12th International Conference of Nordic and General Linguistics

June 14, 2021–June 18, 2021, Universitetet i Oslo

Workshop 1: Establishing phoneme inventories: argumentation and cross-linguistic comparability

The Status of Phoneme Inventories: The Role of Contrastive Feature Hierarchies

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1. Introduction

Introduction

Popular phonological databases represent phonological inventories as sets of IPA symbols, with each symbol standing for a phonetic description akin to a set of fully-specified distinctive features (as in Chomsky & Halle 1968).

Valuable though these resources are, we contend that this approach obscures the fundamental role of the phoneme as a unit in a language-specific system of contrasts.

We argue that phoneme inventories are best understood in terms of contrastive feature specifications, assigned in language-specific hierarchies by the Successive Division Algorithm (SDA; Dresher 2009).

Introduction

In the SDA:

> No feature is assigned unless it serves to mark some phonemic contrast that has not already been encoded.

Thus, only contrastive features are visible to phonological processes.

Understanding phoneme inventories in terms of contrastive hierarchies of features has consequences for what kinds of typological generalizations can meaningfully be made about them.

Introduction

In this presentation we will first show how phonological databases **obscure the contrastive nature of inventories** and give a misleading picture of the inventories themselves.

We will then show that **the phonetic shapes of inventories constrain, but do not dictate, feature specifications**.

Conversely, we will show that **feature specifications constrain, but do not dictate, the phonetic shapes of inventories**.

2. Phonological Databases

Phonological Databases

Phonological databases have become an important resource for typological research; some notable examples are:

- SPA, the Stanford Phonology Archive (Crothers et al. 1979);
- UPSID, the UCLA Phonological Segment Inventory Database (Maddieson 1984, Maddieson & Precoda 1990);
- P-base (Mielke 2008); and
- PHOIBLE (Moran & McCloy, 2019), an online database of phonological inventories that incorporates a number of earlier ones.

These databases include phonological inventories of hundreds of languages and are easily accessible for use in cross-linguistic surveys.

Phonological Databases

However, the very qualities that make these databases easy to use also significantly limit their reliability: they provide a single (sometimes misleading) symbol for every phoneme of an inventory.

Though the problems inherent in such databases are well known (Simpson 1999), they continue to be used because there are no real alternatives.

Dresher & Rice (2015) illustrate how such databases can give a misleading picture of inventories by looking at PHOIBLE's treatment of the vowel inventories of Australian Pama-Nyungan languages.

Pama-Nyungan 3-vowel Inventories

In March 2015 PHOIBLE listed 12 Pama-Nyungan languages with three vowels, and 2 with three short and three long vowels (there are more now):

Antakarinya; Dieri; Dyirbal; Eastern Arrernte; Kalkutung; Kuku-Yalanji; Wangaaybuwan-Ngiyambaa; Yidiny	/i, a, u/
Yanyuwa	/ɪ, a, ʊ/
Western Arrarnta	/i, a, ə/
Karadjeri	/i, ɑ, u/
Dhuwal	/ɪ, ɐ, ʊ/
Ngarinman (Antakarinya, *added after March 2015*)	/i, a, u, iː, aː, uː/
Antakarinya	/i, a, ʊ, iː, aː, uː/

Pama-Nyungan 3-vowel Inventories

We observe that 9 languages are listed as having /i, a, u/, and another 5 have different inventories.

Dresher & Rice (2015) argue that these groupings are not significant: we cannot trust that the difference between /i/ and /ɪ/, or /u/ and /ʊ/, or /a/, /ɑ/, and /ɐ/, is real or phonologically important.

/i, a, u/
/ɪ, a, ʊ/
/i, a, ə/
/i, ɑ, u/
/ɪ, ɐ, ʊ/
/i, a, u, iː, aː, uː/
/i, a, ʊ, iː, aː, uː/

Antakarinya Vowel System

Consider Antakarinya. It is listed three times in PHOIBLE.

Aside from the length contrast, there is a discrepancy between UPSID and Round /u/ versus SPA /ʊ/. It's not that UPSID does not use /ʊ/: they use it for Yanyuwa .

PHOIBLE treats this distinction between /u/ and /ʊ/ as significant.

Thus, the UPSID and Round listing of the phonemes of Antakarinya is counted as one of the 2646 languages (88% of the total) that contain /u/ (as of June 2021).

The SPA listing is one of the 409 (14% of the total) languages that contain /ʊ/.

Antakarinya (UPSID)	Antakarinya (Erich Round)	Antakarinya (SPA)
/i, a, u/	/i, a, u, iː, aː, uː/	/i, a, ʊ, iː, aː, uː/

Antakarinya Sources

The discrepancies between UPSID and SPA are not due to having different sources: they both use the same sources, by W. H. Douglas:

- Douglas, Wilfrid H. 1955. Phonology of the Australian Aboriginal language spoken at Ooldea, South Australia, 1951–1952. *Oceania* 25: 216–229.
- Douglas, Wilfrid H. 1964. *An introduction to the Western Desert language. (Oceania Linguistics Monographs, 4)*. Sydney: The University of Sydney, Australia.

Douglas 1964 links only to the first few front pages (the date is actually 1958, not 1964). We could not find this monograph.

Antakarinya Sources

Douglas 1955 is available online:

PHONOLOGY OF THE AUSTRALIAN ABORIGINAL LANGUAGE SPOKEN AT OOLDEA, SOUTH AUSTRALIA, 1951–1952

By W. H. Douglas

I. Orientation

THIS description is based on research conducted personally at the United Aborigines Mission Station, Ooldea, South Australia, during six months of 1951 and two and a half months of 1952.

The language is regarded as a dialect of the great desert language of South and Western Australia. The area includes Cundeelee, Kalgoorlie, Laverton and Warburton Ranges, in Western Australia, and Ernabella, Oodnadatta and the trans-Australian railway line in South Australia.[1]

Ooldea was, at the time of the study,[2] a popular native ceremonial ground, as well as a government ration depot and mission station. Visitors from other dialect areas were frequently passing through the district, and it was noted that informants modified their speech according to their temporary associations with members of other dialect areas. The phonological modifications followed definable lines, and receive mention in the following description of the Ooldea dialect.

II. Chart of the Phonetic Norms of the Phonemes

	Types of Sounds.	Labial.	Dental.	Alveolar.	Cerebral.	Velar.
Consonants	Stops	*p*	*t′*	*t*	*ṭ*	*k*
	Nasals ..	*m*	*n′*	*n*	*ṇ*	*ŋ*
	Lateral liquids		*l′*	*l*	*ḷ* .	
	Central liquids			*r*	*ṛ*	
	Non - syllabic vocoids ..	*w*		*y*		
Vowels	High			*i*		*u*
	Low				*a*	

[1] See R. M. Trudinger, " Pitjantjara Grammar," *Oceania*, VIII, No. 3, 1943.
[2] The Ooldea Mission has since been closed down.

Antakarinya Vowel System

On p. 216 Douglas gives a "Chart of the Phonetic Norms of the Phonemes" which lists three vowels: *i*, *a*, and *u*.

Maybe the UPSID inventory comes from here.

However, Douglas writes (p. 217) that the symbols are chosen for "convenience in printing and typing" [our emphasis].

II. Chart of the Phonetic Norms of the Phonemes

	Types of Sounds.	Labial.	Dental.	Alveolar.	Cerebral.	Velar.
Consonants	Stops	*p*	*t′*	*t*	*ṭ*	*k*
	Nasals ..	*m*	*n′*	*n*	*ṇ*	*ŋ*
	Lateral liquids		*l′*	*l*	*ḷ* .	
	Central liquids			*r*	*ṛ*	
	Non - syllabic vocoids ..	*w*		*y*		
Vowels	High			*i*		*u*
	Low				*a*	

Antakarinya Vowel System

On p. 220 is a more detailed description of the “phonetic norms” of the vowels:

- /i/ is a “voiced high close front unrounded syllabic vocoid,” that Douglas transcribes as [i].

- /a/ is a “voiced low open central unrounded syllabic vocoid,” transcribed [ʌ].

- /u/ is a “voiced high open back rounded syllabic vocoid,” transcribed [ʊ].

If we take these norms as the inventory, we ought to list it as /i, ʌ, ʊ/; the /ʊ/ is as in SPA, but both UPSID and SPA have /a/, not /ʌ/.

Antakarinya Vowel System

On pages 220–1, Douglas gives even more details of the variants of each vowel; they all have many allophones.

