandaba*▪ for 'red-bellied black snake' while Trida speakers say *Ṇunu*▪*ga* and *Ṇandaba*▪" (Donaldson 1980, p. 18). Dixon (1970a) has argued that two-laminal series are a phonemic split from an original single-laminal system, and similar arguments have sometimes been made for the retroflex series.

A number of arguments have been made concerning the markedness relations of these six positions. Laughren (1990) proposes that, for Central Australian languages, laminals are the unmarked coronal,

citing the fact that apicals become laminals in Warlpiri baby talk (Laughren 1984), and the existence of diachronic changes from initial apical to laminal in proto-Pama-Nyungan (Evans 1988), but against this it may be argued that baby-talk exploits sound-symbolism rather than markedness relations, and that diachronic and morphophonemic changes in the other direction, such as Kayardild delaminalization, are also attested. Within the apical series, she argues that the retroflex articulation is unmarked, since retroflex articulation is found in Warlpiri when the contrast is neutralized, e.g., word-initially, and in onsets after syllables beginning in /r/.

Hamilton (1989, 1992) discusses the similarity between the multivalent gradation of articulators in Australian languages and the well-known patterns of the sonority hierarchy. He proposes the articulator continuum LABIAL > DORSAL > LAMINAL > APICAL as an explanation for phonotactic patterns widespread in Australia: in a given language, syllable-final consonants will be drawn from a continuous portion from the right of the continuum, and syllable-initial consonants will be drawn from a continuous portion from the left of the hierarchy. Interestingly, this hierarchy also correlates with the commonness of fricative phonemes in Australian languages (see below), which are increasingly rare as one moves from left to right on the articulator continuum (cf. McConvell 1988, p. 162ff.).

Some languages augment the six canonical linear positions in one of two ways. Dorso-palatals /k^y/ and sometimes /$ɲ^y$/ appear as an areal feature in the Barkly region, southwest of the Gulf of Carpentaria, though only in Yanyuwa does this make seven linear positions, since the other languages have but a single laminal series. These dorso-palatals probably derive historically from clusters of lamino-palatal plus dorso-velar, and controversy continues about whether this is also the best synchronic analysis for some of the Barkly languages.

A second type of seventh position is found in the Arandic languages Kaytetye, Antekerepenh and Alyawarra, where apical consonants may be prepalatalized. These languages have just two major vowel phonemes, and prepalatalized consonants condition high front vowel allophones; they essentially represent a transfer of frontness from vowel to consonant phonemes.

Glottal stop phonemes have developed in two areas - Cape York, in a number of relatively closely related languages, and Arnhem Land, as an areal feature spanning the Pama-Nyungan/non-Pama-Nyungan border. The synchronic behavior and diachronic sources of /ʔ/ are quite different in the two areas. In Cape York it is a normal segmental phoneme, can occur intervocalically, and derives from /t/, /r/, /g/, /b/ or some combination thereof (Dixon 1980, p. 201). In Arnhem Land it is restricted to syllable-final position and is best analysed as an autosegment (sec. 3.6); it appears to have originated there as a *Grenzsignal* rather than from a segmental phoneme (Harvey 1991).

Laterals

Though languages in the eastern third of the continent have only a single lateral phoneme (Dixon 1980, p. 141), those in the western two-thirds may have up to four - one for each coronal articulation. Diyari, for example has /l/, /ɭ/, /ʎ/ and /ʟ/. The set may be further augmented by prestopped laterals (sec. 3.2) or prelateralized stops (sec. 3.3).

Rhotics

Most Australian languages contrast at least an alveolar tap / trill /r/ and a retroflex continuant /ɻ/. some have a third r-like phoneme - Warlpiri adds a retroflex tap /ɽ/, Diyari contrasts alveolar tap and trill phonemes, and Yaygir has a voiceless trill /r̥/.

The phonological validity of the term "rhotic," often used for the above class of sounds, remains a matter for debate. On the one hand, in languages such as Yidiny (Dixon 1977a, pp. 98-100) /r/ dissimilates to /l/ in the presence of /ɻ/ or /r/, i.e., either rhotic. On the other hand, Alpher (1988) and McGregor (1988) show that in many languages /r/ patterns with the laterals, and /ɻ/ with the approximants.

Approximants

Australian languages typically have a peripheral glide /w/ and a palatal glide /y/, in addition to /ɻ/. A few languages have richer systems: Yindjibarndi adds an interdental glide; Bajjamal contrasts

labiovelar /w/ and bilabial /β/, at least phonetically and possibly phonemically;[6] and a number of Arandic dialects contrast rounded and unrounded velar approximants (Wilkins 1989, pp. 89–90).

Fricatives are rare, and where they exist the place of articulation is marked cross-linguistically. A sample of fricative inventories is given in table 25.2; as can be seen, labial and velar fricatives are commonest, while /s/, the commonest fricative cross-linguistically (Maddieson 1984), is confined to Kala Kawaw Ya (which shows Papuan influence) and Anguthimri, which has the richest fricative inventory. In Marrithiyel there is an incomplete contrasting triplet of long-stop, short-stop, and fricative series; for the lamino-dental, lamino-palatal, and retroflex series the contrast between short stop and fricative is neutralized.

Two-stop series

Around 40 languages have developed a contrast between twostop series. In different languages the contrast has been described as geminate/non-geminate, lenis/fortis, long/short, voiced/voiceless, tense/lax, and aspirate/non-aspirate,[7] but these terms should not be taken at face value as only in a few cases are they based on instrumental phonetic analysis or tight phonological argumentation. In some languages, such as Warray and Mayali, long stops contrast with geminate stops, which always span a morpheme boundary – a Mayali example is *kuk:u* "water" versus *kuk-kuʼuk* "Aboriginal person", lit. "body-black."

Fricative								*Languages*
Peripheral		Laminal			Apical			
β, ɸ, v	ɣ	ð	ʒ	ʃ/ɕ	z,	r	s	
	+							Tiwi; Mawng, Iwaidja, Amurdak; Kunparlang; Kuthant
+								Adnyamathanha
		+						Tharrgari
+	+							Gog-Nar
	+	(+)[a]						Marrgu
+	+	+						Kurtjar, Kunjen, Uradhi
+	+			+	+			Ngan'gityemeri
+		+		+	+			Marrithiyel
+	+	+	+	(+)[a]		+	(+)[a]	Anguthimri
							+	Kala Kawaw Ya (s, z)

[a] Parentheses indicate doubtful phonemic status because of the small size of the corpus.

Table 25.2 Sample Fricative Inventories

A careful instrumental survey of Arnhem Land languages by Butcher (to appear a) shows that length is the primary phonetic parameter in the Gunwinyguan and Burarran families, voicing is the primary parameter in the Daly languages Ngaŋgityemeri and Murrinhpatha, while in the Yolngu subgroup short voiced stops contrast with long voiceless stops. A survey by Austin (1988a) examines languages of the Pilbara, Cape York, and south Central Australia. References to instrumental work on particular languages can be found in these two surveys.

In most languages the stop contrast is intimately linked to stress, meter and vowel length in the flanking syllables. In Warluwarra the voiced/voiceless contrast almost corresponds to a long/short vowel contrast in the preceding syllable –cf. /pantu/ "waist" and /pa:ndu/ "butt of tree"[8] – and in many Cape York languages the development of a voicing contrast was conditioned by vowel length in the preceding syllable.[9] In Warumungu some case suffixes have long-initial allomorphs after trimoraic stems and short-initial allomorphs after dimoraic stems. Many languages have non-phonemic lengthening of consonants between adjacent stressed syllables – in Kayardild, for example, stops are lengthened between two stressed short syllables – or to meet targets of initial heavy syllables, as in

Djapu. Further advances in our understanding of this phenomenon will almost certainly depend on integrating accounts of meter, syllable weight and other manifestations of "prominence" such as the glottal stop (Hyman 1975); an attempt to do this for Djinang is in Waters (1980).

The most radical departure from the standard Australian consonant inventories is found in Damin, an auxiliary language used by second-degree Lardil initiates on Mornington Island. It augments Lardil's standard consonant inventory (which adds /l̪/ to the Kayardild one above) with a bilabial fricative, four nasal clicks, an ingressive lateral fricative /ǁ/, a velar nasal made with extra pulmonic pressure, an ejective velar stop /kʼ/, and a velaric egressive bilabial stop /ʘ/ made "not with glottalic pressure... but by creating pressure between the tongue and the bilabial closure" (Hale 1973, p. 443). Uniquely among the world's languages, it uses all five phonetic initiation types – the standard pulmonic egressive, pulmonic ingressive (/ǁ/), velaric ingressive (the nasal clicks), velaric egressive (/ʘ/) and glottalic egressive (/kʼ/).

2.2 Vowels

The typical Australian language has a triangular three-vowel system with a length contrast. In some languages length is lost, sometimes conditioning new developments in the consonant system (see below). Or vowel length may develop anew, as in the Cairns rainforest area, where phonemic vowel length has developed as an areal feature, partly to compensate for the loss of syllablefinal liquids and /y/, though the mechanisms by which it developed in Yidiny are quite different from those of the adjacent northern Dyirbal dialects (Dixon 1990).

As for vowel quality, some Arandic languages have reduced to a two-vowel system by transferring roundedness and frontness to adjoining consonants (see sec. 3.5), while many languages of Cape York have augmented it, largely through processes of historical ablaut, to anywhere between four (Ntraʔrŋiṯ) and up to 17 (Anguthimri)[10] phonemes. Five-vowel systems are found in many non-Pama-Nyungan languages and, in the case of Gunwinyguan at least, are of considerable antiquity (Harvey to appear). Nasal vowel phonemes are surprisingly rare, being found only in Anguthimri, although some languages (e.g., Yidiny, Mayali) have nasalized allophones when word-final nasals are elided.

3 Autosegments and Complex Segments

A major source of variation in Australian phonological systems has been the spilling of articulatory gestures beyond the phonemic segment with which they were originally associated, resulting either in syllable-level prosodies or in the merging of two segments on a single consonant position. This has created a variety of types of complex segment: prenasalized stops and prestopped nasals, prestopped laterals and prelateralized stops, stops with trilled release, and labialized consonants. Many languages have also developed syllable prosodies, such as glottalized syllables in Arnhem Land languages, and retroflexion in others. While the last three decades has seen a great deal of diachronic work that is implicitly non-linear (Dixon 1980: chapter 7 provides an excellent summary); it is only in the last few years that explicitly non-linear synchronic accounts have appeared.

While autosegmental theories make a clear distinction between complex segments, where two or more elements on the same tier are associated with a single skeletal position, and autosegments, where elements from distinct tiers are associated with the same skeletal position, in practice it is not always clear which analysis is to be adopted, and we shall see that such phenomena as retroflexion may yield best to an autosegmental analysis in one language, and to a complex-segment analysis in another. I therefore treat both phenomena in this section.

