Is there a universal basic consonant inventory?

Eitan Grossman[1] and Dmitry Nikolaev[1,2]
[1]Hebrew University of Jerusalem & [2]University of Helsinki

Academia Grammaticorum Salensis Septima Decima
27 July, 2020
Salos, Lithuania

A quick experiment

Write down the sounds that you think belong to a basic consonant inventory, the set of consonants that you think that a randomly picked language will include.

Try for 10-15 consonants, circling those you think are really fundamental to spoken languages.

Our questions

1. Is there a basic consonant inventory?
2. Is it just some set of very frequent sounds?
3. Is it the sounds found in small consonant inventories?
4. How can we operationalize questions like this?

Background

Phonological diversity in the world's languages

We know of thousands of distinct phonological segment types that occur in human languages (Moran & McCloy 2019).

Newly-described languages reveal new segment types all the time.

Newly-described languages reveal new segment types

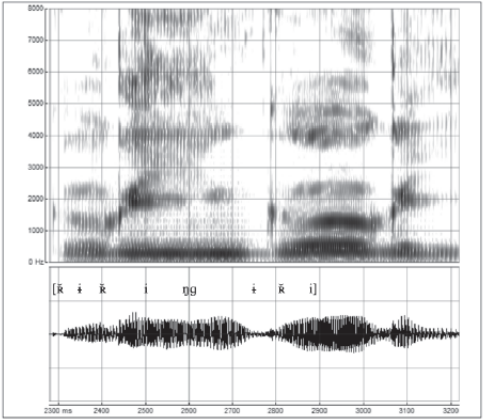


Figure 1. Illustration of an uvular flap in Kuikuro word [ʀ̆ɨʀ̆iŋgɨʀ̆i] ' fish' where [ʀ̆] symbolizes the uvular flap (Demolin, Fausto & Franchetto, forthcoming).

Newly-described languages reveal new segment types

CONSONANTS (PULMONIC)

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		ʈ ɖ	c ɟ	k ɡ	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Trill	ʙ			r					ʀ		
Tap or Flap		ⱱ		ɾ		ɽ					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative				ɬ ɮ							
Approximant		ʋ		ɹ		ɻ	j	ɰ			
Lateral approximant				l		ɭ	ʎ	ʟ			

Where symbols appear in pairs, the one to the right represents a voiced consonant. Shaded areas denote articulations judged impossible.

Some languages have small consonant inventories

	bilabial	alveolar	velar
voiceless	p	t	k
voiced	b	d	g

Central Rotokas (Non-Austronesian Papuan, Bougainville)

Some language have big consonant inventories

Table 7: Consonant chart, using Nakagawa's (2006) orthography

Series		Extended Place of Articulation										
		Lb	Dt	Dt-Af	Dt-Af-Cl	Al-Cl	Al-Af (Lt)-Cl	Pl	Pl-Cl	Vl	Uv	Gl
Stop segments	plain	p	t	ts	ǀ	!	ǁ	(c)	ǂ	k	q	ʔ
	voiced	b	d	dz	gǀ	g!	gǁ	(ɟ)	gǂ	g	(ɢ ?)	
	voiceless ejective		t'	ts'	ǀ'		ǁ'	(c')	ǂ'	k'		
	voiceless aspirated		t^{h}	ts^{h}	ǀ^{h}	!^{h}	ǁ^{h}	(c^{h})	ǂ^{h}	k^{h}		
Stop cluster	plain + x		tx	tsx	ǀx	!x	ǁx	(cx)	ǂx			
	plain + q				ǀq		ǁq	(qy)	ǂq			
	plain + ɢ				ǀɢ		ǁɢ		ǂɢ			
	plain + ʔ				ǀʔ	!ʔ	ǁʔ	(ʔy)	ǂʔ			
Nasal	voiced	m	n		ŋǀ		ŋǁ	(ɲ)	ŋǂ	ŋ		
Pre-nasalised		mb	nd		ŋǀg	n!g	ŋǁg	(ɲɟ)	ŋǂg	ŋg		
Fricative	voiceless		s							x		h
Tap or Flap			(ɾ)									
Glides		w						j				