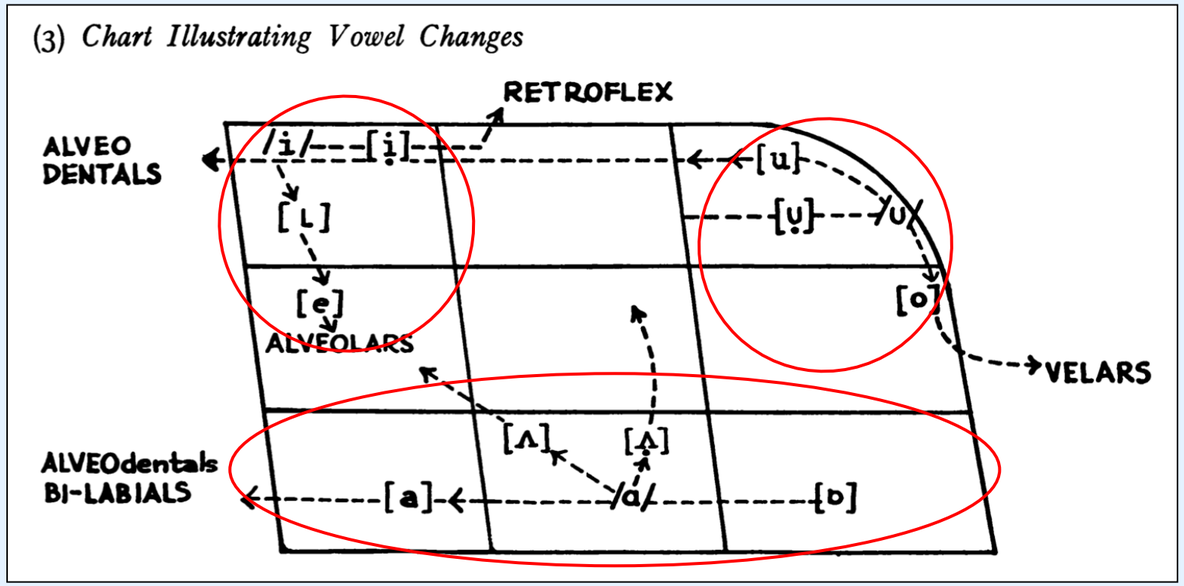
- /i/ has allophones [i]; retroflex [ɨ] before retroflex consonants; open [ɪ] “in free fluctuation with [i]” in certain contexts; [e] “freely fluctuating with [ɪ] and [i]” word-medially before alveolar consonants.

- /a/ has allophones [ʌ]; retroflex [ʌ̣] before retroflexes; [ɑ] before bi-labial and alveo-dental consonants; “slightly rounded” [ɒ] in free fluctuation with [ɑ] near velars and /w/.

- /u/ has allophones [ʊ]; retroflex [ʊ̣]; [u] “in free fluctuation with [ʊ] before alveo-dental consonants”; [o] “in free fluctuation with [ʊ] before velars word-medially”; voiceless [ʊ̥] occurring utterance finally only, “in rapid utterances of the past tense verbal suffix –*ngu*.”

Antakarinya Vowel System

Douglas (1955: 221) sums up the phonetic realization of the vowels with the following chart:

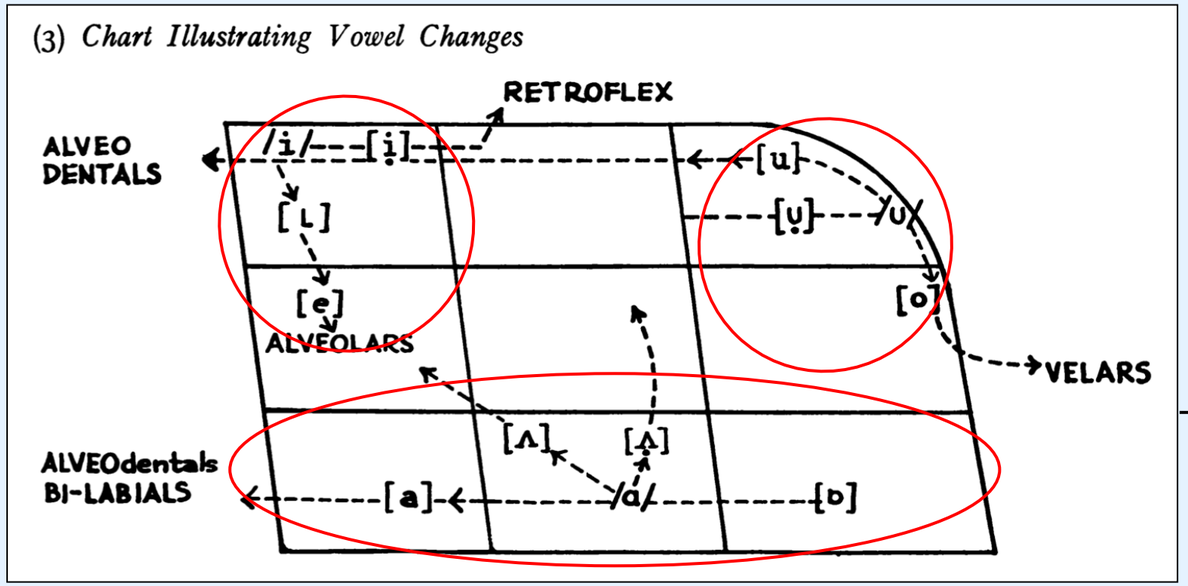


No three symbols can do justice to this system.

We can say that there are 3 contrasting vowels that can be distinguished by 2 features. This is often what /i, a, u/ really means. But which features?

Antakarinya Vowel System

The range of the low vowel extends across the low region; we can designate it [+low].



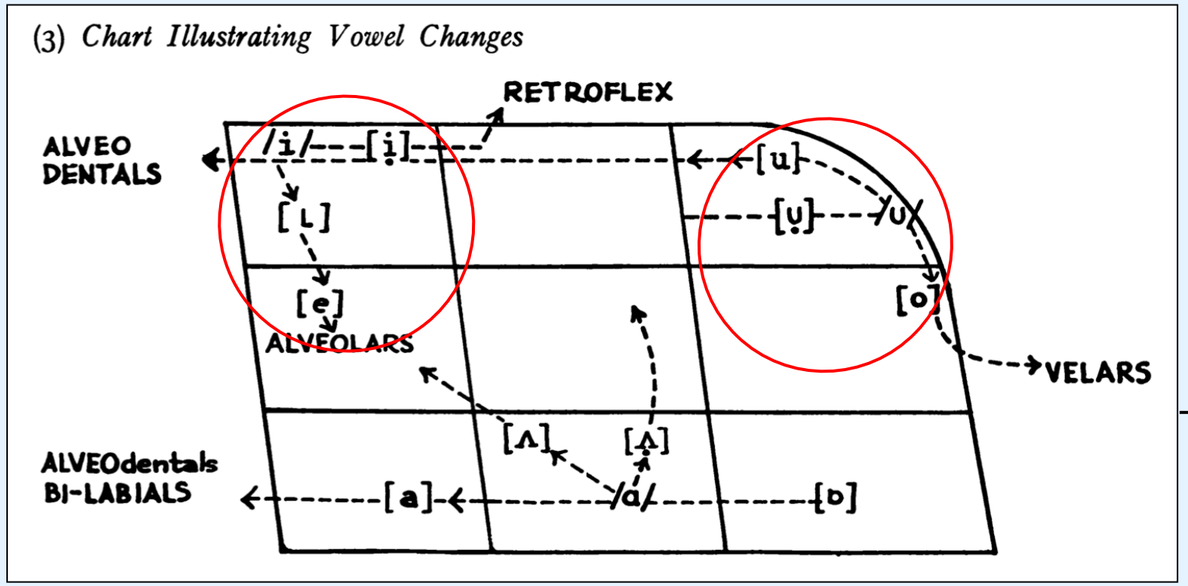
It appears to have no other contrastive features.

$$\frac{[-\text{low}]}{[+\text{low}]}$$

The other vowels are non-low. /I/ is front and unround, /U/ is back and round. Backness and roundness go together here and cannot be disentangled.

Antakarinya Vowel System

We can call this contrastive feature [front/unround] or [back/round] (cf. Jakobson 1962 [1931]; Kaye, Lowenstamm & Vergnaud 1985).