3.1 Prenasalized Stops

The desirability of treating homorganic nasal plus stop sequences as unitary phonemes was first pointed out by Oates (1967), who noted that phonotactic statements of Kuku-Yalanji could thus be simplified. Alawa (Sharpe 1972, pp. 14–16) contrasts prenasalized stops with sequences of nasal plus stop (which may or may not be homorganic). Sharpe's arguments for a prenasalized stop series are largely phonotactic: nasal-stop sequences can occur word-initially, provided they are homorganic, and the relevant sequences would, if treated as two phonemes, be the only word- and syllable-initial clusters in the language. In addition, a homorganic nasal-stop structure (using the term here and

throughout without prejudice as to its ultimate analysis) is broken up differently in slow speech, depending on whether it is a prenasalized stop or a biphonemic sequence (ibid., p. 16). Sequences spanning a morpheme boundary furnish many examples of two-phoneme sequences. The difference is shown by the words *ki.ɬa.ŋa.ɬi* "circumcised boy" and *kar.kaŋ-ɬi* "kitehawk-erg."

For many Australian languages the only evidence bearing on whether nasal stop sequences should be treated as bi- or mono-phonemic is from the phonotactics of non-initial syllables. But occasionally other phonological evidence for a complex segment analysis can be found. Nash (1979b) reanalyses Yidiny, described in Dixon (1977a, 1977b), as containing prenasalized stop phonemes, which are realized phonetically as simple stops word-initially and as nasal-stop clusters elsewhere.

In addition to phonotactic considerations (which are actually rather weak for Yidiny – they simplify the morpheme-structure conditions, and eliminate some but not all three-consonant clusters), Nash gives three further arguments. First, a complex segment analysis can explain why a homorganic nasal appears at the reduplication boundary in *payka-mpayka-* "feeling very sore", from the base ^{m}*payka-*, whose nasal onset is suppressed word-initially but appears in the reduplicand, as opposed to words like *punja-punja-n* "hit each other", whose root is simply *punja-n*. Second, it accounts for another characteristic of reduplications, formulated by Dixon (1977a, p. 156) as "a syllable-final nasal which is homorganic with the following stop is not reduplicated"; this contrasts with other syllable-final elements which are – cf. *kintal-kintalpa* "lizards" and *jukar-jukarpan* "have unsettled mind for a long period" but *kala-kalampa-la:* "marchflies" and *maji-majintan* "keep walking up". On a complex-segment analysis this falls out automatically, since the nasal segment actually belongs to the following syllable. Third, the loss of nasals in the slow, syllabified pronunciations of some words (e.g., *kilpaynta*, pronounced slowly as *kilpay-ta*) can be explained as the loss of prenasalization when pauses place the complex segment in word-initial position.[11]

A recent article by McConvell (1988) has drawn attention to a problematic phenomenon, Nasal Cluster Dissimilation (NCD), in Gurindji and related languages.[12] One rule, NCD deletion, reduces true homorganic nasal stop clusters to stops after nasal stop sequences (not necessarily homorganic) in the same phonological word. In the following Gurindji examples, eliminated prenasalizations are in brackets, retained prenasalizations are underlined, and the determining sequence is in bold.

(1)

(a)	lutju-**ŋ**ka	(b)	wiɲji-(**ŋ**)ka	(c)	pinka-(**ŋ**)ka
	ridge-LOC		spring-LOC		river-LOC
	"on the ridge"		"at the spring"		"at the river"

(2)

(a)	**ɲ**ampa=(n)ta	**ɲ**a-**ɲ**a	(b)	waɲji=(**ŋ**)ku	**ɲ**unu-**ɲ**-ma ?
	what-2SUBJ	see-PST		which-2IOBJ	you-DAT-TOP
	"What did you lot see?"			"Which is yours?"	

NCD deletion fails to apply to nasal-stop clusters that span morpheme or word boundaries, and as such are clearly bisegmental:

(3)

(a) tampaŋ karinа
dead bePST
"He died."

(b) nuŋkiyiŋ-ku
relation-DAT
"for a relation"

However, the segments of the determinant may span morpheme boundaries:

(4)

(a) ŋaɹin-ku(ɲ)ja
food-COMIT
"with meat"

(b) ɲin-ku(m)paly
drown-LEST
"to avoid drowning"

NCD deletion may apply over an unlimited number of syllables containing only liquids and / or glides (5), but is blocked by any intervening stop or nasal (6):[13]

(5)

ɲampa-wu-wa[a-yi-(n)ta ɲa-ɲa
what-DAT-now-1sgOBJ-2plSUBJ see-PST
"Why did you lot look at me?"

(6)

(a) waɲji-ka-ɳta
which-LOC-2plSUBJ
"Where are you lot?"

(b) kuya-ŋka-ma-ŋku pa-ni
thus-LOC-TOP-2sgOBJ hit-PAST
"It was for that reason that he hit you."

A second and related type of nasal cluster dissimilation rule, NCD denasalization, applies to *any* sequence of nasal plus stop – not necessarily homorganic, and possibly spanning a morpheme or word boundary – converting the nasal to its corresponding stop. In the following examples the underlying nasal is given in parentheses after the resulting stop.

(7)

ɲampa-t(n)-pula ɲa-ɲa
what-2SUBJ-DU see-PST
"What did you two see?"

(8)

ɲampa-wu-wa[a-t(n)-jina pa-ni
what-DAT-NOW-2SUBJ-3plOBJ hit-PST
"Why did you hit them?"

(9)

waɲji-wa[a-t(n) ka-ɲa
which-now-2SUBJ bring-PST
"Which did you bring?"

Although the long-distance dissimilations found with Nasal Cluster Dissimilation resemble OCP effects, the phenomenon has so far resisted an autosegmental treatment, since it is not clear how the nasal-stop clusters can be represented in a way that will capture the similarity between both NCD rules – delection of the nasal with complex segments, and denasalization with diphonemic sequences – and that will motivate the correct blocking conditions. Ultimately we may need to develop new conceptual tools, such as cluster weight, to explain it; the metrical structure of Gurindji is surely also relevant but has yet to be described explicitly. Diachronic changes resulting from various sorts of nasal dissimilation, such as the loss of prenasalization following nasalinitial syllables, have been widely reported in Australian languages (Dixon 1980, pp. 216–8).

3.2 Prestopped Nasals and Prestopped Laterals

Prestopping of nasals and laterals is an areal feature of languages in south-eastern Central Australia. Arandic languages have complete series of prestopped nasals, but no prestopped laterals; languages of the Lake Eyre region have both, though the series are not always complete, and the prestopping is often allophonic rather than phonemic. In some Arandic languages, such as Alyawarra, they are restricted to the first consonantal position in the word, and should right-reduplication or compounding place them in a later position, an ordinary nasal will be substituted – cf. Alyawarra $a^{n}m^{w}$ a "bad", $a^{p}m^{w}$–am^{w}a "rubbishy"; *akŋima* "carry, take"; a^{y}lpu▮a "shoulder"; a^{y}lpu▮–aŋima "carry on the shoulder" (Yallop 1977, p. 18).

Accounts of prestopping as a Central Australian areal feature are in Hercus (1972), Austin, Ellis, and Hercus (1976), and Austin (1981). In Cape York, Kunjen can be analyzed as having a prestopped nasal series, or more abstractly as nasals "plus tensity," and Yir Yoront has a non-phonemic prestopped lateral: it realizes the sequence /ll/ as a prestopped lateral [^{d}l], as in /mall/ [ma^{d}l "longtailed white stingray". Gidabal has prestopped nasal and lateral allophones in word-final position, before other consonants, and in intervocalic position when preceded by at least two other syllables and followed by no other lateral or nasal.

Evidence for treating prestopped nasals and laterals as single phonemes, in which the prestopping is the less salient part, comes from their phonotactic, morphophonemic, and etymological sources. Phonotactically, "prestopped nasals…have the same distribution as nasals in Kaititj…and sometimes alternate with long nasals in both Kaititj and Alyawarra" (Busby 1980, p. 88). Perceptually the nasal or lateral portion is more salient. Etymologically, they develop from nasals or laterals, e.g., proto-Pama-Nyungan **kuna* "shit, guts" > Diyari /kuna/, phonetically [ˈku^{d}na], and Mparntwe Arrernte / a^{t}na/ (Wilkins 1989, pp. 88–9).

The commonest environment for the development of prestopped nasals and laterals is following a stressed syllable. Hercus (1972) shows that the first step in their development is for intervocalic nasals and laterals to be geminated after stressed syllables, followed by dissimilation to stop+nasal or stop+lateral sequences. However, word-initial nasals inhibited this dissimilation. The development of prestopped nasals in Kunjen is still not fully understood, but appears to be linked to complex combinations of stress and vowel length that have yet to be reconstructed satisfactorily.

3.3 Prelateralized Stops

Most languages of the Iwaidjan family have a series of complex segments that have been described as "lateral flaps" (Pym and Larrimore 1979) or "prelateralized stops" (Handelsmann 1991). In all four languages apico-alveolar and apico-postalveolar complex segments /^{l}t/ and /^{l}ʈ/ exist; fuller investigation of these languages may reveal palatal /^{l}c/ as well. The complex segments contrasts with

simple laterals /l/ and /ɭ/, and with true clusters /lt/, /ɭt/ which span two syllables. Prelateralized stops pattern phonotactically like single phonemes. Unlike clear clusters, they can be syllable- and word-initial, as in Amurdak /ˈtaŋ/ "dingo" and / a.ˈta.wuʃ/ "water", and in slow syllabifications both segments are kept with the following syllable. Their duration in Amurdak is comparable to ordinary single segments and shorter than that of the corresponding clusters. In the mainland languages prelateralized stops are restricted to syllable-initial position, but in Marrgu they can also occur syllable- finally, as in /ɭɭumaɭɭ/ "ear"; in this position they are sometimes pronounced as a retroflex tap.

3.4 Trilled-release Stops

Apical stops with a trilled release[14] occur as an areal phenomenon in the Lake Eyre region, where it is merely allophonic in most languages except for Ngamini and Yandruwandha, although its origins as a sound change that has yet to propagate completely through the lexicon make classical phonemic analysis difficult. The historical sources of the phenomenon are surveyed in Austin (1988). In Cape York, trilled-release phonemes are found in a number of Cape York languages such as Anguthimri and Nt^{r}a?ʔiʈ. In Anguthimri the trilled release series is articulated further back than the regular alveolars, though they are not retroflexed; they derive from homorganic apical nasal plus stop in intervocalic position following a labial-initial first syllable that was subsequently lost.

3.5 Roundedness

In the Arandic languages phonemic roundedness has been transferred from vowels to adjacent consonants. In some Arandic languages, e.g., Kaytetye, this has reduced the number of vowel phonemes to two (/a/ and /ə/), while in others such as Mparntwe Arrernte two further phonemes /i/ and /u/ play a restricted role. The locus of roundedness is not immediately clear at the phonetic level, since both consonants and vowels are rounded in a Mparntwe Arrernte word like [p^{w}ɔʈɪrə-] /p^{w}ə ʈirə -/ "turn to stone", but a number of morphological processes show its association with the consonant.