(Abbreviations used: Lb = labial, Dt = dental, Dt-Af = dental affricate, Dt-Af-Cl = dental affricate click, Al-Cl = alveolar click, Al-Af (Lt)-Cl = alveolar affricate lateral click, Pl = palatal, Pl-Cl = palatal click, Cl = velar, Uv = uvular, Gl = glottal)

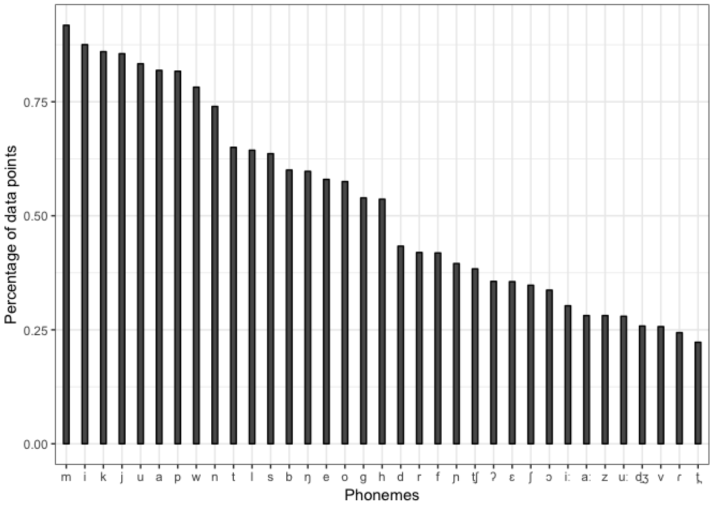
Ts'ixa (Kalahari Khoe, Fehn 2014)

Most languages are somewhere in the middle

	bilabial	labio-dental	alveolar	post-alveolar	palatalized	palatal	velar	glottal
plosive	p		t		t^j		k	
nasal	m		n		n^j			
trill			r					
fricative		f v	s	ʃ	s^j		h	
lateral			l		l^j			
approximant						j		

Estonian (Uralic)

Some sounds are very common



The 35 most frequent segments in PHOIBLE 2.0

Some segments are attested only once

t̪’kx’ d̥ʲ ntɾ c’ ˀʍʲ tsʲː g!x’

ʱm ndz̤ pkʰ pʷˠː

dẑ ʰkʲ mʷˠː ʂʷ cɕ’

q̚ ŋ!ʰ ɖʲ d̠ⁿ ’ɣ qχˤː p’kx’

t̪’ː gˡ kl̪ ŋʱ ˀt̪ɬ n̪̼ d̰̠ ʔ kl̽ˀ ˀl̪

ʃ̩’ w̞ wʲ ˀn̪̥ dz̥ʲ rʱ t̪ɬ’ ɲ’ tʃx

p̚ tʃʱˤ l̪ʱ ʂʲ b’ ɗʱ r̪̽ nːː b̼ d̥ː

ˀd ŋ̊m̥ ɮ̪ hᶣ ɮ̤ ŋʲː t̂ʂʰ mɓ

d̻z̻ w’ l’ː ⁿtɕ ŋ̊ʷ ʱg qǁ’ ɻʲ kɬ nʲ

t̻s̻ qʰʷʲ ʃʷː ʰʷtɕ ʟ̥̽ kǂ!̽x nθ

ŋkx lᶣ ʷr qχʰ fʃ

Some robust typological findings

- The range of phonemes across languages ranges from a low of 11 in Rotokas (six consonants, five vowels) and Pirahã (eight consonants and three vowels) to a high of 141 segments in !Xũ, which has an extensive consonant inventory of click sounds and 66 segments that occur in no other language (Maddieson 1984).
- Most languages on average have somewhere between 20-37 contrastive segments (Maddieson 1984).
- Consonant inventories range from 6-95 segments, with a mean of 22.8 (Maddieson 1984).
- Vowel inventories range from 3-46 with a mean of 8.7 (Maddieson 1984).