[+front/unround] | [–front/unround]

[–low]

———

[+low]

Phonological Activity

Turning to phonological activity, Douglas (1955) does not describe any alternations triggered by vowels, or other types of activity that could help us pinpoint what the contrastive features are.

He does (p. 218) mention an effect of the vowel “i” on dental consonants that could suggest that it has a marked feature that the other vowels lack:

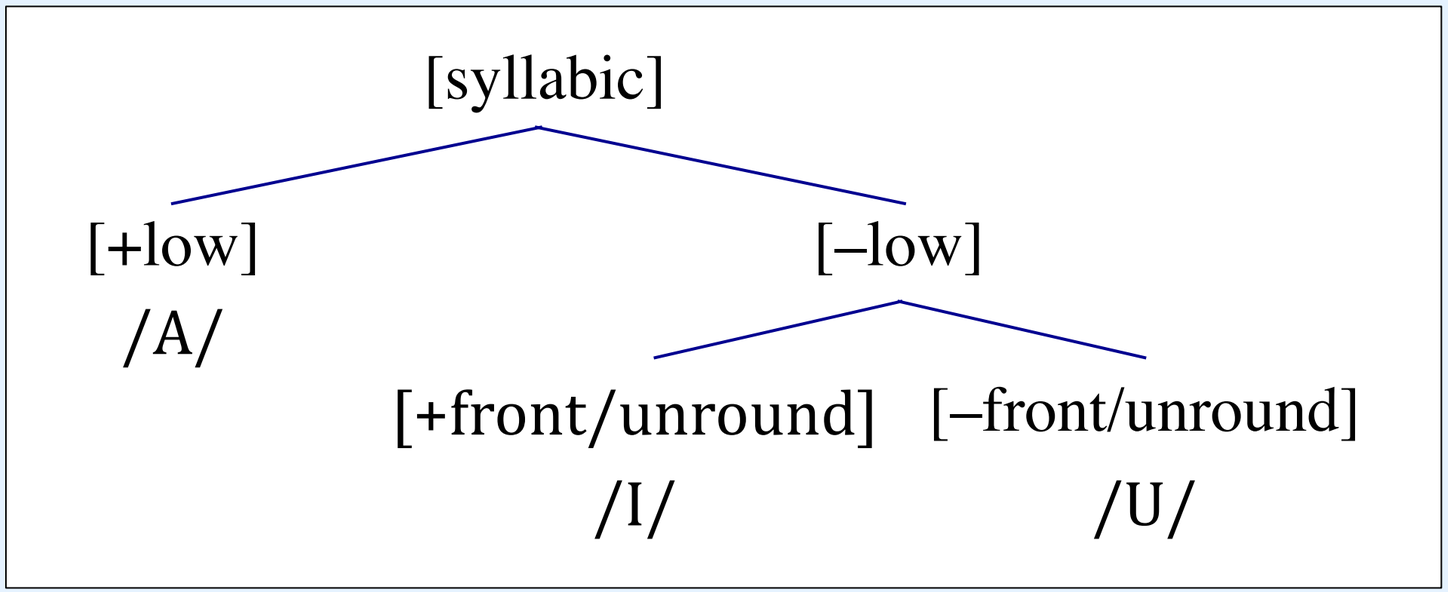
> “At Ooldea there was fluctuation between the use of the interdental and the alveo-dental varieties of these consonants preceding the vowels "a" and "u"; but before "i" the alveo-dental only occurred.”

We can identify this feature with [+front/unround].

Antakarinya Vowel Features

We now have 2 features, which is all we can have for a contrastive hierarchy with 3 segments.

Since we have no evidence that the low vowel is contrastive for anything but [+low], it follows that the order of the features must be: [low] > [front/unround].



We propose that this kind of representation gives a more accurate account of the vowel inventory than /i, a, u/.

Phonological Databases

To sum up what we have seen to here, the vowel system of Antakarinya does not consist of a set of points that can be represented by IPA symbols.

IPA-based databases make artificial distinctions (such as between /i/ ~ /ɪ/ and /u/ ~ /ʊ/ in three-vowel systems) that are then used in typological statistics.

Rather, a segment inventory is an inherently **contrastive** system best expressed by a feature hierarchy.

3. Phonetic shapes of inventories constrain (but don’t dictate) feature specifications

Phonetic and Phonological Properties of Inventories

The SDA does not stipulate an ordering of features.

With variation in feature ordering, phonetically similar inventories may be phonologically distinct, even if the same features are used to specify them.

We will illustrate this point with Ngizim and Hausa, two Chadic languages with distinct systems of laryngeal harmony.

Laryngeal Harmony in Ngizim and Hausa

Based on inventories in Schuh (1971, 2002) and Newman (2000), both languages have a three-way laryngeal contrast among coronals with voiced, voiceless, and implosive stops resulting in the inventory /t, d, ɗ/.

Ngizim stop inventory (Schuh, 2002)

	labial	alveolar	(alveo)palatal	lateral	velar	lab.velar
voiceless stop	p	t	tʃ		k	k^w
voiced stop	b	d	dʒ		g	g^w
glot. stop	ɓ	ɗ	$ɗ^y$/'y			

Hausa stop inventory (Newman, 2000)

	lab.	cor.	pal.	vel.	lab-vel.	pal-vel.	laryn.
vl	(f, fy)	t	c	k	kw	ky	
vd	b	d	j	g	gw	gy	
gl	ɓ	ɗ	'y	ƙ	ƙw	ƙy	'

Ngizim Voicing Harmony

Ngizim has a cooccurrence restriction which prohibits voiced pulmonic obstruents from following voiceless ones (Schuh 1997; Hansson 2004, 2010; Mackenzie 2012, 2013).

gâ:zá	‘chicken’	*k…z	kùtər	‘tail’	*k…d
dəbâ	‘woven tray’	*t…b	tàsáu	‘find’	*t…z
zədù	‘six’	*s…d			

voiceless stop	p	t	ʧ		k	k^w
voiced stop	b	d	ʤ		g	g^w
glot. stop	ɓ	ɗ	$ɗ^y$/’y			

Ngizim Voicing Harmony

Although phonetically voiced, implosives do not participate in the restriction and occur freely following voiceless stops (Schuh 1997).

kì:ɗú	‘eat (meat)’	√k…ɗ		pə́ɗə́k	‘morning’	√p…ɗ

The voiced and voiceless stops interact in voicing harmony to the exclusion of the implosives.

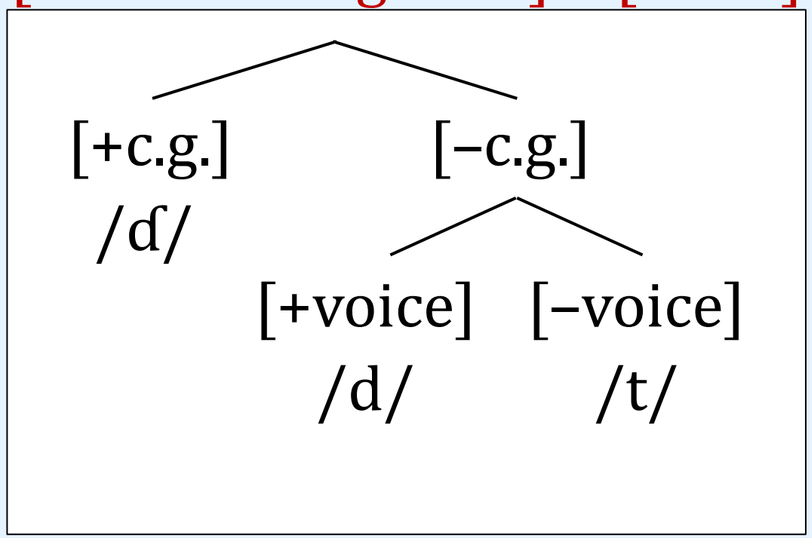
voiceless stop	p	t	ʧ		k	k^w
voiced stop	b	d	dʒ		g	g^w
glot. stop	ɓ	ɗ	$ɗ^y$/’y			

Ngizim Contrastive Hierarchy

This patterning can be accounted for with a hierarchy in which the feature [constricted glottis] is ordered above the feature [voice].

In the proposed hierarchy, implosive /ɗ/ is not contrastively specified for the feature [voice].