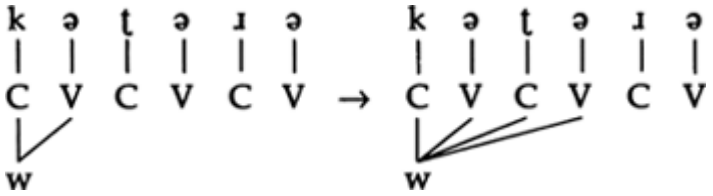
For example, one reduplication type copies the initial (V)C(C), inserting -əlpə - between copy and stem. Applying this to /p^{w}ə ʈirə -/ gives [p^{w}ωlpʊ-p^{w}ɔʈira] / p^{w}əlpəp^{w}əʈirə-/. Since this pattern copies only the first C in words of this type, the roundedness on the first vowel must stem from the consonant. Compare this with the same reduplicative pattern applied to [pɔʔʈɪrə-] "clump, cluster". Here the rounding is due to the vowel, phonemicizing as /puʈirə-/, and it does not carry leftward with the reduplication: [pəlpʊ-pɔʔʈɪrə-] / p-əlpə-puʈirə-/. This pattern, then, can be used to detect labialization on initial consonants.

A second reduplication pattern right-reduplicates the final (V)(C)Cə- of the stem, and insets -*p*ə- between stem and copy. This can be sued to see whether the roundedness is part of vowels. Thus the labialization of the [ɔ] in [ɪlɔɳə-] "extinguish", which fails to be copied into [ɪlɔɳəpəɳə-] "extinguish again and again", is seen to be associated with the preceding consonant, justifying the phonemicization /il^{w}əɳə/.

While facts such as this justify associating labialization with the consonant, several analytical possibilities remain. Some analyses (e.g., Breen 1977; Wilkins 1989) postulate a series of labialized (or "rounded") consonants, essentially doubling the inventory of consonant phonemes. But a recent paper by Breen (1991) has argued that "[r]oundness is not associated with consonants as such, but with consonant positions in a word - which might be occupied by one or two consonants. Roundness may be manifested either on the onset side or the release side of a consonant or cluster…"

He further points out that roundedness tends to spread or migrate within words. Spreading is shown by the second [v] in the optional pronunciation [kʊ́tvɹə] of the word *k^{w}ətəə* "nulla-nulla (a weapon)" and migration by the two forms ʃə^{p}*m*^{w}*a*ɹə and ʃ^{w}ə^{p}*ma*ɹə for "nail". This often makes it difficult to locate the roundness on a particular segment. These facts suggest roundness in the Arandic languages should be represented on a separate tier, associated with the C position, and able to spread to other V and C positions, or reassociate with other C positions, under certain conditions. This implies the following representations for "nulla-nulla":

(10)



Outside Arandic, incomplete sets of labialized consonants are found in Mbabaram (Dixon 1991) which has syllable-initial labialized /d^w/, /n^w/, and /g^w/, the velar deriving historically from rounded vowels in the preceding syllable (e.g., proto-Paman **guŋgaɭi* "north" > Mbabaram *Ṇgwaɭ*(ə)), and in Tiwi, which can be analyzed as having syllable-initial peripheral stops and nasals. In Tiwi labialized consonants appear to have gained their roundedness from the following vowel, rather than the preceding one as in Arandic and Mbabaram -compare *kuku-ni* "water" (-ni is the masculine suffix) and *kukwa* "water hole', *yuruku-ni* "long-masculine" and *yurukwa* "long-feminine", as well as cognates like Tiwi *muŋkwa-ni* "small stone axe", Lardil *muŋkumuŋku* "wooden axe". For none of these languages is our understanding of the phonology sufficient to decide whether rounding should be associated with consonant phonemes, or with a consonant position on the CV skeleton.

3.6 The Glottal Stop as Autosegment in Arnhem Land Languages

In many languages of Arnhem Land, /ʔ/ occupies an anomalous position in the phonemic inventory. Although it contrasts with other segmental phonemes and with zero (Mayali *yiɭuʔme* "you swim", *yi ɭutme* "you pierce it"; *kun-miʔ* "forehead"; *kun-mil* slice of yam"), and would therefore be treated as a segmental phoneme by classical structural phonemics, five features distinguish it from other phonemes:

1 In most Arnhem Land languages it is the only possible final element of three-consonant syllable codas.

2 Several languages have rules preventing successive syllables or morphemes from having glottal stops. Thus in Djapu reduplication of *liwʔ-yun* "go round" gives *liwʔ-liw-yun* instead of the expected *liwʔ-liwʔ-yun*. Such rules suggest the glottal stop should be located on an independent tier.

3 The glottal stop almost always occurs at morpheme boundaries, particularly in junctures within complex verb stems, reduplicated elements, and certain types of suffix; in the Gunwinyguan family most occurrences of glottal stop appear to have arisen as boundary markers (Harvey 1991).

4 Patterns of suffixal allomorphy in Rembarrnga, Ngalakan, and the Yolngu languages ignore the glottal stop. For example, the three allomorphs of the ergative in Djambarrpuyngu, which are conditioned by stem-final nasals, semi-vowels, and vowels, all ignore the presence of stem-final glottal stops:
(11)

N__	Semi-vowel__	V__
ɹaŋan-ʈu	kalay-yu	ʈarwa-y
"paperbark-ERG"	"cousin-ERG"	"many-ERG"
warakanʔ-ʈu	kalpawʔ-yu	maːrma-yʔ
"animal-ERG"	"boil-ERG"	"two-ERG"

5 The ergative form *maɭrmayʔ* of "two" in (11) illustrates another unusual fact about the glottal

stop in Arnhem Land languages – its position disregards morpheme boundaries, passing over affixal material in such a way that it is always syllabified as the final segment of the coda. In certain conditions it may even cross two morphological boundaries, as when the dative and "prominence" suffixes are added to a stem ending in vowel plus glottal stop: *ma‡rma-w-‡ʔja* [2-DAT-PROM]. Similar phenomena occur in the other Yolngu languages, as well as Rembarrnga and Wagiman.

A number of linguists, such as Schebeck (n.d.) for Yolngu in general (as well as Wood 1978 on the Yolngu dialect Galpu and Morphy 1983 on Djapu), and Mckay (1975) for Rembarrnga, have treated the glottal stop as a syllable prosody. However, this fails to account for the segmental-like contrasts contracted by ʔ with other phonemes, and Harvey (1991) has recently proposed that in Ngalakan, Rembarrnga, and the Yolngu languages the glottal stop should be represented on a separate plane to the other consonants as a completely unspecified segment underlyingly. In the Yolngu languages and Rembarrnga, on Harvey's analysis, it only becomes associated with a skeletal position after affixation and partial syllabification have taken place. In other languages, such as Ngalakan, in which suffix allomorphy treats stem-final ʔ as a consonant, the glottal stop is syllabified before affixation.

3.7 Retroflexion as Complex Segment or Autosegment

The location of retroflexion within phonological representations is by no means uniform in Australian languages. Most descriptions postulate a separate series of retroflex consonants, but even in such languages adjacent vowels may receive a clear "retroflex coloring" or on-glide; in Mpakwithi the retroflex coloring from syllable-initial /ɹ/ can pass through preceding consonants: /gwapɹa/ "is eating" is pronounced [Ṇgwaɹfɹa). While it is usually the preceding vowel so affected, in some languages such as Marrithiyel the following vowel is colored – /maʂi/ "belly" may be pronounced [maʐi] or [maʐɻi].

Two analyzes of Tiwi (Osborne 1974, p. 10; Oates 1967, pp. 36–41), and an article on Kukatj by Breen (1992), propose two-segment analyses of phonetically retroflex consonants as a sequence of /ɹ/ plus apical consonant. The Tiwi argument, which rests on phonotactics (the absence of word-initial retroflexion can be subsumed under the general ban on word-initial clusters) and certain morphological alternations, has certain problems, and a stronger argument for a cluster analysis of retroflexion is given by Breen for Kukatj.

In Kukatj, verb stems are reduplicated according to the rule $C_1VLX \rightarrow C_1LVLX$ where L is a liquid, /l/ or /r/. Examples are

(12)

karpel- "be afraid"	→	krarpel-	yirŋk- "talk"	→	yrirŋk-
milmel- "suck"	→	mlilmel-	ʈal- "copulate"	→	ʈlal-

Now, words containing phonetically retroflex consonants copy /r/ under reduplication (13); this can readily be explained if phonetically retroflex consonants are phonemically complex segments whose first element is r (realized as ɹ before other apical consonants, with which it then merges) and whose second element is an apical stop or nasal.

(13)

[ʈaɳ-] /ʈarn-/ "stand" → [ʈraɳ-] /ʈrarn-/

While Tiwi and Kukatj provide evidence for a cluster or complex segment analysis of retroflexion, a number of facts about Mayali suggest it is best analysed as having retroflexion as an autosegment

associated with the syllable:

1 Within a syllable, all apical stops and nasals agree in retroflexion: there are words like /ɖiɖ/ "moon" and /ɖoɖ/ "louse" on the one hand, and /dadguyeŋ/ "long-legged" or /nan/ "I see you" on the other, but no syllables like */diɖ/,*/ɖiɖ/,*/naɳ/ or* /ɳan/.[15] Note that the retroflex continuant /ɻ/ does not participate in these effects, and hence we find words like /naɻin/ "snake".

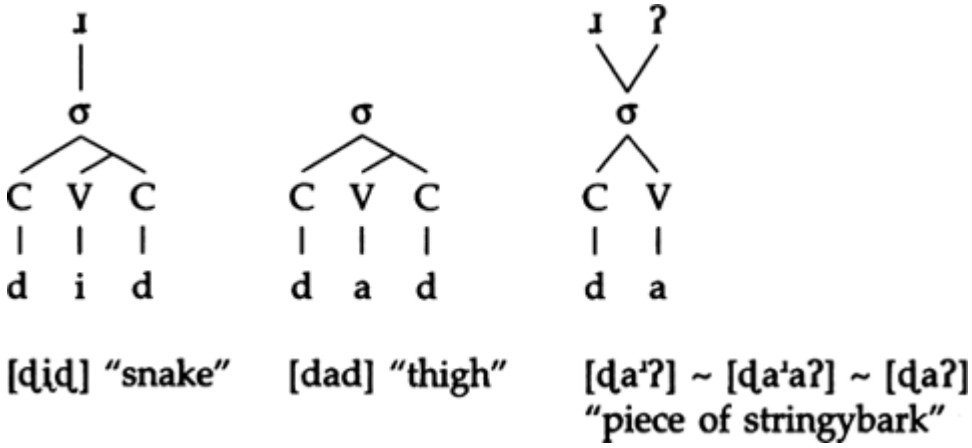
2 Agreement in retroflexion is also found over apical stops and nasals in successive open syllables: there are words like ɖuɖʻu "older brother" (ʻ here represents fortition rather than length; fortis consonants are always syllable-initial) and ɖuɖʻu "heart" (incorporated form) but none like *daɖʻa or *ɖadʻa.

3 Syllables may be retroflexed even when there is no apical segment, with the retroflexion manifested on the vowel in rather variable ways. For example, the word for "death adder" is pronounced [beɻek], [bɻek], [beɻek] or [bek] by different speakers, or even the same speaker. Such variability is not found with regular phonemes. And it is noteworthy that literate speakers have difficulty placing the ɻ when spelling these words; the only other sound with which they have similar difficulties is the other autosegment, /ʔ/.