Phonological typology

A major goal of phonological typology is to uncover the factors that govern the size, shape, and composition of segment inventories in human languages.

All sorts of causal factors have been proposed, including production and perceptual factors, speech community size and structure, other aspects of demography, genes, sexual mores, physiology and pathology, and more.

But first we have to know what the structure of of phonological inventories is really like.

Is there a set of sounds that are truly universal?

Prima facie, it looks like there isn't.

No sounds in PHOIBLE are found in all languages.

Even the most frequent sound /m/ occurs in 96% of languages.

And frequency declines sharply – most of PHOIBLE is a very long tail of segments documented in a single language.

Frequency?

TABLE 3.1. The 20 cross-linguistically most common consonants (Maddieson 1984)

	Labial	Denti-alveolar	Palatal	Velar	Glottal
Plosives	p b	t d	tʃ	k g	ʔ
Fricatives	f	s	ʃ		h
Nasals	m	n	ɲ	ŋ	
Approximants	w	l r	j		

But no language has a phoneme inventory built of the 20 most frequent sounds (Gordon 2016).

Frequency?

Raw frequency counts make it impossible to draw the boundary between quasi-universal segments and merely very frequent ones.

Should the boundary be drawn between /s/, whose relative frequency is 72%, and /ŋ/ at 63% or between /g/ at 56% and /d/ at 49%?

Hyman (2008)

Asks what the smallest consonant inventories are composed of, with the goal of seeing whether there are some sounds or distinctions that languages can't do without.

Looks at languages in UPSID with 10 or less consonant inventories.

Hyman (2008)

Rotokas	p	t		k		β	ɾ		ɡ							
Hawaiian	p			k	ʔ		l			m	n			h	w	
Nasioi	p	t		k	ʔ	b	ɾ			m	n					
Pirahã	p	t		k	ʔ	b			ɡ				s	h		
Taoripi	p	t		k			l			m		f	s	h		
Gadsup	p	t		k	ʔ	β	d			m	n					j
Roro	p	t		k	ʔ	b	ɾ̪			m	n̪			h		
Ekari	p	t		k		b	d		ɡl	m	n				w	j
Maxakalí	p	t	tʃ	k	ʔ	mb	nd	ndʒ	ŋɡ					h		
Sentani	p	t		k			d			m	n	f		h	w	j

Table 1: Some very small consonant inventories

How to find a basic consonant inventory

Kind of accidentally.

Part of a larger project on the structure of phonological segment inventories.

Details in Nikolaev & Grossman (under review).

The question we asked

To what extent are phonological inventories predicted by Feature Economy (Clements 2001, 2003, 2009)?

Feature Economy is the theory that 'languages tend to maximise the ratio of sounds over features.'

Basically, the idea is that languages will exhaust features before adding new ones.

Our idea

Investigate co-occurrence classes, i.e., classes of sounds that tend to occur together in phonological inventories.

This should give an evaluation of the empirical coverage of Feature Economy with respect to the sound systems of the world's languages.

Importantly

These are classes of sounds between which there are bilateral dependencies, i.e., sound A predicts sound B, and sound B predicts sound A.

These are not unilateral implicational universals, which have the form “If A, then B.”

As an example, languages with /pʲ/ very strongly tend to also have /p/. Nevertheless, the bidirectional co-occurrence dependence between these segments is very low: the absence of /pʲ/ is a very weak indicator of the absence of /p/.

On the other hand, absence of /pʲ/ is a strong indicator of the absence of /bʲ/ and vice versa.

A basic consonant inventory?

This offers a new way of looking at the question of a basic consonant inventory.