[constricted glottis] > [voice]

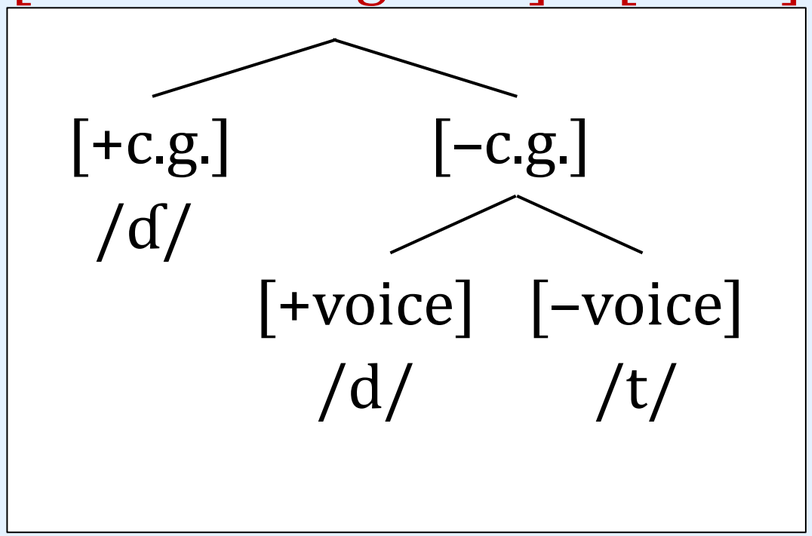


Ngizim Contrastive Hierarchy

If voicing harmony follows from a restriction barring [+voice] segments from occurring after [–voice] ones, the implosive is expected to be neutral.

The absence of a [+voice] specification for Ngizim /ɗ/ is supported by other aspects of phonological patterning.

[constricted glottis] > [voice]



Ngizim implosives fail to pattern with voiced stops in restrictions on consonant clusters (Schuh, 1997), local assimilation processes, and consonant-tone interaction (e.g. Tang, 2008).

Hausa [constricted glottis] Harmony

Hausa implosives may not co-occur with their homorganic pulmonic counterparts (Newman 2000).

ɓaɓe	‘quarrel’	*ɓaba	ɗaɗa	‘to strike a blow’	*ɗadi

This pattern has been analyzed as harmony in the feature [constricted glottis] which is parasitic on place (e.g. Hansson 2010; Rose & Walker 2004).

	lab.	cor.	pal.	vel.	lab-vel.	pal-vel.	laryn.
vl	(f, fy)	t	c	k	kw	ky	
vd	b	d	j	g	gw	gy	
gl	ɓ	ɗ	’y	ƙ	ƙw	ƙy	’

Hausa [constricted glottis] Harmony

Significantly, implosives may occur with homorganic stops that differ in voicing (Newman 2000).

ɗata	‘a small, bitter, green tomato’	√ɗ…t

The implosive and pulmonic voiced stops interact in [constricted glottis] harmony to the exclusion of the voiceless stop.

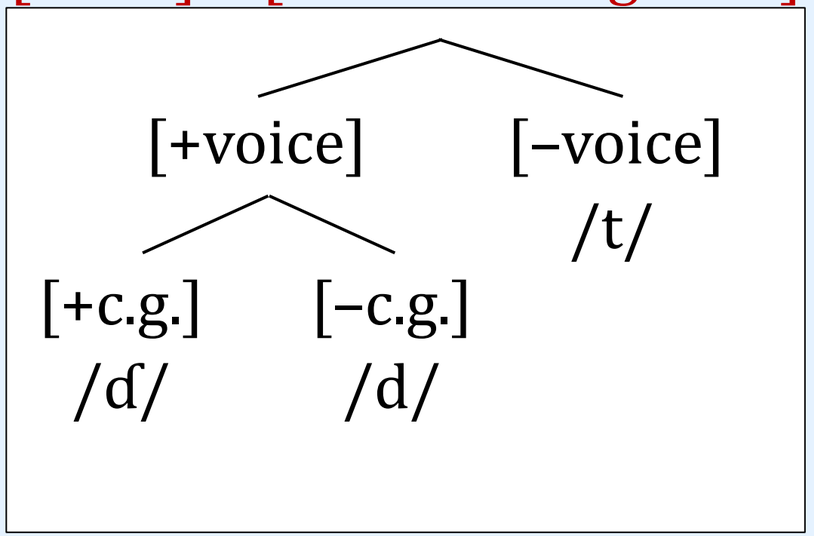
	lab.	cor.	pal.	vel.	lab-vel.	pal-vel.	laryn.
vl	(f, fy)	t	c	k	kw	ky	
vd	b	d	j	g	gw	gy	
gl	ɓ	ɗ	’y	ƙ	ƙw	ƙy	’

Hausa Contrastive Hierarchy

/d/ and /ɗ/are partners which share a specification for [voice] and differ only in the feature [constricted glottis].

This pattern can be accounted for with a hierarchy in which the feature [voice] is ordered above the feature [constricted glottis] (Mackenzie 2012, 2013).

[voice] > [constricted glottis]

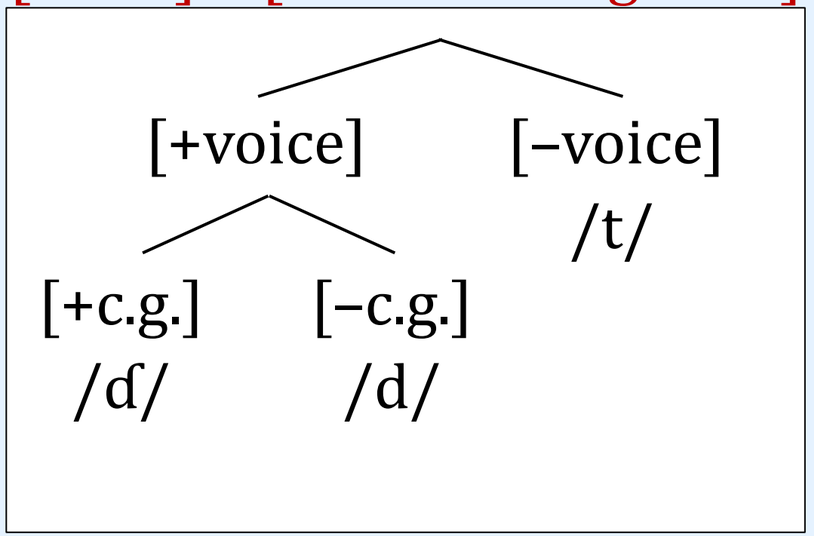


Hausa Contrastive Hierarchy

In the proposed hierarchy, /t/ is not contrastively specified for the feature [constricted glottis].

If harmony follows from a restriction barring segments which differ only in [constricted glottis] from co-occurring, we expect /t/ to pattern as neutral.

[voice] > [constricted glottis]

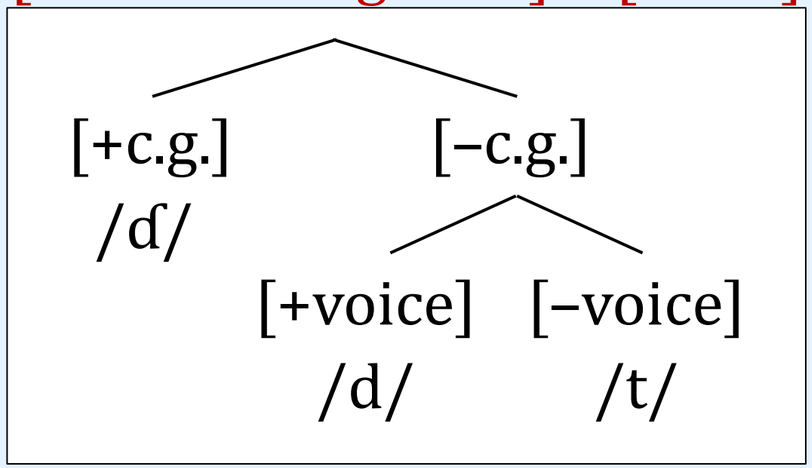


Phonetic and Phonological Properties of Inventories

Ngizim and Hausa have phonetically similar inventories of coronal stops.