These three factors suggest retroflexion is an autosegment associated with the syllable, and manifested clearly on any apical stops that may be present, as well as variably on any vowel. Similar phonetic facts have been reported for Murrinhpatha.

The autosegmental representations these facts suggest are illustrated below:

(14)



In articulatory terms, retroflexion involves a gesture of the tongue-tip, which is independent of the movement of the whole tongue. Since the timing of this gesture may be synchronized with the occlusion by the tongue, may immediately precede or follow it, or may be slower (i.e., at syllable pace) than that of the occlusion itself, it is not implausible that phonologically retroflexion should have the variable range of treatments that have been discussed here-as part of a unitary retroflex phoneme, as the first or second part of a complex segment, or as a syllable prosody. It is likely that the next decade will see many more subtle phonological effects reported.

4 Vowel Harmony

Vowel harmony is an areal feature of languages across the northern desert fringe, including the Ngulipartu dialect of Nyangumarda, Gooniyandi, Warlpiri, Warumungu, and Jingilu;[16] it is also found in a few other areas, such as in the inland dialect of Kuku Yalanji in Cape York.

In most Australian languages, harmony affects just /i/ and /u/ of a three-vowel system, through the spreading of frontness and roundedness respectively, and it is surely significant that the affected languages lie just to the north of the Arandic languages, which have developed roundedness autosegments (sec. 3.5). However, in Warumungu and the Ngulipartu dialect of Nyangumarta /a/ can also propagate harmony into suffixes -cf. Warumungu *murumuru-ku* "*sickness*-DAT", *kaɭi-ki* and *Ṇapa-ka* "water-DAT". In Warlpiri vowel harmony may be regressive or progressive. The former is confined to the past tense suffix *-Nu*, which propagates regressive roundedness harmony back to the beginning of the verb root - cf. *kɪɻi-ɳi* "throw-NonPast", *kɪɻi-kaɭa* "throw-irrealis" but *kuɻu-ɳu* "throw-Past"; preverbs are exempt, as shown by *piri-kuɻu-ɳu* "DISTR-throw-Past". Progressive harmony is more productive, being spread by any positionally appropriate high vowel (in (15a), the first vowel of the proprietive suffix; in (15b) by the final vowel of the root and then again by the enclitic *-lku* "then") across any suffix and clitic boundary; /a/always blocks the spread of vowel harmony:

(15)

(a) miniʈa-kuɭu-ɭu=lku=ʂu-lu
cat-PROP-ERG-then-1sgO-3plS

(b) maliki-kiɭi-kira=lku=ʂu-lu
dog-PROP-ALL-then-1sgO-3plS

[Nash 1986, p. 92, with glosses and clitic and suffix boundaries added]

The labial high consonants /p/ and /w/ block the rightward spread of vowel harmony in words like *Ṇamɳi-puɭaji* and *Ṇali-wuru*; Nash (1986, p. 93) argues this is because autosegments associated with non-syllabic segments cannot be deleted.

The facts of vowel harmony in Nyangumarta are more complex. Vowel harmony is progressive, and can affect all three vowels, as with the realis suffix and first person subject clitics in (16):

(16)

yiri-ɳi=ɳi "see-REALIS-1sgNOM"
kalku-ɳu=ɳu "hold-REALIS-1sgNOM"
wiɭa-ɳa=ɳa "hit-REALIS-1sgNOM"

However, when there is a second spreading trigger to the right, the morphemes just discussed surface with an /a/ "buffer vowel":

(17)

yiri-ɳa=li "see-REALIS-1sg.inclusive.NOM"
kalku-ɳa=li "hold-REALIS-1sg.inclusive.NOM"
wiɭa-ɳa=li "hit-REALIS-1sg.inclusive.NOM"

(18)

yiri-ɳa=ŋu	"see-REALIS-2sgDAT"
kalku-ɳa=ŋu	"hold-REALIS-2sgDAT"
wiɭa-ɳa=ŋu	"hit-REALIS-2sgDAT"

Sharp (1986), from whom these examples are cited, argues that the affected vowel slots here should be left unspecified; when there is only one harmony trigger its vowel features spread to them, as in (16), but when there are two triggers the buffer vowel is delinked and surfaces as the unspecified vowel /a/ (17, 18); the delinking is motivated by the Obligatory Contour Principle which would prohibit the spreading of the identical feature [+high] to adjacent skeleton positions.

There is a second set of suffixes that are immune to vowel harmony and always surface as /a/ (19). Sharp concludes from this that Nyangumarta "phonology distinguishes among four different vowels even though only three are phonetically realized," and proposes that the unchanging /a/ vowel be represented as an empty feature matrix linked to a V position, while the vowels that only surface as /a/ in buffer position should simply be represented as unspecified vowel slots.

(19)

yiri-nama-ɳa	"see-IRR-1sgNOM"
kalku-nama-ɳa	"hold-IRR-1sgNOM"

5 Word and Syllable Structure

Australian languages tend to have a disyllabic (or at least dimoraic) minimum word, although monosyllabic structures are found in several areas including Arnhem Land, Cape York, Arandic, and Victoria.

Syllable structures tend to be simple; Kayardild is typical in having CV(L)(N), where L = liquid and N = nasal. Itô (1986) and Wilkinson (1988) show how the well-known battery of truncation-rules in the related language Lardil, first described by Hale (1973), can be motivated by rules of syllable structure and a dimoraic minimum word size.

In almost all Australian languages the maximum coda is more complex than the maximum initial; an exception is Mpakwithi which allows some clusters (basically stop plus continuant) in the onset but only a very limited set of single consonant segments syllable-finally.

A few languages of the southeast allow initial clusters of peripheral stop plus liquid, e.g., Wergaia *bra* "man", *gri* "canoe" and Gippsland *mragen* "face". The South Australian language Ngarrinjerri allows liquids after all sonants, e.g., *Ṉlelin* "knowing", *mrukun* "basket", *yrottulun* "lean, poor", *wraŋgi* "bad, silly". Some languages of the northern Pilbara region, such as Ngarla and Nyangumarta (Geytenbeek 1992), elide first-syllable /i/ and /u/ just between initial /k, p, t/ and /r, w/, leading to phonetic cluster-initial words like [kwari] "now" kuwari/ and [p□iri] "man" < /pi□iri/.

More complex codas are found in languages of Arnhem Land and Cape York, e.g., Mayali *nakur□?* "son-in-law-VOC", Kunjen *alᵖmp* "opossum", Wik-Munkan *wolmp* "big noise", Yir-Yoront *ka□□* "big". In some of these languages, such as Urningangk, the most complex clusters only arise at word boundaries and can be treated as containing extrasyllabic segments. An interesting case is Kayardild, where prosodic truncation at the end of intonational phrases eliminates final /a/ (sec. 6.5). For older speakers this is a prosodic process, and final syllables underlyingly have a restricted, vowel-final structure, e.g., *ki.yarŋ.k(a)* "two". But for younger speakers, who take these truncated forms as underlying, the final syllable of a word can have a more complex structure, e.g., *ki.yarŋk*, resulting in the extrasyllabic licensing of a third coda element.

The most common additional stipulations applying to word structure but not syllable structure tend to

be those requiring words to end in vowels (e.g., Warlpiri) or consonants (Kunjen), or adding vowel-initial words as a possibility (in Mayali the only V-initial syllables are word-initial) or as the canonical type (Olgolo - Dixon 1970b). But there may also be constraints on intervocalic clusters beyond those on syllabic structure. Thus although the heterosyllabic clusters *ny* and *ŋw* are allowed across a syllable boundary by the syllable-structure conditions in both Mayali and Kayardild, they only actually occur in Mayali (e.g., *apanyameŋ* "I speared them", *kaparaŋwayʔme* "the escarpment goes up"). This is due to the existence in Kayardild of an additional syllable-contact constraint stating that the coda consonant of the first syllable must be lower or equal to the onset of the second on the sonority hierarchy; morphophonemic rules eliminate many would-be violations (e.g., underlying *Ṇaŋwulaʈa* "from the beach" surfaces as *ŋaŋwulaʈa*). Where the two segments are equal in sonority, the first is always to the right of the second on Hamilton's articulator hierarchy (sec.2.1); this permits clusters like *ŋm* in the example just given, and *ʈp* in *ŋiʈpaluʈa* "to cool food", but outlaws the reverse sequences.

5.1 The VC Problem

Data from a number of Australian languages have been used to challenge claims about the universal unmarkedness of CV syllables. Sommer (1969, 1970) proposed that all syllables in Kunjen had the structure VC* and hence were counterexamples to claims that CV is a universal syllable type. He based his arguments on the segmentability of all Kunjen words into VC* units (e.g., *id.un.aɽ.al* "make a spear"), and on the easier formulability of reduplication rules in terms of VC* syllables - e.g., "copy the first VC syllable" giving *eḍ.eḍ.eḷ* "heavy rain" and *alg.alg.al* "straight as a ram-rod", "copy the second VC syllable", as in *iy.alm.alm.ey* "keeps playing", or "copy the third VC syllable" in *an.aŋ.um.um.in* "keeps peeking". (In fact, the generalization that the penultimate VC syllable is copied would be compatible with all the data except one word which Sommer admits is exceptional anyway.)

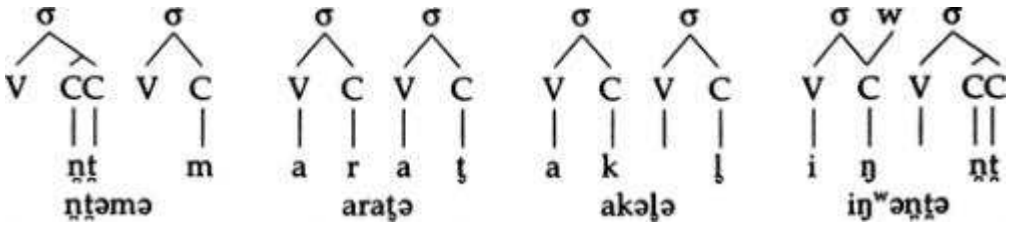
Sommer's original paper has engendered considerable controversy (see Dixon 1970b; Darden 1971; and McCarthy and Prince 1986); the restated position in Sommer (1981) is that *underlying* Kunjen syllables must have a VC* structure, while *surface* syllables[17] may have a CV structure as a result of late rules such as reduction; it is these surface CV syllables that are responsible for the effect, pointed out by Dixon (1970b), that consonants are articulated more forcefully before stressed vowels.

More recently, data from the Arandic languages has been employed by Breen (1991) to give a more convincing case for underlying VC syllables. The phonology of the Arandic languages is exceptionally complex and interesting, and they are still vigorous enough for detailed phonological analysis to be possible; the existence of a play language called "Rabbit Talk" (Turner and Breen 1984) has furnished a number of phonological insights. Excellent work by a number of linguists has gradually led to a radical and unusual view of Arandic phonological structure, but very little of this work is published, even in samizdat form.[18]

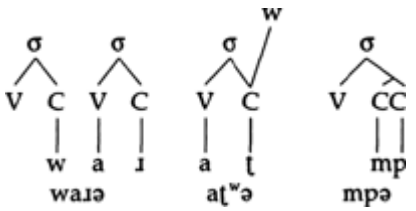
We have already seen the arguments for treating rounding in Arandic as an autosegment primarily associated with C positions. Of the two main vowels[19] /a/ and /ə/, the phonetic realization of the latter is, apart from its vocalicness, "completely determined by the consonants preceding and following it"; furthermore, /ə/ "is a realization of an underlying vowel that appears on the surface only when there is a need for something to separate consonants" (Breen, 1991). /ə/is added in final position on some words when they are utterance-final, or a C-initial word follows; the exact conditions vary according to the dialect and age of the speaker.