When a group of extremely highly frequent segments form a co-occurrence cluster, it means that inventories lacking some of these sounds are somehow statistically anomalous, which is precisely how one would like to describe the basic inventory.

Operationalization

We operationalise the Feature Economy Principle by interpreting it as largely synonymous with the **Layering Principle (LP)**:

New classes of sounds arise by virtue of adding new features to already existing combinations.

An empirical confirmation of this is found in Moran (2012) with respect to vowels, such that 'once languages expand their inventories beyond cardinal vowels, they tend to do so either by nasalization or lengthening, and to a lesser extent by adding diphthongs to the inventory.'

Prediction 1

If we investigate empirical co-occurrence classes, we should see that they are progressively defined by a succession of additional features.

Thus, we should see both large classes dominated by basic distinctions (place, manner, and VOT) and smaller classes in which these distinctions are augmented by different additional articulations.

We call classes that respect the FEP/LP *conformant classes*.

Predictions 2 and 3

The Layering Principle predicts that certain constellations should not exist.

It prohibits **cross-layer connections** (the close patterning of segments with different numbers of features turned on) and **cross-feature connections** (the close patterning of segments with different privative features turned on).

Predictions 2 and 3

That is, if there is a class of palatalised segments, we do not expect some of the members of this class to pattern with either labialised segments (which would be a cross-feature connection) or with plain segments (which would be a cross-layer connection) as this would imply that languages do not exhaust the usefulness of the [+palatalised] feature.

We call classes that do not respect the FEP/LP *non-conformant* classes.

What we did and how we did it

The data comes from PHOIBLE (Moran & McCloy 2019), the largest curated database of phonological systems.

One doculect was randomly selected for each language, and the resulting dataset used contains information about phonological inventories of 2761 languages.

Only segments occurring 30 or more times in the dataset were included in the analysis (N=193), giving a binary 2761$\times$193 matrix with rows corresponding to inventories (with 1's for segments present in the inventory and 0's for segments absent from the inventory) and columns corresponding to segment distributions.

Why only relatively common segments?

The frequency distribution of segments in worldwide samples such as PHOIBLE shows a strong positive skew: it declines exponentially, such that the 10th most frequent segment /ŋ/ is found in 63% of the languages in the sample; the 20th most frequent segment /ʃ/ is found in 35% of the languages, and the 40th most frequent segment /d̪/ is found in only in 21%.

Most of PHOIBLE is in fact a very long tail of segments each of which is documented only in a single language.

Rare segments lead to a lot of sampling noise.

What kind of features?

We adopted a shallow but robust approach to feature specification: all segments from all inventories were analysed in terms of IPA features.

The IPA feature set for consonants is articulatory in nature and is oriented towards describing inventories as assemblages of individual segments.

This is different from the feature sets prevalent in the theoretical literature, where the focus is on succinct description of phonological rules or constraints (e.g., Hayes (2008).

However, many languages in the sample have not been analysed from the point of view of their rule/constraint systems.

Measuring the strength of association between segments

We used Pearson's correlation coefficient as a measure of the strength of the association.

The value of the coefficient ranges from -1 (the presence of one segment predicts the absence of another with absolute certainty and vice versa, i.e. they are never found together) to $+1$ (the presence of one segment predicts the presence of another with absolute certainty and vice versa, i.e. they are always found together).

The middle value of 0 indicates the absence of any association (i.e., for any segment of the two, we are as likely to find an inventory that contains only this segment as to find an inventory containing both).

Cases of an implicational universal—segment A strongly predicts segment B, but not vice versa—give rise to small positive values of the coefficient.

The next step

Divide segments into co-occurrence classes based on their pairwise distributional similarities.

Given the high number of segments, it is hardly feasible to do this by manually investigating several thousand correlation coefficients.

In order to make the data tractable, one can use dimensionality reduction, but this requires transforming correlational similarity values to a non-negative dissimilarity (or distance) measure. We used the arccosine transformation.