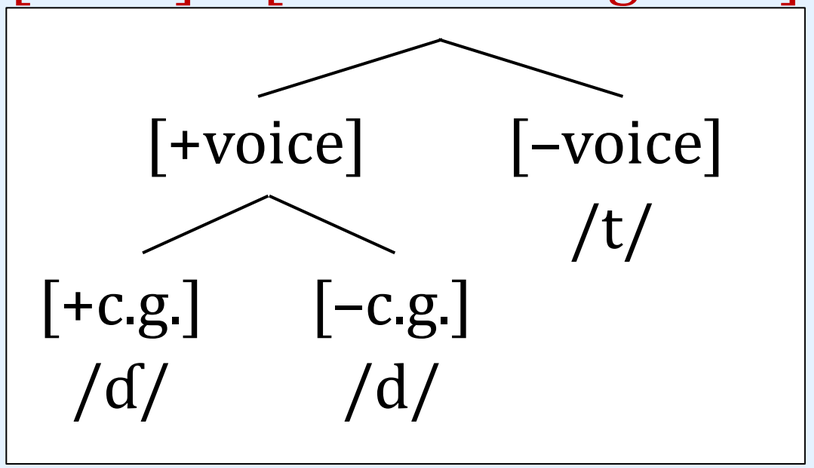
Differences in the order of features in their contrastive hierarchies result in differences in feature specifications for phonetically similar segments.

[constricted glottis] > [voice]



Ngizim

[voice] > [constricted glottis]



Hausa

Ngizim and Hausa Implosives in PHOIBLE

PHOIBLE represents the voiced, glottalized, coronal stop in Ngizm as /ɗ̰/, a symbol representing a laryngealized, voiced plosive (Moran, 2012: 617).

The voiced, glottalized, coronal stop in Hausa is represented as /ɗ/, which is a voiced implosive (Moran, 2012: 620).

These different symbols are accompanied by different feature specifications:

Ngizim /ɗ̰/
[+constricted glottis]
[–lowered larynx implosive]
[+periodic glottal source]

Hausa /ɗ/
[–constricted glottis]
[+lowered larynx implosive]
[+periodic glottal source]

Ngizim and Hausa Implosives in PHOIBLE

This raises the question of whether these implosives have distinct phonetic properties that could play a role in their differing phonological behaviour.

However, a number of points suggest that the distinct feature specifications used in PHOIBLE are not motivated by phonetic facts.

Instead, the different features likely follow from a principle of PHOIBLE that "if two phonemes differ in their graphemic representation, then they necessarily differ in their featural representation as well" (Moran & McCloy, 2019).

Ngizim /ɗ̰/
[+constricted glottis]
[–lowered larynx implosive]
[+periodic glottal source]

Hausa /ɗ/
[–constricted glottis]
[+lowered larynx implosive]
[+periodic glottal source]

Ngizim Implosives in PHOIBLE

Whereas PHOIBLE gives several sources for the Hausa inventory, the Ngizim inventory is based on UPSID; both databases give a single source, Schuh 1972.

Schuh (1972) lists /ɗ/ as a glottalized stop in the consonant chart, but provides no phonetic description in the phonological sketch of Ngizim.

Elsewhere (e.g. Schuh 1997), he uses the feature [implosive] to characterize /ɗ/.

Ngizim /ɗ̰/

[+constricted glottis]
[–lowered larynx implosive]
[+periodic glottal source]

There is therefore no phonetic description in the source that motivates the choice of [–lowered larynx implosive] for Ngizim /ɗ/.

Hausa Implosives in PHOIBLE

The PHOIBLE feature specifications also pose a challenge for the characterization of the phonological class of glottalized stops in Hausa.

In PHOIBLE, Hausa /ɗ/ and /kʼ/ do not share any laryngeal features.

Hausa /kʼ/

[+constricted glottis]
[–lowered larynx implosive]
[–periodic glottal source]
[+raised larynx ejective]

Hausa /ɗ/

[–constricted glottis]
[+lowered larynx implosive]
[+periodic glottal source]
[–raised larynx ejective]

Hausa Implosives in PHOIBLE

Yet /ɗ/ and /kʼ/ both participate in laryngeal harmony in Hausa which is parasitic on place and voicing (Newman 2000).

kʼukʼuta ‘try hard’ *kʼaka	ɗaɗa ‘strike a blow’ *ɗadi

Both segments also participate in a general restriction on the cooccurrence of multiple, unlike glottalized segments.

*ɓakʼa	*sʼaɓa	*kʼaɗa

Ngizim and Hausa Implosives in PHOIBLE

PHOIBLE's use of different features to characterize /ɗ/ in Ngizim and Hausa is not motivated by phonetic or phonological factors.

Nonetheless, in the theory of the contrastive hierarchy, it is not crucial that the feature used to distinguish relevant segments be 'the same' across languages.

Ngizim /ɗ̰/
[+constricted glottis]
[–lowered larynx implosive]
[+periodic glottal source]

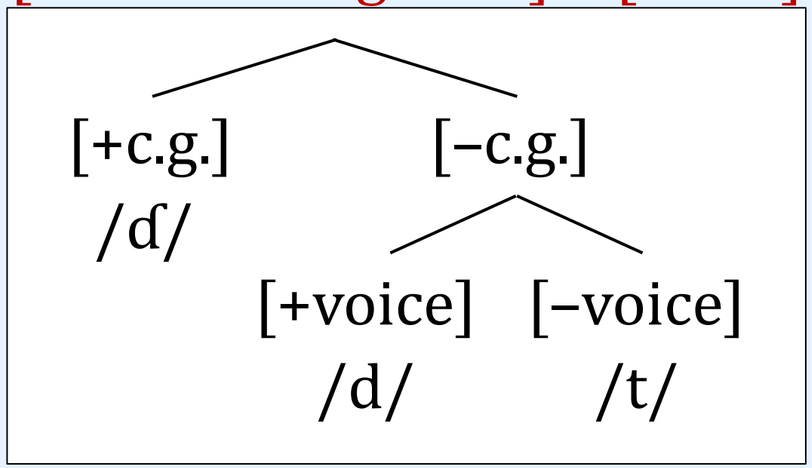
Hausa /ɗ/
[–constricted glottis]
[+lowered larynx implosive]
[+periodic glottal source]

Ngizim and Hausa Implosives in Contrastive Hierarchy Theory

In the case of Ngizim and Hausa, it is not important whether [constricted glottis] or [implosive] is the relevant feature distinguishing /ɗ/ from /d/.

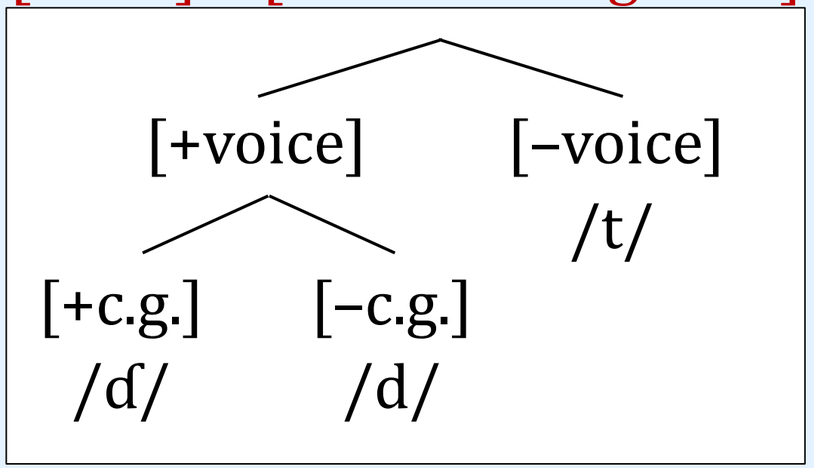
It is a feature's role in language-specific systems of oppositions that is crucial, rather than its phonetic definition, which may be more or less abstract.