With this background we can now turn to Breen's main claim, that Arrernte has an underlying VC(C) syllable structure, even though surface syllables have the structure (C)V(C). This analysis implies the initial syllabifications in (20). Note that in the initial syllabification there will be many empty V slots which will eventually be candidates for realizaton as /ə/; others will eventually be eliminated by joining C-only underlying syllables as onsets to the following syllable; and underlying word-final Cs are resyllabified on the surface with final ə.

(20)

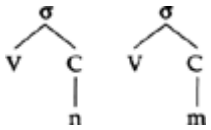


(21)



There are a number of motivations for this analysis. First, there is great variability in the number of surface syllables: “sits”, for example, can be pronounced [anémə] (three syllables), [némə] (two), [aném] (two), or [nəm] (one). Yet the number of underlying VC syllables stays constant at two, namely:

(22)



Second, speakers break up words not into CV syllables, but into word-like parts with initial /a/,/i/, or/u/, e.g., giving/ uᵗnaʂətə/ “mulga blossom” as /uᵗnə, aʂətə/; such breaks do preserve the postulated underlying VC-syllabification.

Third, stress rules can be neatly stated in terms of underlying VC-syllables, In terms of conventional syllables, the rule needs to incorporate references to syllable onsets, giving formulations like “for words of two or more syllables, stress falls on the first syllable containing an onset”: cf. /inə́mə/ “gets”, /nə́mə/ “sits”. But in terms of VC syllables the rule can be formulated simply as “for words of two or more VC-syllables, stress falls on the second VC-syllable.”

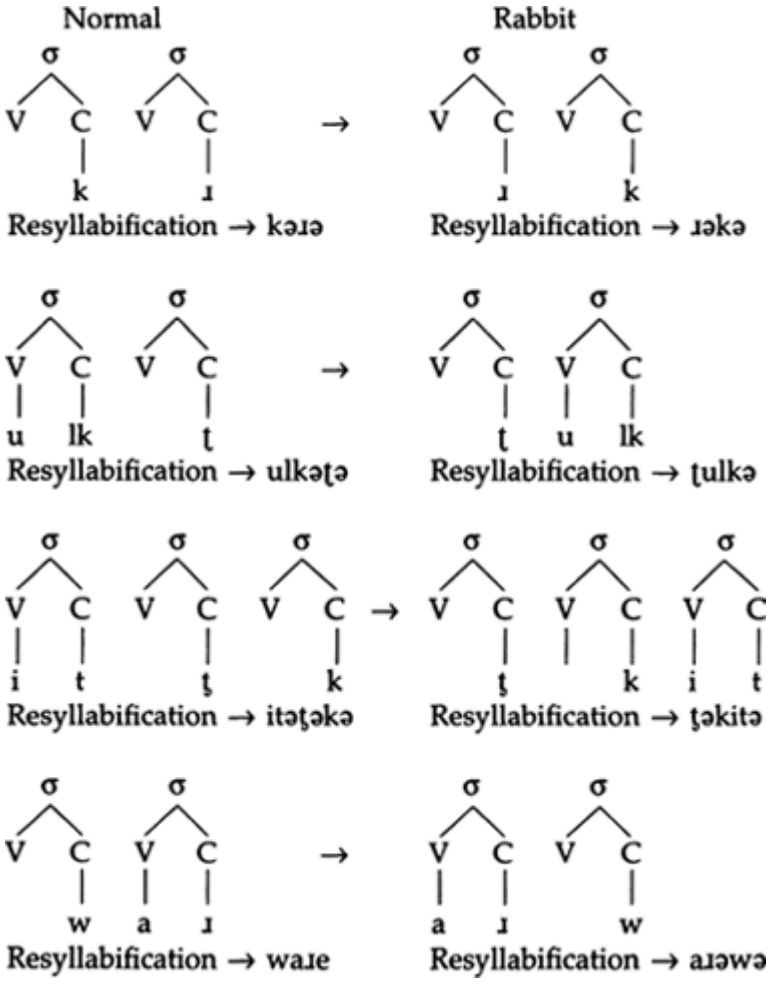
In addition to these general considerations, a number of morphological rules can be formulated most neatly in terms of the VC model. Let us begin by considering the formation of words in the play language “Rabbit Talk”; I leave aside the treatment of monosyllables, which is exceptional under any analysis.

(23)

	Normal	Rabbit Talk	Gloss
(a)	Initial vowel slot unfilled:		
	kəɹə	ɹəkə	"meat"
	n̪t̪əmə	mən̪t̪ə	"giving"
(b)	Initial and second vowel slots filled:		
	araʈə	aʈarə	"right"
	itirəmə	irəmitə	"thinking"
(c)	Initial vowel slot filled; second unfilled:		
	ulkəʈə	ʈulkə	"prentie (goanna)"
	itəʈəkə	ʈəkitə	"to light (a fire)"
(d)	Initial vowel slot unfilled; second filled:		
	waɹə	aɹəwə	"only"
	l̪aʈə	aʈəl̪ə	"now"

Under the VC analysis of underlying syllables, the rule for all four sets can be formulated elegantly: the first underlying VC syllable is simply shifted to the end of the word, as in the following examples:

(24)



Formulating the main Rabbit Talk rule in terms of normal syllables, on the other hand, would require a number of complex and unnatural rules. Another advantage of the VC analysis is that the Rabbit Talk

forms always have the same number of VC-syllables as their ordinary equivalents, whereas the number of surface CV syllables may vary – decreasing from three to two with *ulkə*ɭə, and from to four to three with *it*ə*t*ə*k*ə, but increasing from two to three with waɭə.

A number of "normal" rules of affixation and reduplication likewise allow more elegant formulations in terms of underlying VC-syllables. For example, the formation of nominalizations is exemplified by:

(25)

aɭkʷə	"eat"	aɭkʷəɳaɭkʷəɳə	"food"
aŋkə	"talk"	aŋkəɳaŋkəɳə	"talker"
atʷərə	"fight"	atʷərəɳərəɳə	"weapon"

On a conventional syllable model, the rule needs to be expressed as "suffix əɳ to the stem and right-reduplicate the last two syllables that result, minus the onset of the first syllable." But the VC syllable model permits the neater formulation "add ɳ to the stem and right-reduplicate the last two VC syllables thus formed."

Any claim about preferred syllable structure depends on the level being discussed. In both Arrente and Kunjen the level of surface syllabicity presents no great problems to claims for the universal status of CV as preferred syllable structure. But at the deepest level of representation the arguments for VC being the canonical syllable in Arrernte must now be considered very strong.

5.2 Syllable Constituency

Data from certain Australian languages also challenge a second oft-made universal claim about syllable structure, namely that all syllables can be broken down into an onset and a rhyme, which may then be further broken down into nucleus and coda. Davis (1985, 1988) marshals data from several Australian languages to argue instead for a flat syllable structure;[20] his main arguments for a flat syllable structure in some Australian languages rest on onset-sensitive stress assignment. Rhyme-sensitive stress assignment has, of course, been a mainstay of rhyme-based syllable analyzes given the common tendency of heavy syllables (defined in terms of a complex rhyme) to attract stress.

Davis reviews evidence from a number of Australian languages–Western Aranda, Alyawarra, and Madimadi – in which certain onsets attract stress in a way that appears comparable to heavy rhymes. For example, in Madimadi, words normally bear initial stress (e.g., *púkumanàma* "kangaroo", *wálwaɭa* "to burn") but second syllables which do not begin with a peripheral consonant attract stress (e.g., *wìrántu* "your whiskers", *ɖìnáŋu* "(his) foot", *kùyúni* "a large spear").[21] Davis shows that this is best accommodated by a metrical analysis of stress if a level syllable structure is proposed; however, it must be borne in mind that Hercus's description is based on work with the last, very old speaker and contains a limited corpus. The other two languages cited by Davis are the Arandic languages Western Aranda and Alyawarra; as we saw in (5.1), Arandic languages stress the initial syllable if it begins with a consonant, and the second syllable if the first begin with a vowel. These examples lose their force, of course, if we adopt Breen's VC syllable analysis, which treats both cases as second-syllable stress.

To these examples we may add several Yolngu languages, in which stress assignment is sensitive to apical initials: in Djapu first syllables are normally stressed, but apical-initial second syllables may attract stress if heavy[22] (e.g., *puɭáptun* "go down and cross"). In Djinang stress assignment is more complicated, depending on a prior division of the word into feet, which act as timing units. I will indicate intraword foot-boundaries with brackets. Within each foot that is longer than an open monosyllable the initial syllable is stressed, and primary stress is assigned to the first syllable of the word. A new foot will be initiated after any closed syllable (e.g., [míɽl][kùl][ɭíke] "covet"); after an open syllable a new foot can only be initiated if it begins with a non-apical consonant (cf. [káɭi][kàr] "track, road" and [míri][kà] "clothes" with *wákiri* "crow" and *ɭúmiliŋ* "blunt").

As this Djinang example shows, it is simplistic to base stress assignment simply in terms of local

syllable structure. If it depends indirectly on the structure of higher-order units such as feet, then the force of Davis's arguments is weakened. We must conclude that there is no knock-down stress-based argument for a level syllable structure in Australian languages, since all relevant cases are either based on a limited corus, an underlying VC-syllable, or are epiphenomena arising from the sensitivity of phonological feet to intervocalic consonants.

A second line of argument for a syllable structure in which quantity is onset-sensitive has been proposed by Hale and Nash (1987) for the Lardil auxiliary language Damin. Unlike Lardil, Damin has initial consonant clusters such as /fŋ/ and /[illegible]r/, and Hale and Nash raise the possibility that the various complex unusual initiation types behave phonologically as complex segments (e.g., /[illegible]/ as underlying /l/ plus /l/). They then relate this to a second difference between Lardil and Damin: where Lardil words must be at least dimoraic (i.e., disyllabic, or monosyllabic with a long vowel), Damin permits short-vowelled monosyllabic words only if they begin with a cluster or complex segment: "the minimal Damin word would be of the form CVV or CCV (but not CV). It would seem that Damin continues to satisfy the Lardil bimoraic minimal word requirement only if CCV words are considered to be bimoraic minimal word requirement only if CCV words are considered to be bimoraic. If the CC of CCV is a single onset, then we are faced we are faced with an unusual onset-rime or onset-nucleus dependencies (sic) involving quantity." (ibid, p. 9).