Dimensionality reduction

Every segment in our dataset is represented as a binary vector of length 2761.

The data are very high-dimensional, which makes it impossible to directly visualise them or even to use Principle Components Analysis, which prohibits the number of variables to be larger than the number of datapoints (2761 vs. 193, in our case).

For the analysis of our dataset, we used UMAP (McInnes 2018), a novel method for dimensionality reduction.

UMAP takes as input a table with the original data-points or a matrix of pairwise distances between them and chooses a lower-dimensional representation of the point assemblage in such a way that neighbourhoods of individual points and relative positions of larger clusters are preserved as much as possible.

Clustering

To separate points into clusters, we used the density-based clustering algorithm DBSCAN (Ester 1996).

It divides the space (in our case, the space of segment distributions interpreted as points on the 2D-plane) into regions of high density surrounded by peripheral points and noise points.

Summary: the pipeline

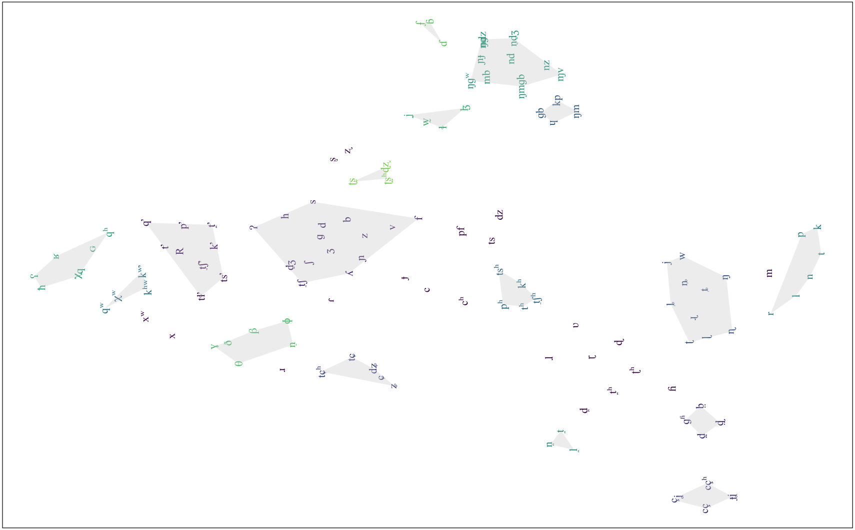
In order to derive co-occurrence classes of consonants in the world's languages, we pipelined four well-defined mathematical procedures:

(Pearson's correlation coefficient $\rightarrow$ arccosine transform $\rightarrow$ UMAP dimensionality reduction $\rightarrow$ DBSCAN clustering).

The pipeline separates data-points into groups without any prior knowledge about their nature or properties.

The distribution of 193 most common segments in PHOIBLE

The distribution of segments in the big cluster



Some divergent clusters (outside the big cluster)

Phonologically long consonants are split into voiced stops /bː dː gː/ and everything else.

tʃː	wː	ŋː	ɲː	dː	fː	ʃː	jː	rː	gː	pː	tː	bː	sː	lː	kː	nː	mː
35	35	35	38	40	41	41	47	47	51	56	56	58	69	77	78	86	89

The layering principle: when adding voiced long plosives, languages tend to exhaust this feature combination as well as more basic ones despite differences in the articulatory difficulty of different segments.

In other words, languages are more likely to acquire /bː dː gː/ as a group rather than to acquire individual pairs /bː pː/, /dː tː/, and /gː kː/.

Some divergent clusters (outside the big cluster)

Voiceless approximants, liquids, and nasals are a small group of low-frequency and, on average, rather tightly intercorrelated sounds except for /r̥ ʍ/, which rarely appear together.