[constricted glottis] > [voice]



Ngizim

[voice] > [constricted glottis]



Hausa

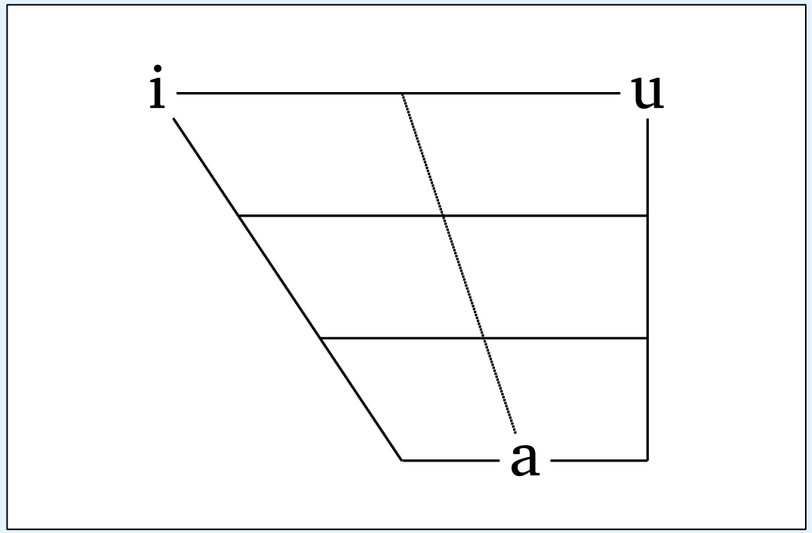
4. Feature specifications constrain (but don’t dictate) phonetic shapes of inventories

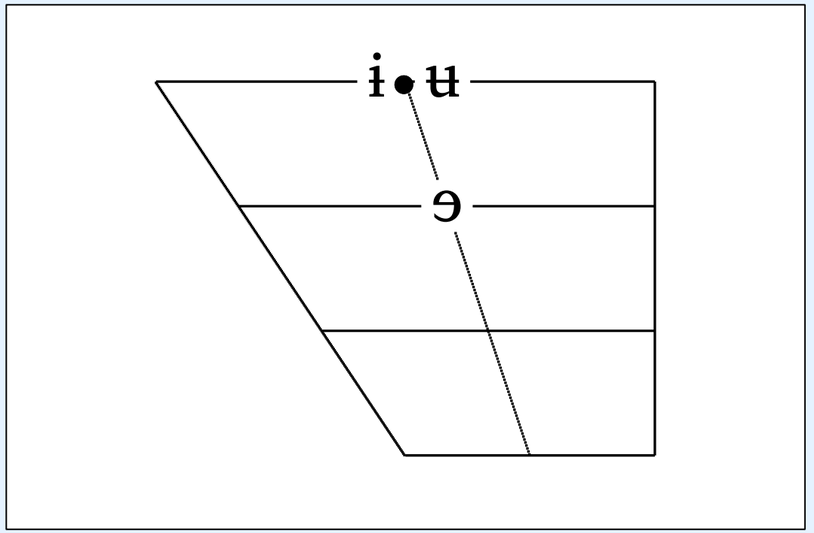
Dispersedness: The phenomenon

Phoneme inventories tend to consist of segments that are robustly phonetically distinct.

E.g., /i a u/ is a very common three-vowel inventory; /ɨ ɘ ʉ/ is not.

To some extent, this is an artefact of the symbols people tend to choose, especially in the case of vowel inventories.

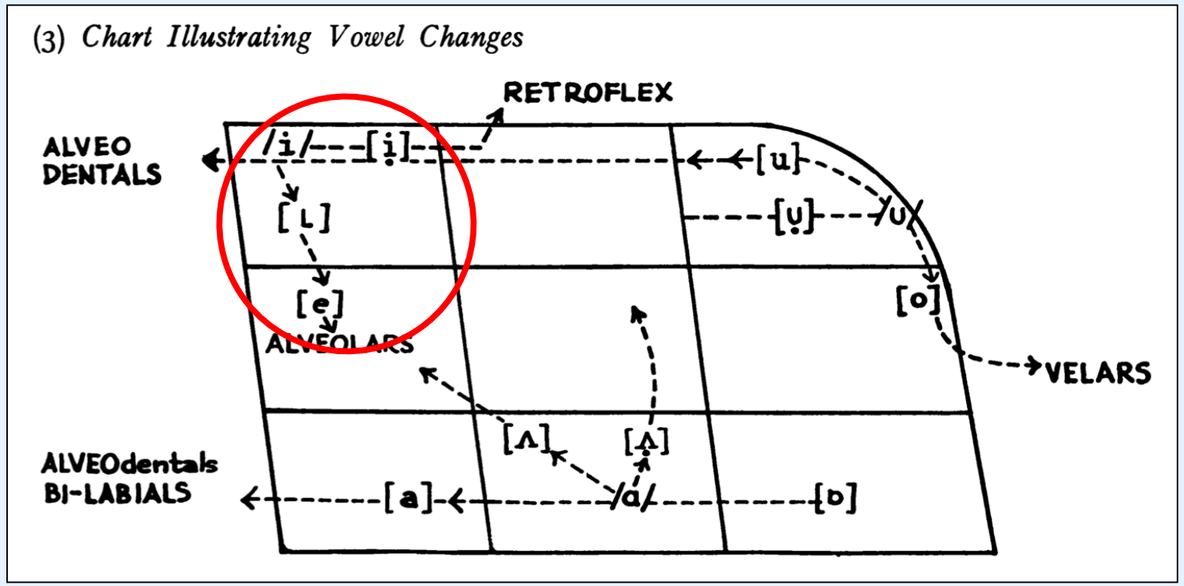




Dispersedness and Dispersion

E.g., a vowel whose phonetic realizations range from [i] to [ɪ] to [e] is more likely to be represented as /i/ than as /ɪ/ or /e/, partly for reasons of typographical convenience (recall Douglas 1955 on Antakarinya).

But it's also a real cross-linguistic tendency.



Dispersion Theory (e.g., Liljencrants & Lindblom 1972; Flemming 2002, 2004; Padgett 2003; Sanders 2003) posits that dispersedness is an explicit desideratum.

Dispersedness: An epiphenomenon

But the Successive Division Algorithm gives us a way of seeing dispersedness as an epiphenomenon (Hall 2011).

Recall that in the SDA:

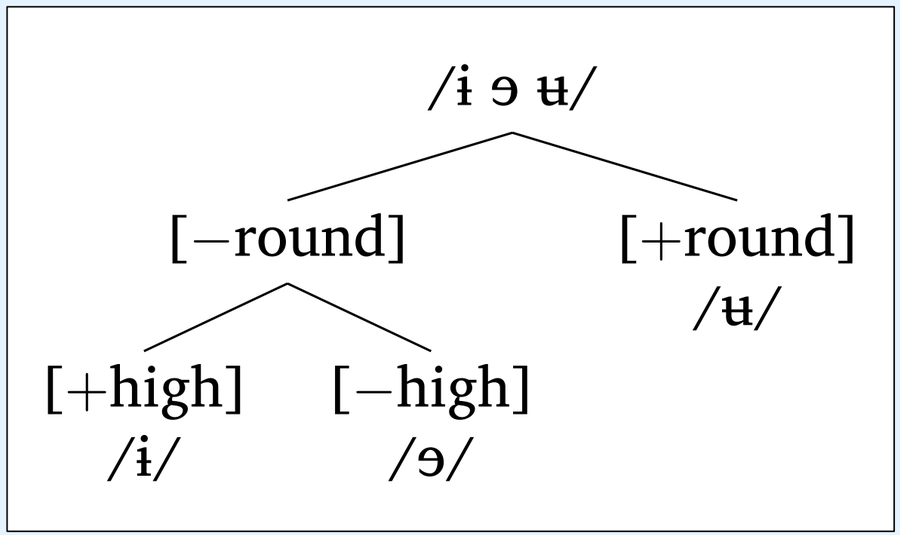
> No feature is assigned unless it serves to mark some phonemic contrast that has not already been encoded.

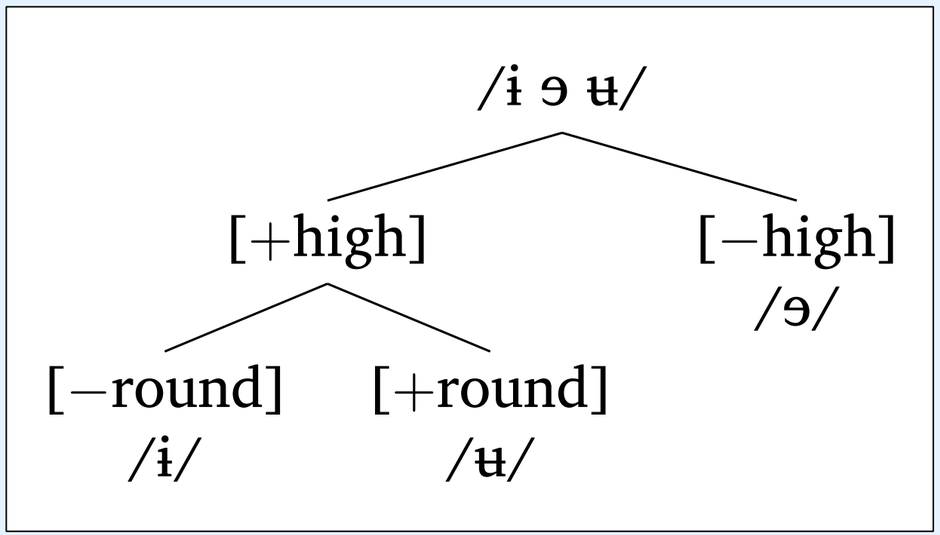
In other words, features can only indicate how phonemes differ from one another.