6 Prosodic Domains

In this section I review phonological processes sensitive to particular levels of the hierarchy of prosodic domains proposed by Nespor and Vogel (1986): the syllable (see above), the foot, the phonological word, the clitic group, the phonological phrase, the intonational phrase, and the phonological utterance (though of course authors may not use these terms). I shall say nothing about intonation which, with a few honorable exceptions largely within the tagmemic tradition (e.g., Sharpe 1972 on Alawa; Sayers 1974, 1976 on Wik-Munkan; and Pym and Larrimore 1979 on Iwaidja; see also Ford and Ober 1985), has been seriously neglected.

6.1 The Foot

Following Nespor and Vogel, I assume that the foot exists as a phonological constituent independent of stress rules, and indeed we have already seen that in Djinang foot-construction must precede stress assignment. Feet are used in the treatment of Warlpiri phonology by Nash (1986, p. 103ff.) as a means of indirectly making morphological structure available to the stress assignment rules, and to formulate the verbal reduplication rule: the first foot of a verb is left-reduplicated. The reanalysis of Yidiny stress by Hayes (1982) uses the foot as a formal device to eliminate the need for syllable-counting rules; foot construction also precedes stress assignment in Mayali (sec. 7.2).

6.2 The Phonological Word

An interesting case in which a grammatical word can comprise two phonological words is Yidiny. Monosyllabic suffixes form part of the same word both grammatically and phonologically; for example, they feed rules which lengthen the penult, and delete final suffixal syllables of odd-syllabled words (cf. (26a) and (26b)). But suffixes of more than one syllable, though part of the same grammatical word by such criteria as fixed morpheme order and distribution across phrases, will initiate separate phonological words (delimited here by [ ]ω). These phonological words are the input to the rules of penultimate lenghening and final-syllable deletion (27a, b). Other processes responsive to phonological rather than grammatical words are the selection of case and tense allomorphs, and the assignment of stress.

(26)

(a) [milpa-ŋa-l-ɲu]$_{ω}$ → milpaŋalɲu
clever-CAUS-CONJ-PST
"made clever"
(b) [kumaɹi-ŋa-l-ɲu]$_{ω}$ → kumaɹiŋa:l
red-CAUS-CONJ-PST
"made red"

(27)

(a) [milpa]$_{ω}$[-taka-ɲu]$_{ω}$ → [milpa]$_{ω}$[-taka:-ɲ]$_{ω}$
clever-INCH-PST
"became clever"
(b) [kumaɹi]$_{ω}$[-taka-ɲu]$_{ω}$ → [kuma:ɹi]$_{ω}$[-taka:-ɲ]$_{ω}$
red-INCH-PST
"became red"

6.3 The Clitic Group

Clitics in various positions are widespread in Australian languages. Complexes of pronominal enclitics, sometimes also including tense/mood marking, are found in Wackernagle's position in many languages, including Warlpiri and Ngiyambaa: they may follow either the initial word or the initial phrase. Clitics marking such functions as interrogation, focus, and restriction are also common, encliticizing to the word in their scope. More unusually, some languages (e.g., Kugu Nganhcara) have enclitics to the preverbal constituent:

(28)

n̪ila	pama-ŋ	ŋaʔa=la	yenta
3sgNOM	man-ERG	fish=3sgNOM	spear

"The man speared the fish."

It is often said that clitics are part of the same phonological word as their host – in Warlpiri, for example, clitic auxiliaries count as part of the same phonological word as their host for purposes of vowel harmony and stress assignment,[23] and in Gurindji the domain for nasal cluster deletion includes enclitics (sec. 3.1). But rules specific to the clitic phonological domain are sometimes found. In Ngiyambaa, for example, clitic pronouns behave like normal suffixes in a number of ways, participating in normal stress assignment rules within the word, and in an alternation that sees initial laminal stops realized as /ɟ/ after /i/ and /ʤ/ elsewhere. But whereas normal suffixes induce a preceding homorganic nasal on stems ending in the "nasal archiphoneme" *N*, pronoun enclitics parallel word boundaries in failing to induce the nasal. Thus the underlying final nasal in palkaɳN "boomerang" (palkaɳ in citation form) will appear before the diminutive suffix (palkaɳŋ-ʤul "boomerang-DIM") but not before a clitic (palkaɳ-ʤu "boomerang=1sgNOM").

In some languages of the Barkly region (Warumungu, Garawa) pronominal clusters may occur as clitics or may stand alone. Simpson and Withgott (1986) argue that such clusters in Warumungu cannot be accommodated in the normal, layer-ordered cycles of lexical phonology and are formed in the lexicon as flat structures, by template morphology. One piece of evidence comes from a rule that retroflexes nasals in the environment [[…]$_{σ}$[V___]$_{σ}$] just inside clitic clusters;, this derives aʧilaɳkaɳa, for example,

from underlying a[illegible]k[illegible]u "1du.excl.subj → 2sg.obj" (the change in the final vowel is due to vowel harmony).

6.4 The Phonological Phrase

External sandhi rules within phonological phrases are not uncommon in Australia. An example is the Iwaidjan language Mawng, with four sets of external sandhi rules. One lenites initial peripheral stops of quantifying and emphatic particles after vowel-final nouns, pronouns, verbs, or adverbs (29b).

(29)

(a)	yinimaɲ	kirk	(b)	kinima	yirk
	he.took.it	all		he.takes.it	all
	"He took it all."			"He takes it all."	

A second involves another set of lenitions- initial /k/ becomes /ɣ/ before /i, e, a/ and /w/ before /u/ after vowel-final words in phrases comprising a verb and its intransitive subject (30b), or anoun and its premodifier (31b).

(30)

(a)	karkpin	kapala	(b)	kɛ	ɣapala
	big	boat		it.goes	boat
	"big boat"			"The boat goes."	

(31)

(a)	marik	kupuɲ	(b)	mata	wupuɲ
	not	canoe		the:CLIII	canoe
	"not a canoe"			"the canoe"	

Two further processes, not illustrated here, ivolve the denasalization of verb-final nasals before uninflected roots or adverbs beginning with a stop, and the merging of like vowels across word boundaries, including like vowels separated by a homorganic glide. Although the syntactic constituents within which external sandhi can apply are not specified in the source, all examples are consistent with a phonological-phrase domain of either the NP or the "verbal group" (i.e., verb plus adverb, auxiliary, quantifier, or absolutive noun), and this corresponds closely to the conditions on the "phonological phrase" defined by Pym and Larrimore(1979, pp. 16-18) for the related language Iwaidja.

More limited examples of sandhi rules within a phonological phrase come from Yir-Yoront, which inserts schwa to break up certain consonant clusters between words within a phonological phrase, and Diyari, where inflected verb stemp plus a following auxiliary verb merge into a single unit in rapid speech.

6.5 The Intonational Phrase

In Kayardild final /a/is deleted from the last syllable of each intonational phrase (including, of course, the citation form). In (32) two words, each ending in /a/, are repeated in different orders, pausing after each intonational phrase. In rapid speech intonational phrases may span a whole clause, but as speech is made slower they may shrink to single (syntactic) phrases, or even single words within a phrase.

(32)

[ʈirkuɹ-uŋ-ka	ʈaa-ʈ]$_{I}$;	[ʈaa-ʈa	ʈirkuɹ-uŋ-k]$_{I}$
north-ALLAT-NOM	return-ACT	return-ACT	north-ALLAT-NOM

"From the north (he) returned; he returned from the north."

"From the north (he) returned; he returned from the north."

6.6 The Phonological Utterance

An interesting set of sandhi rules whose domain is the phonological utternace have been described by Crowley (1980) for the Cape York dialects Atampaya, Angkamuthi and Yadhaykenu; a later publication (Crowley 1983) gives a pandialectal grammar under the cover name "Uradhi."

Most Atampaya words have three surface forms: one in utterance-final position (an environment which affects the citation form), one in non-final position before vowels, and one in non-final position before consonants. The effects of these environments on the word for "tree" is illustrated below, for the moment in phonetic rather than phonemic transcription.

(33)

(a) [yukuŋ]$_{U}$
tree
"tree"

(b) [yuku wampaŋ]$_{U}$
treeNOM float-PRES
"The tree is floating (on the floodwaters)."

(c) [yuk ana:luŋ]$_{U}$
treeNOM float:PRES:hither
"The tree is coming this way (with the flood)."

Words with final *-n*, e.g., *wapun* "head" or *aŋan* "dig" either delete *-n* or add *-a* before a following consonant (34); before vowels they replace *n* with *r* (35).

(34)

[ayu	muʈ	aŋa / aŋana	nani-mun]$_{U}$
1sgERG	grubACC	dig-PST	ground-ABL

"I dug the grubs from the ground."

(35)

[uŋkyaw	mayi-wapur	uŋyaw]$_{U}$
flying.foxERG	food-headACC	eat-PRES

"The flying fox is eating fruit."

The full set of Atampaya sandhial alternations is as follows:

Underlying form	Utterance final	Prevocalic	Preconsonantal
-V	-Vŋ	-ø	-V
-n	-n	-r	-ø/-na
-Vɳ/-Vɲ/-Vy	-Vɳ/-Vɲ/-Vy	-ø	-V/-Vɳa /-Vɲa /-Vya
-l	-w	-l	-w

The remaining dialects are basically similar, but with some additional alternatives – for example Yadhaykenu responds to the sequence V#V either by eliding the first vowel, or by inserting a velar nasal: cf. *yapi* "forehead" but either his forehead is not wrinkled".

Crowley argues that these sandhi patterns developed to resolve anomalies arising as Uradhi lost or lenited initial consonants and moved from an ancestral CV-initial word structure to a modern (C)V-initial word structure, but retained constraints against successive vowels. The unacceptable sequences of adjacent like *kutakampu ŋaŋi ŋampuŋku paɭan* to a would-be modern sequence *utaɣampu aɳi ampuŋku waɭan* were avoided either by elision of the first vowel (as in Atampaya) or by inserting a consonant (as with Yadhaykenu ŋ-insertion). Other sandhial alternations can be traced to new constraints on sequences at word and utterance boundaries: against CC sequences across word boundaries (explaining the loss of *n* in the environment –#C) and against V utterance-finally (resulting in the addition of ŋ). Finally, the *l*/*w* alternation preserves original *l* just in the environment V__#V; ithas changed to *W* in preconsonantal and prepause (including citation form) positions. The current complicated alternations are thus due to a series of interactions between loss of word-initial segments, preservation of certain sequencing constraints across word boundaries, and the introduction of new constraints across word boundaries and at utterance boundaries.

7 Stress and Metrical Structure

No Australian languages utilize tonal contrasts, and with the exception of Wik-Mungkan and Ndjebbana (McKay and Coleman to appear) they all have fixed-accent systems. In Wik-Mungkan different stress patterns distinguish segmentally identical compounds (cf. *méˑʔ-peŋɭ* [eye-hair] "to be born", *méˑʔ-péŋɭ* "eyebrow"). Sayers also claims that the future versus past tense contrast is distinguished by a contrast between secondary and no stress (cf. *ṯaṯàŋ* "I will see", *ṯaṯaŋ* "I saw"),but an alternative is to admit syllabic nasals and phonemicize these as *ṯaṯaŋ* and *ṯaṯŋ* respectively (Gavan Breen p.c.). Most Australian languages appear to be stress-timed, but Kugu-Nganhcara is syllable-timed.