/n̥ m̥/, on the contrary, are nearly inseparable.

r̥	ʍ	n̥	m̥	l̥
34	37	65	69	75

Some other divergent classes

1. Tense and weakly-articulated stops are very rarely described outside Australia and are almost exclusively found together since they form a systemic opposition.
2. Phonologically apical stops and liquids are also predominantly found in Australia, whose languages are famous for their extended range of place oppositions.
3. Voiceless prenasalised stops /mp nt ŋk/ are found in Africa, Eurasia, and South America, but are rare ($N = 36, 42, 41$ respectively) and are twice as likely as not to be found in inventories that also have corresponding voiced prenasalised stops.

Within the big cluster

The cluster consisting of /p t k n l r m/ can be considered a serious contender for the title of the Basic Consonant Inventory (a group of consonantal sounds that we expect to find in a randomly picked language) in the domain of consonants.

Not just frequency

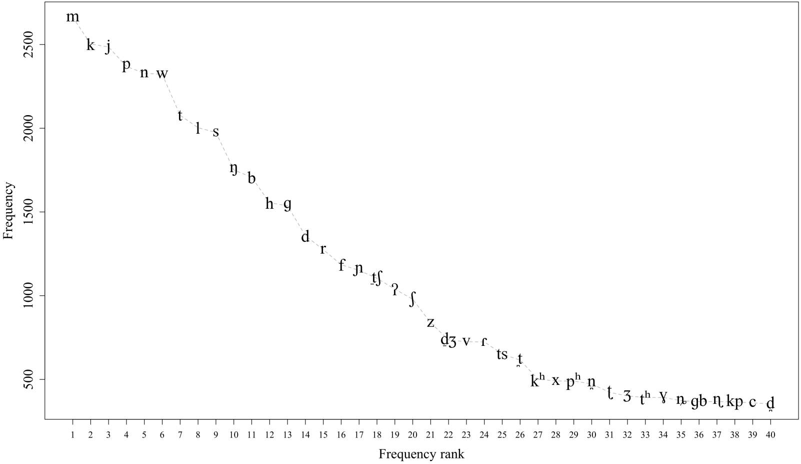


Figure 1: Frequencies of 40 most-frequent segments in the sample

The Basic Consonant Inventory

		Bilabial/ labiodental/ labiovelar	Denti-alveolar	Post-alveolar	Palatal	Velar	Glottal
Stop	Vcl	p	t			k	
	Vcd						
	Vcl						
Nasal	Vcd	m	n				
Lateral	Vcd		l				
Rhotic	Vcd		r				

Table 2: The Basic Consonant Inventory

A somewhat unexpected feature of the basic-inventory cluster is the fact that /j/ and /w/, which are also exceedingly common ($N = 2485, 2322$ respectively), do not form part of this cluster and are grouped together with alveolo-palatal stops found predominantly in Australia.

What we see here is probably the case of macro-areal influence being strong enough to skew the worldwide distribution of basic segments.

So we re-ran it without Australia. In the resulting clusterisation, /j w/ are indeed grouped together with /p t k m n l r/.

The Basic Consonant Inventory without Australia

		Bilabial/ labiodental/ labiovelar	Denti- alveolar	Post- alveolar	Palatal	Velar	Glottal
Stop	Vcl	p	t			k	
	Vcd						
	Vcl						
Nasal	Vcd	m	n				
Lateral	Vcd		l				
Rhotic	Vcd		r				
Glide	Vcd	w			j		

Table 3: The basic consonantal inventory without Australia

The Basic Consonant Inventory with and without Australia

Thus, it seems that even though /j w/ are very frequent, languages care mostly about having *both* these segments.

Losing a segment from the /p t k m n l r/ set, on the other hand, even though clearly possible, leads to a statistically marginal configuration.

How do we build up consonant inventories in Australia?