Il n’y a que des différences

There’s no set of specifications that can be assigned to /ɨ ɘ ʉ/ that couldn’t equally well represent /i a u/.

Whatever order the features are assigned in, /ɨ/ always ends up with specifications that could represent /i/; /ʉ/ could always be /u/; and /ɘ/ could always be /a/.





Enhancement

Okay, so the inventory /i ɘ ʉ/ can't be represented in a way that distinguishes it from /i a u/. But by itself, that doesn't mean that it will **be** /i a u/ instead.

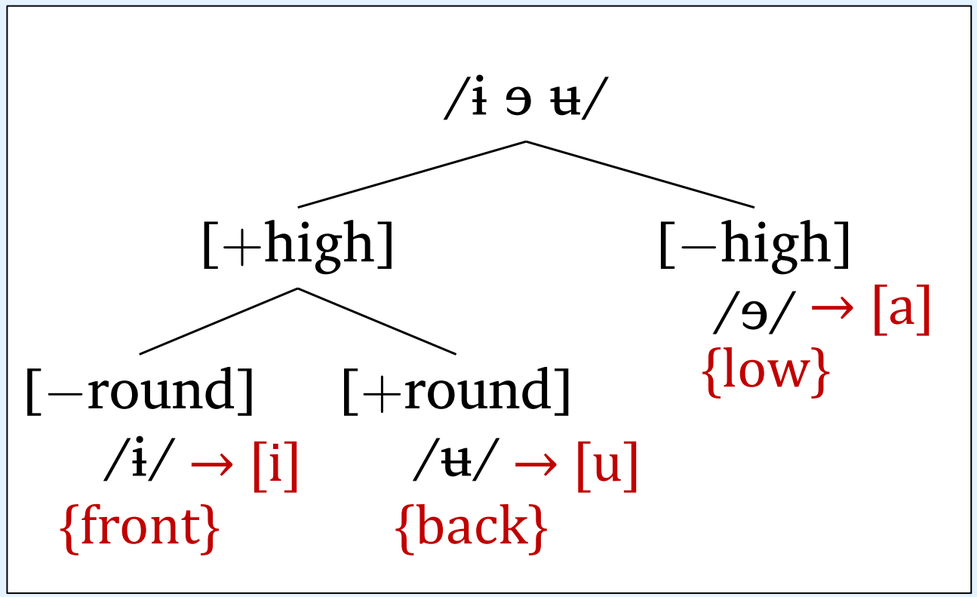
The other piece of the picture is enhancement (Stevens, Keyser & Kawasaki 1986; Stevens & Keyser 1989, 2010; Keyser & Stevens 2001, 2006):

Distinctive features tend to be reinforced in phonetic realization by additional articulatory gestures with similar auditory effects.

Enhancing /ɨ ɘ ʉ/

For example, suppose /ɨ ɘ ʉ/ is specified like this:

How might the specified features be enhanced?



- [–high] on /ɘ/ can be enhanced by making it low (higher F1). → [a]
- [–round] on /ɨ/ can be enhanced by making it front (higher F2). → [i]
- [+round] on /ʉ/ can be enhanced by making it back (lower F2). → [u]

SDA + Enhancement = dispersedness (without Dispersion)

- The SDA ensures that only contrastive features are specified.
- Enhancement amplifies the phonetic effects of specified features.
- Therefore, contrast is phonetically amplified.
- We don't need a separate mechanism that evaluates or enforces distinctness at the phonetic level (like Flemming's MINDIST constraints).

SDA + Enhancement = dispersedness (without Dispersion)

Enhancement isn't uniform; its exact effects vary from language to language, and from one environment to another within a language.

But if the phonological features that are the input to enhancement specify only differences, then enhancement will make inventories more phonetically dispersed, and smaller inventories more dispersed than larger ones—all without any explicit reference to phonetic distance between segments.

5. Conclusions

Conclusions

- Phonological inventories exist in phonological space: a system of oppositions expressed by distinctive features (Trubetzkoy 1939).
- Phonemes correspond to regions in phonetic space, not points. To represent them as phonetic points is a category error (a foible of PHOIBLE).
- Phonetically similar inventories can have important phonological differences (as in Ngizim and Hausa).
- The phonetic shape of an inventory limits what features can be assigned to it, but does not dictate a specific set of features.
- Conversely, distinctive features encode some information about phonetic properties of segments, but leave other properties to phonetic implementation (which often includes enhancement).

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Appendix

(Slides on Pama-Nyungan and Hausa omitted from the talk)

Pitjantjatjara Vowel System

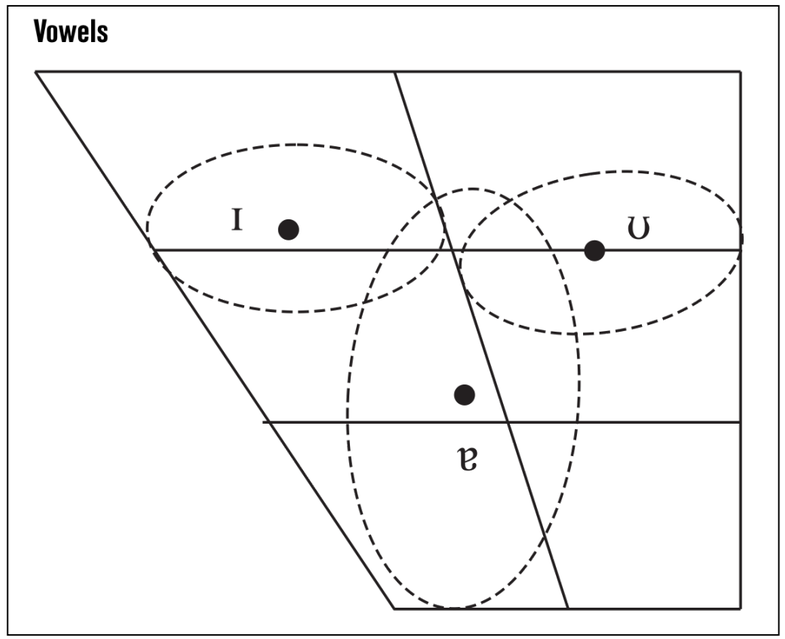
Another dialect of the Western Desert Language of central Australia is Pitjantjatjara (not listed in PHOIBLE).

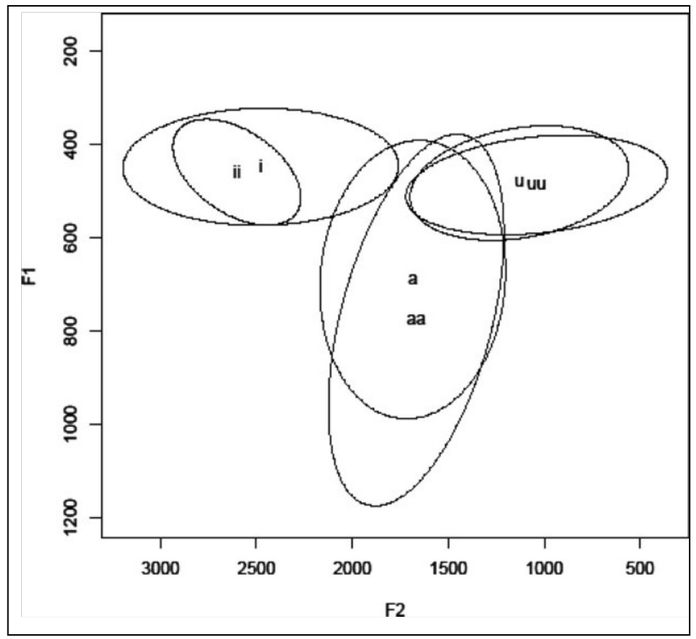
Its vowels have been studied by Tabain & Butcher (2014). They write (2014: 195):

“Pitjantjatjara has three vowel qualities [ɪ ɐ ʊ]...However, for phonemic purposes these are more commonly written /i a u/”.