7.1 Meter that Ignores Morphological Boundaries

Although almost all Australian languages have fixed-accent systems, there is enormous diversity in their stress patterns; data from a number of languages have already been of central importance to the development of metrical theory but much remains unexplored.[24] In general, the unmarked primary stress position is on the initial, though in some prefixing languages (e.g., Tiwi) it is on the penultimate.

Much of the cross-language variation comes from the setting of various parameters which are easily accommodated by existing metrical theories. Are feet constructed from left to right, as in Maranungku and Yidiny, or from right to left, as in Garawa? Is stress allowed on final syllables, as in Guugu-Yimidhirr, or disallowed, as in Pintupi, and more generally are there extrametrical syllables in initial position (as on one analysis of Arandic) or final position (e.g., Pintupi)? Is the word stress left-headed (as in most Pama-Nyungan languages), or right-headed as in Jingilu, which has penultimate stress, and Uradhi, which has prepenultimate stress unless there is a long vowel. Are feet quantity-sensitive, being attracted to long vowels (e.g., Waalubal) or heavy syllables more generally (Gumbaynggir)? Or does the mora form a more appropriate unit than the syllable for stress assignment, as in Gooniyandi? Are feet binary, as is the case in most Australian languages, or unbounded, as in Waalubal, which gives primary stress to the first syllable, and secondary stress to any remaining long vowel, allowing unbounded feet between any long syllables, e.g., *Ṇámàˑlu* "tree goanna-ERG", *wúrkulùˑm* "magpie", and *páŋɭanibèˑ* "only covered".

To these differences we may add the possible effects of syllable- or foot- onsets on stress assignment, already discussed in 5.2, which sees certain syllable onsets attracting or spurning stress in Madimadi, Djinang, and possibly Arandic.

A particularly intricate system is that of Yidiny, which shows a complex interaction between vowel-length, syllable-count and stress: (1) syllables alternate between stressed and unstressed (e.g., *ɭámpuláŋalŋúnta*), (2) all long vowels occur in stressed syllables (e.g., *wúŋapáˑɭiŋúnta*), (3) long

vowels must always be separated by an odd number of syllables (e.g., *makˌ:riŋáˌ:ldaŋúˌ:n*), and (4) all words with an odd number of syllables must have a long vowel in at least one even-numbered syllable. In the initial descriptions by Dixon (1977a, b) a number of rules sensitive to syllable-count were used to derive surface forms satisfying the above constraints; for example, Penultimate Lengthening lengthens the penultimate vowel of any word with an odd number of syllables, and Illicit Length Elimination shortens long vowels occurring in odd-numbered syllables of odd-syllabled words. These facts have been subjected to various reanalyses, largely motivated by the localistic need to reformulate Dixon's rules without actually counting syllables; the reader is referred to Hayes (1982), and Halle and Vergnaud (1987a) for details.

7.2 Meter and Morphological Structure

In many Australian languages the most natural account of stress assignment makes reference to morphological structure. For example, the basic Warlpiri pattern is for odd-numbered syllables to be stressed, with the proviso that word-final syllables must be unstressed *mánaŋkaˌla* "spinifex plain", *wátiya* "tree". However, this basic pattern is broken when suffixes of two or more syllables initiate new domains for stress assignment; this leads to such minimal pairs as (36a, b). Successive monosyllabic suffixes may be merged as a single disyllabic foot, whose first syllable then receives stress (36c).

(36)

(a)	yápaˌla-ŋùˌlu	"father's mother-ELAT"
(b)	yápa-ˌlàŋu-ˌlu	"person-for.example-ERG"
(c)	wáti-[ŋkà-ˌlu]$_{\Sigma}$	"man-LOC-ERG"

Diyari stress behaves similarly, with each plurisyllabic suffix bearing an initial secondary stress (37a), but unlike in Warlpiri monosyllabic suffixes may not be merged into a foot (37b).

(37)

(a)	kàɳa-wáɹa-ŋúndu	man-PL-ABL
(b)	máda-la-ntu	hill-CHAR-PROPR

Although many grammars make reference to morphological structure in their formulation of stress rules, some theoreticians have sought ways of representing the stress facts without overt reference to morphology (see the treatment of Diyari and Warlpiri stress by Poser 1989); others (e.g., Halle and Vergnaud 1987a: 93) tacitly accept the role of morphological structure in conceding that "the property of being a stress domain is not necessarily coextensive with that of being a word."

Poser's approach eliminates the need for metrical rules to refer to morphological structure by making foot construction cyclical, applying after each morpheme is added; monosyllabic suffixes are assigned degenerate feet which block them from appearing in new feet and are postcyclically defooted. This works for Diyari and Warlpiri because both affixation and stress assignment go from left to right, but there are other languages, such as the polysynthetic Gunwinyguan languages, where Poser's solution will not work: the basic problem there is that stress is assigned from right to left, while the relevant affixes are added from left to right; consequently stress assignment cannot begin until all affixation has been completed.

The following examples of stress assignment in Mayali verbs will illustrate the problem, and the need to recognize morphological structure; the simplest analysis first builds feet on the basis of morphological structure, and then stresses the leftmost syllable of each foot, with the final non-degenerate foot receiving word stress; feet are the timing unit, and are of approximately equal duration. Normally each morpheme before the root is a foot, even if monosyllabic (38a, b), but from the root rightwards things are more complex: tense suffixes are merged with the preceding

morpheme (the root, or the reciprocal-forming suffix) into a single foot (38a, b, c, d). Complex stems (prepound plus root), whose elements are separated in these glosses with a +, behave slightly differently; the root of complex stems merges with single monomorphemic word-final syllables to the right (38a), otherwise the complex stem forms one foot (38c). All stems are shown in bold.

(38)

(a)	[pàri]$_\Sigma$-[mìm]$_\Sigma$-**[bò]$_\Sigma$+[wó-ni]$_\Sigma$**	they-seed-water.give-past.imperfective
(b)	[pà]$_\Sigma$-[kàɲ]$_\Sigma$-[ŋú-neŋ]$_\Sigma$	(s)he-meat-eat-past.perfective
(c)	[pàri]$_\Sigma$-[ʈàrk]$_\Sigma$-**[màn+ka]$_\Sigma$**-[ré-ni]$_\Sigma$	they-together-fall-recip-past.imperf
(d)	[àri]$_\Sigma$-**[pù]$_\Sigma$**-[ré-ni]$_\Sigma$	we-hit-recip-past.imperf

Verbs in the irrealis behave uniquely, in requiring the formation of a final trisyllabic foot (39a) regardless of the position of the irrealis morpheme break; any remaining stem material forms its own foot (39b) even if this breaks up a morpheme (in 39b, it fractures the root *ware* "bad").

(39)

(a)	[àpan]$_\Sigma$-**[kárme-niɲ]$_\Sigma$**	I/them-get-irrealis
(b)	[bà]$_\Sigma$-**[wà]$_\Sigma$[ré-m-eniɲ]$_\Sigma$**	it-bad-inchoative-irrealis

Once foot-construction has been carried out,it is easy to state the stress rules. Stated informally, stress is assigned to the first syllable of each foot, and word-stress to the first syllable of the rightmost non-degenerate foot; if stress has still not been assigned once left of the root, it goes on the first syllable of the first foot left of the root, degenerate or not. The latter condition is needed to account for case like (40), where all feet right of and including the root are degenerate and hence ineligible to bear primary stress, though they still receive secondary stress. Because of constraints on root-size this means that the primary stress will fall two, three, or four syllables to the left of the word-edge.

(40)

(a)	[pá]$_\Sigma$-**[ŋù-ø]$_\Sigma$**	(s)he:PST-eat-IMP "may (s)he eat!"
(b)	[án]$_\Sigma$-**[pò-m]$_\Sigma$**	(s)he/me-hit-past.perfective
(c)	[àn]$_\Sigma$-[máɳe]$_\Sigma$-**[pò-m]$_\Sigma$**	(s)he/me-benefactive-hit-past.perfective
(d)	[kàpani]$_\Sigma$-[kúk]$_\Sigma$-**[pù]$_\Sigma$**-[rè-n]$_\Sigma$	they.two-body-hit-reciprocal-non.past

Roots beginning with /d/ behave anomalously: following the comitative applicative *yi-*, and a small set of prefixes whose last vowel is lexically accented, e.g., *m*[illegible] *é* "many", such roots merge with the preceding syllable in a new foot, and change /d/ to /r/ (41a, b), but not if the stem is more than disyllabic (cf.41c). Elsewhere these prefixes behave normally, and are their own foot with initial stress (41d, e); the accent fails to surface. As we would expect given the right-to-left construction of meter, this pattern of stress assignment is bled by the irregular stress found with the irrealis.

(41)

(a)	[à]$_\Sigma$-[yí-runʈe-ŋ]$_\Sigma$	I/it-comitative-return-non.past
(b)	[kàpari]$_\Sigma$-[mìɳ]$_\Sigma$[té-ri]$_\Sigma$	they-many-stand-non.past
(c)	[kàpari-[míɳʈe-[dúlu+bo-m]	they-many-shoot-past.perfective
(d)	[àn]$_\Sigma$-[yì]$_\Sigma$-[báwo-ŋ]$_\Sigma$	(s)he/me-comitative-leave-past.perfective
(e)	[bà]$_\Sigma$-[mìɳ[e]$_\Sigma$-[bìm]$_\Sigma$+[bú-ni]$_\Sigma$	she-many-paint-past.perfective

Such complex stress patterns force a view of metrical phonology in which stress assignment follows the building of feet over the fully assembled word, a process which must be responsive to morphological boundaries and peculiarities of certain affixal elements. More complete phonological studies of other Gunwinyguan languages are likely to confirm this picture.

8 Prosodic Morphology: Reduplication

Given the essentially concatenative nature of most Australian morphological systems, the main interest of Australian languages for prosodic morphology (see chap. 9, this volume) comes from their rich possibilities of reduplication, surveyed in Dineen (1989). We have already seen examples of both left- and right-reduplication in Arandic (sections3.5 and 5.1), left-reduplication in Yidiny (sec. 3.1), and reduplicative infixing of syllable-codas in Kukatj (sec. 3.7); in general, left-reduplication is more common.

Many languages, such as Mparntwe Arrernte, have a number of reduplication templates each with their own meaning, and at least two of these may apply to the same verb: (42a) shows "continuous inceptive" left-copying with infixed ə/*pə*-, and "frequentative" right-copying with infixed *-p* together, expressing repeated inception, and (42b) the "inceptive" and "sporadic" together; the phonology and semantics of multiple reduplication need further investigation.

(42)

(a) t-əlpə-tanṯə-p-anṯə-mə
REDUP-CONT.INCEP-spear-FREQ-REDUP-non.past.progressive
"always making as if to spear, over and over again, without doing it"

(b) aŋk-əlp-aŋkə-[-aŋkə-[iwə-mə
speak-CONT.INCEP-REDUP-FREQ-speak-FREQ-non.past.progressive
"stuttering from time to time"

One aim of prosodic morphology is to replace characterizations of reduplication in terms of segment strings with simpler characterizations in terms of roots, morphemes, or syllable templates, and to use morphemic tiers to capture patterns that are hard to characterize in a simple linear model. Certainly, reduplicative processes in Australia are often sensitive to these structures (see for example Levin 1985 on Umpila). Reduplication involves verbal roots in Nyigina, and verbal stems (= root plus conjugation marker) in Kuku Yalanji. Verbal reduplication uses a syllable-pruned version of the inflected form in Warlpiri and Mayali (see below); Dineen points out that reduplication based on inflected forms is found only with verbs, not nouns, in Australian languages.