Three types of segments: retroflexes /ɭ ɳ ɽ ʈ/, forming a counterpart to the subset of the basic inventory, alveolo-palatal segments /ȴ ȵ ȶ/, and /ŋ/. In worldwide perspective, these sounds fall into three different frequency bands:

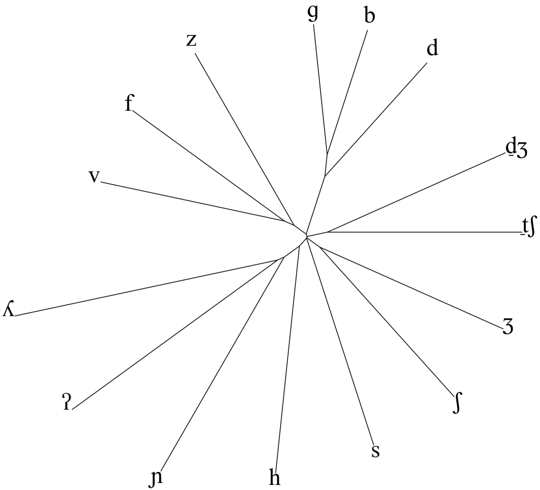
- /ŋ/ is very frequent ($N = 1751$), but its overall relative frequency (0.634) pales in comparison to its relative frequency in Australia (it is present in all Australian languages in the sample). The same applies to /j w/, found in all Australian languages in the sample.
- Retroflex segments are associated with South Asia and the Himalayas, where they are indeed found in a greater variety. The relative frequencies of /ɭ ɳ ɽ ʈ/ in Australia, however, are all very high, while in other regions retroflex inventories display more variation.
- Alveolo-palatal /ȴ ȵ ȶ/ are not reported outside Australia.

The non-Australian extension set

If Australian languages expand the basic inventory by means of an extended set of places of articulation and avoid both voiced plosives and fricatives, languages from outside Australia almost universally add to the basic set using some or most of the following segments:

s	b	h	ɡ	d	f	ɲ	tʃ	ʔ	ʃ	z	dʒ	v	ʒ	ʎ
1975	1707	1555	1537	1358	1185	1151	1104	1039	979	838	736	725	401	121

More than frequencies: structure within the first extension set



More than frequencies: structure within the first extension set

Voiced plosives /b d g/ cluster together, as do /f v z/ and postalveolar pairs /ʃ ʒ/ and /tʃ dʒ/.

/s/ is placed separately, presumably because its very high frequency dilutes correlations with other segments.

Other less frequent 'semi-basic' segments do not form pairs.

The Basic Consonant Inventory with the first extension set

		Bilabial/ labiodental/ labiovelar	Denti-alveolar	Post-alveolar	Palatal	Velar	Glottal
Stop	Vcl	p	t			k	ʔ
	Vcd	b	d			g	
Fricative	Vcl	f	s	ʃ			h
	Vcd	v	z	ʒ			
Affricate	Vcl			tʃ			
	Vcd			dʒ			
Nasal	Vcd	m	n			ŋ	
Lateral	Vcd		l		ʎ		
Rhotic	Vcd		r				
Glide	Vcd	w			j		

Table 4: The basic consonantal inventory plus the first extension set

More extension sets

- A fricative extension set
- A postvelar extension set
- An ejective extension set
- And so on…

The Basic Consonant Inventory compared

Rotokas	p	t		k		β	ɾ		ɡ							
Hawaiian	p			k	ʔ		l			m	n			h	w	
Nasioi	p	t		k	ʔ	b	ɾ			m	n					
Pirahã	p	t		k	ʔ	b			ɡ				s	h		
Taoripi	p	t		k			l			m		f	s	h		
Gadsup	p	t		k	ʔ	β	d			m	n					j
Roro	p	t		k	ʔ	b	ɾ̪			m	n̪			h		
Ekari	p	t		k		b	d		ɡl	m	n				w	j
Maxakalí	p	t	tʃ	k	ʔ	mb	nd	ndʒ	ŋɡ					h		
Sentani	p	t		k			d			m	n	f		h	w	j
BCI$_{\text{Clements}}$	P	T	TŠ	K		B	D, L, R		G	M	N		S	H	W	J
BCI	p	t		k			r, l			m	n				(w)	(j)

The Basic Consonant Inventory compared

We see that BCI can be considered a good predictor for what a minimal consonantal inventory will look like.