They provide plots of the distribution of the vowels:

Pitjantjatjara Vowel System

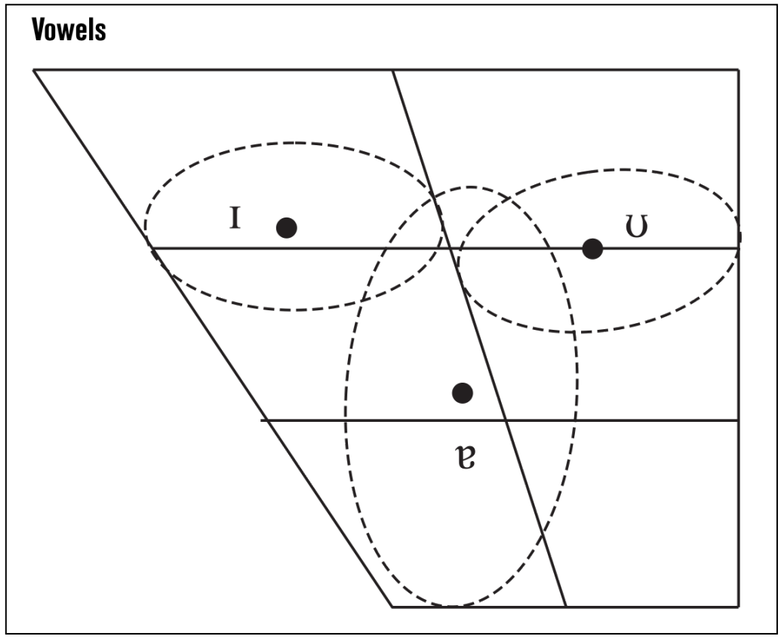




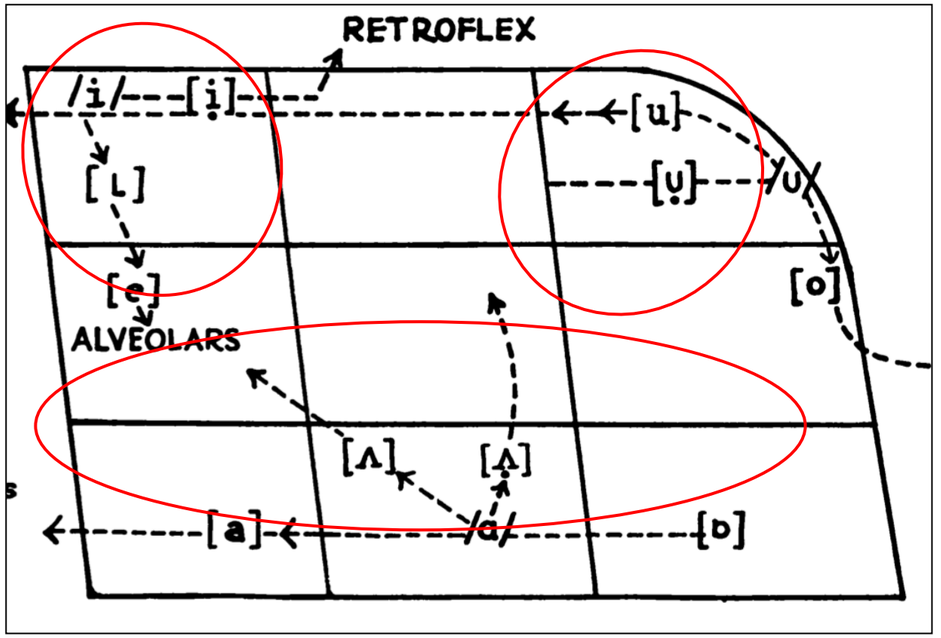
The figure on the left shows the positions of the short vowels.

The plot on the right show formants from 3 speakers for short and long vowels, collapsed across consonantal contexts.

Pitjantjatjara Vowel System



Pitjantjatjara



Antakarinya

Compare these vowel distributions with those of Antakarinya, which we analyzed as [low] > [front-unround]

It appears that the height feature in Pitjantjatjara is [high], not [low]. Thus, the feature hierarchy is [high] > [front-unround].

Pama-Nyungan 3-vowel Inventories

One of the Pama-Nyungan languages in PHOIBLE has a /ə/ where the other languages have /U/. What is the status of this /ə/?

Antakarinya; Dieri; Dyirbal; Eastern Arrernte; Kalkutung; Kuku-Yalanji; Wangaaybuwan-Ngiyambaa; Yidiny	/i, a, u/
Yanyuwa	/ɪ, a, ʊ/
Western Arrarnta	/i, a, ə/
Karadjeri	/i, ɑ, u/
Dhuwal	/ɪ, ɐ, ʊ/
Ngarinman	/i, a, u, iː, aː, uː/
Antakarinya	/i, a, ʊ, iː, aː, uː/

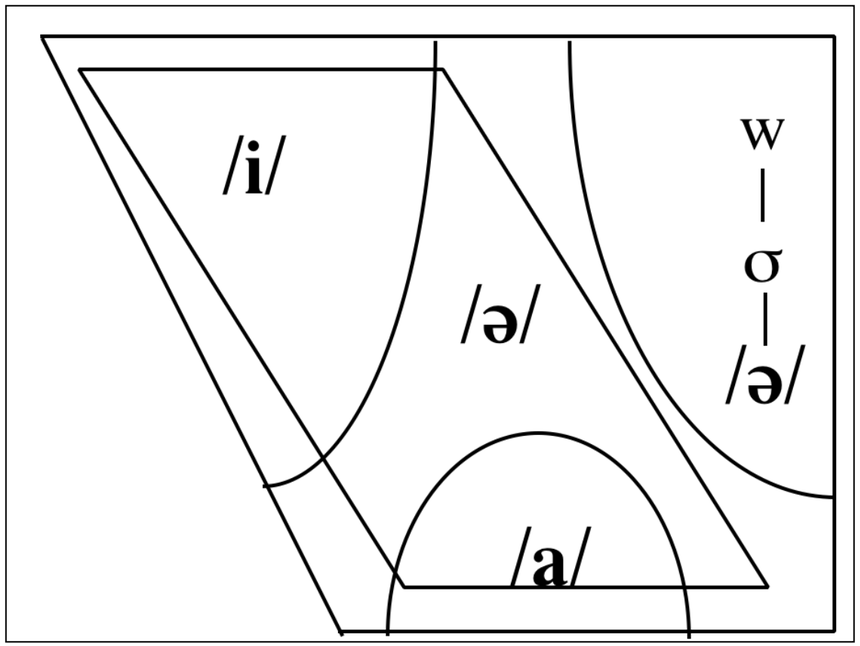
Western Arrarnta Vowel System

The source for this inventory is Anderson (2000), who calls the language Western Arrernte (aka Aranda, Arrarnta).

She writes (2000: 36–7): “Vowel phonology in Arandic languages is as yet imperfectly understood. An emerging analytical consensus, following Breen (1990), suggests that W. Arrernte has three vowel phonemes varying in height: /i/, /ə/, /a/; and that contrastive rounding is associated with some syllables, to yield rounded vowels (allophones of /ə/.)”

The above makes it sound that this language has a vertical system, but this does not appear to be correct, as can be seen from Anderson’s impressionistic plot of the vowel space (p. 37):

Western Arrarnta Vowel System



The vowel /a/ is restricted to a very small space; we infer it is [low].

/i/ "varies in quality from [ɛ] to [i]." We can assign it [front].

/ə/ is "extremely variable" in height and backness and has unrounded and rounded allophones.

It also appears to be the epenthetic vowel.

What is different about this vowel system is that the unmarked features [non-low] and [non-front] are not enhanced by [high] and [round], resulting in great variation of the /U/ vowel.

Hausa laryngeal features across place of articulation

- In Hausa, the laryngeal contrast among stops is not uniform across place of articulation.
- Whereas the coronal series is /t, d, ɗ/, with a voiced implosive, the velar series is /k, g, k'/, with a voiceless ejective.
- If place features are ordered above laryngeal features, and [voice] is ordered above [c.g.], [–c.g.] will be contrastive for /k/ but not for /t/.

	lab.	cor.	pal.	vel.	lab-vel.	pal-vel.	laryn.
vl	(f, fy)	t	c	k	kw	ky	
vd	b	d	j	g	gw	gy	
gl	ɓ	ɗ	'y	ƙ	ƙw	ƙy	'

Hausa laryngeal features across place of articulation

[dorsal] > [voice] >[constricted glottis]