In many languages reduplication is sensitive to the syllabicity of the source morpheme(s). In Ngiyambaa, verbal reduplication involves the first two syllables of the stem, with pruning of the second syllable to make it light, e.g., *kaṯi-kaṯinma-ɲa* "REDUP-smash-PRES"; if the stem is a monosyllabic root, it cannot redupolicate. In Mayali, "iterative" verb reduplication takes the tense-inflected stem as input: if this has tow or more syllables the first syllable and next CV reduplicated

(43a), but if the inflected stem is a monosyllable a second template is used,which has the form CVNV-, where N is realized as *n* if C is a peripheral (43b), and ŋ elsewhere (43c):

(43)

(a)	ta-ŋen	stand-NonPast	→	taŋe-ta-ŋen
	wo-ni	give-PastImperfective	→	woni-wo-ni
(b)	ma-ŋ	get-NonPast	→	mana-ma-ŋ
	mey	get-PastPerfective	→	mene-mey
	wo-n	give-NonPast	→	wono-won
(c)	ta-ɲ	stand-PastImperfective	→	taŋa-ta-ɲ
	yo-y	lie-PastImperfective	→	yoŋo-yo-y

Another interesting example of the interaction of syllable targets, morpheme structure and inserted morphemic material comes from the Mayali terms for ecozones, formed by reduplicating a root designating some dominant plant or landscape feature. The template for this involves a disyllabic foot, with second syllable, open except possibly for ʔ, prefixed to the root. The coda of the first occurrence of the reduplicated root must be ʔ, displacing any copied coda material. (44) illustrates how monosyllabic, disyllabic and trisyllabic roots are adapted to this template; notice that the initial CV of monosyllabic roots gets copied twoice to meet the foot requirements.

(44)

kun-waṯe	"rock"	→	kun-waṯeʔ-waṯe	"rock plateau"
an-kapo	"creek"	→	an-kapoʔ-kapo	"area with lots of creeks"
an-yakŋara	"pandanus"	→	an-yakŋaʔ-yakŋara	"pandanus scrub"
an-powk	"seasonal swamp"	→	an-poʔpo-powk	"alluvial plains"
kun-kot	"paperbark tree"	→	an-koʔko-kot	"paperbark swamp"

In some languages, the reduplicated portion often fails to correspond to a natural phonological unit.We have already seen examples where the coda is absent from reduplicated monosyllabic or disyllabic prefixes, or is replaced with a final glottal stop; here it is a CV-, rather than a syllable, that is copied.[25] A number of languages (Jingilu, MalakMalak, Warumungu, Kugu-Nganhcara, Mangarayi) have a distinctive type of reduplication appearing at first glance to involve rightward copying and infixation of the rhyme of the first syllable and onset of the second:

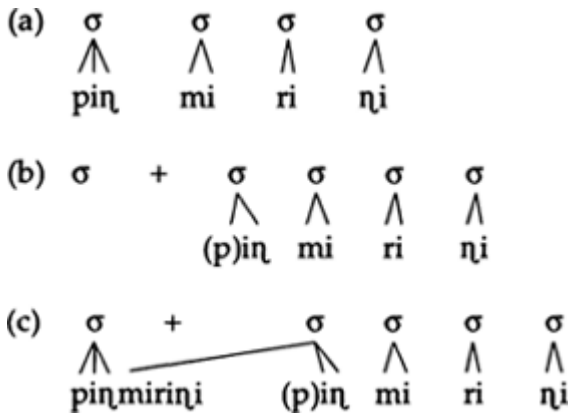
(45)

ʈapanʈa	"young"	→	ʈapapanʈa	"young ones"
maɭuka	"old man"	→	maɭaɭuka	"old men"
piɳmiriɳi	"old woman"	→	piɳminmiriɳi	"old women"

However, McCarthy and Prince (1986) account for the Mangarayi version of this by rendering the initial C extramelodic and then prefixing a syllable to which a copy of the phonemic melody is linked; this melodic copy saturates the prefixed syllable and fills the vacant onset slot left by the detachment of

the initial melodic element from the base. An example of how their account can be adapted to the Jingilu data is (46); note that this postulates left-copying, and avoids the need for postulating infixation.

(46)



I am grateful to Gavan Breen, Andy Butcher, Carolyne Coleman,Bob Dixon, Brian Geytenbeek, John Hajek, Robert Handelsmann, Mark Harvey, John Henderson, Mary Laughren, Patrick McConvell, Bill McGregor, David Nash, Rachel Nordlinger, Nick Reid, Janet Sharp, Jane Simpson, and Oscar Whitehead for their helpful discussions of various issues in this chapter, and for their generosity on making unpublished work available. I would also like to take this opportunity to thank the compilers -Bob Dixon, Michael Walsh, Harold Koch and Geraldine Triffitt - of the annual bibligraphies of work on Austrualian languages that appear in the Australian Journal of Linguistics, which have been invaluable in preparing this article; I recommend them as a means of following recent developments in the years that will follow the publication of this chapter.

1 Most descriptive work has been based on classical phonemic, early generative, Firthian prosodic, or tagmemic models. The availability of models from the last two traditions in particular saved many descriptions from ignoring prosodic facts that could not easily be accommodated in the generative tradition and were thus at risk of being omitted from more theory- bound descriptions. Notable early descriptions based on the richer phonological models offerd by the tagmemic tradition are Sharpe (1972) on Alawa, Sayers (1974) on Wik-Mungkan, and Pym and Larrimore (1979) on Iwaidja. Sayer's descriptions for example, recognize a phonological hierarchy comprising syllable, foot, word, phonological clause, and phonological sentence. A phonological description applying the Firthian notion of syllable prosody to the glottal stop in Rembarrnga is McKay (1975), while McGregor (1993) examines Gooniyandi phonology from a systemic perspective.

2 For brevity's sake I give the primary sources for all language data with the list of language locations.

3 The symbols used here have their standard IPA values, except that I use *y* for IPA *j* and ɻ for IPA ɽ.

4 Although Butcher (to appear b) shows that in some languages, e.g., Warlpiri, “retroflexes” are actually sublaminal rather than apical.

5 And Butcher (to appear b) has shown that the point of apical contact word-initially is actually intermediate between the normal contact points when the phonemes are distinct.

6 We still lack a definitive treatment of Bajjamal phonology, and the bilabial glide may be an allophone of /b/ after vowel plus liquid sequences (Andy Butcher p.c.).

7 E.G., Hosokawa (1991) discusses a possible “tense/lax” contrast in the Kimberley language Yawuru, predominantly cued by unrealeased versus aspirated realization in word-final position.

8 But there is a single disyllabic exception, ka.ɳ.ta, plus a number of exceptions in longer words.

9 However, some languages, such as those of the Yolngu group, have both a contrasing stop series and

contrastive vowel length.

10 Crowely's description of Anguthimri is a salvage study only and the data is too limited to give unquestioned phonemic status to all 17.

11 Consistent with this analysis is the observation by Brian Geytenbeek (p.c.) that attempts to teach literacy in Aboriginal languages by the "syllable method" often lead to learners omitting the nasal.

12 The phenomenon is found in various other languages of the northern desert fringe. McGregor (1990) descrirbes a similar phenomenon in Gooniyandi, though here is it restricted to adjacent syllbeles.

13 These facts hold for the major dialect considered. In a second dialect /p/ fails to block it (McConveli 1988, p. 161).

14 Breen (1975) analyzes these as prestopped trills.

15 The two exceptions to this involve (a) cases where an apical in one syllable changes its value for retroflexion through assimilating to another in an adjoing affixed syllable: cf. ɖoɖ 'louse' but ŋan-doɖ-maŋ' he delouses me', and (b) underlyingly non-retroflexed follwing a glottalized syllabel - cf. *naŋ* "I saw you" and *woʔɳaŋ* "I looked after you". This process is as yet poorly understood, but there is some evidence that apicals after glottalized syllables are ambisyllabic, since the retroflexion colors the preceding vowel: *woʔɳaŋ* is phonetically [wɔŋʔɳ*aŋ*].

16 Theoretical discussions are in Steriade (1979), Nash (1979a), van der Hulst and Smith (1985), Archangeli (1986), Nash (1986), and Sharp (1986).

17 The terms "underlying syllable" and "surface syllable" are my own. Sommer uses the terms "phonological" and "phonetic" syllable.

18 Two short but influential papers on Arandic phonology - Turner and Breen (1984) and Wilkins (1984) - appeared in the now-defunct *Language in Central Australia*, available from the Institute for Aboriginal Development, Alice Springs.

19 Two more vowels, /i/and/u/, have a much more restricte distribution.

20 In a beautiful example of structurally parallel phonological and syntactic arguments in temporal décalage, this recapitulates the use of data from Dyirbal, Nunggubuyu and other Australian languages to agrue against the universality of a VP constituent in syntax.

21 The diachronic operation of a similar rule followed by loss of the first vowel is likely to have led to the initial clusters in Ngarrinjerri and some Victorial languages (see sec. 5).

22 However, the discrepant status of the apical stops in Djapu (as the only ones not descending from long stops intervocalically) suggests the following hypothesis: only apicals are not ambisyllabic, so that nonapical stops all follow closed syllables. This would then allow us to formulate the stress rule in terms of first-syllable weight.

23 In fact, Warlpiri presents problems for Nespor and Vogel's prosodic hierarchy, which says that the clitic group exhaustively subsumes lower constitutents, in particular the phonological word. Warlpiri vowel harmony presents problems from this view, since harmony spreads rightward into the enclitic group, but does not spread out of preverbs, reduplicated elements, or compounded nouns: (a) piri-kuʃu-ɳu=ju-lu DISTR-throw-PST=1sgO-3plS (b) yukiɲi-yukiɲi-li green-green-ERG (c) miyi-kupu-ɳu food-winnow-PST If the harmony domain is used as evidence for a prosodic constituent, the first break is between the preverb, etc. and the remainder plus clitics, rather than between the clitics and the complex word, as Nespor and Vogel's theory would suggest.

24 And in fact the primary data on which discussions of MalakMalak and Maranunggu stress are based may not be accurate. In particular, it seems that these languages do in fact take morpheme boundaries into account in their stress assignment rules (Mark Harvey and Ian Green, p.c.).

25 However, the possibility that this pattern can be analyzed as an open or light syllable template warrents investigation.

Cite this article

EVANS, NICK. "Current Issues in the Phonology of Australian Languages." *The Handbook of Phonological Theory*. Glodsmith, John A. Blackwell Publishing, 1996. Blackwell Reference Online. 31 December 2007 <http://www.blackwellreference.com/subscriber/tocnode?id=g9780631201267_chunk_g978063120126727>

Bibliographic Details

The Handbook of Phonological Theory

Edited by: John A. Glodsmith
eISBN: 9780631201267
Print publication date: 1996