The two noticeable discrepancies are that minimal inventories tend not to have both a rhotic and a liquid and that BCI does not include /h/.

Our BCI compared with Clements' (2009) BCI

Perhaps more interesting is the comparison of our BCI with that proposed by Clements (2009), which is based on the 15 most common segment types in UPSID.

Clements' proposed BCI is phrased in terms of feature combinations, given as capital letters, with representative sounds given in IPA glyphs.

The first five sounds /t k n m p/ converge, as do some sound types /l r/ that are less frequent in UPSID.

Our BCI compared with Clements' (2009) BCI

However, other sound types in Clements' BCI, in particular all fricatives, affricates, glottals, as well as voiced stops, are not part of our BCI proper but rather belong to extension sets.

Furthermore, as we have shown, the glides /j w/ are part of the BCI only if Australian languages are excluded.

In other words, we show that even within the set of basic sounds proposed in prior art on the basis of frequency, there is additional structure to be uncovered.

Do the most basic consonant inventories conform to Feature Economy?

Nope.

The Basic Consonant Inventory itself conforms badly to Feature Economy.

Interestingly, the first extension doesn't exhaust features but rather introduces new places and manners.

The Basic Consonant Inventory with the first extension set

		Bilabial/ labiodental/ labiovelar	Denti- alveolar	Post- alveolar	Palatal	Velar	Glottal
Stop	Vcl	p	t			k	ʔ
	Vcd	b	d			g	
Fricative	Vcl	f	s	ʃ			h
	Vcd	v	z	ʒ			
Affricate	Vcl			tʃ			
	Vcd			dʒ			
Nasal	Vcd	m	n			ŋ	
Lateral	Vcd		l		ʎ		
Rhotic	Vcd		r				
Glide	Vcd	w			j		

Table 5: The basic consonantal inventory plus the first extension set

Main findings

1. There is a Basic Consonant Inventory.
2. It cannot be derived simply from cross-linguistic frequencies, but can be derived from establishing mutual dependencies between sounds.
3. Previous proposals about the Basic Consonant Inventory concealed quite a lot of structure.
    3.1 Mainly, they missed what is really basic and what is the next best set of sounds.
    3.2 They also were influenced by areal biases.

How can we think about this?

This entire study was based on synchronic distributions.

So one way to think about it is as some sort of empirically-derived basis for a markedness theory.

How can we think about this?

But we know that synchronic distributions are historically grown (basically entire bodies of work by Greenberg, Givón, Bybee, Bickel, Cristofaro, and many others).

It is likely that the Basic Consonant Inventory and its extension sets ultimately reflect preferred pathways of change, including loss (see forthcoming work by Joan Bybee and Shelece Easterday).

We currently know very little about the factors that make particular sounds stable or unstable within languages and families (no current big databases of sound change).

However, the data presented here can lead to lots of hypotheses about the role of dependencies in change.

Language contact

Furthermore, many of our clusters show areal patterning, some clear and some overt. This also points to the importance of language contact in a number of ways.

1. Sound systems can become more similar due to ‘perceptual magnets’ (Blevins 2017).
2. Language contact can promote the stability of otherwise dispreferred sound structures (Nikolaev & Grossman 2018).
3. Some of the most frequent sounds are likely the result of very recent borrowing events (Blasi et al. 2019; Grossman et al. 2019, 2020).
4. It is now known that the features active in a sound system can either facilitate or inhibit the borrowing of sounds with the same features (Eisen 2019).

For whatever reason

The Basic Consonant Inventory represents an attractor state, roughly a state that is easier to enter and remain in than to exit.

But we still don’t know why, and we won’t speculate for now.

Thank you for your attention!