

Variability of Languages in Time and Space

Phonological Typology **Consonant and Vowel inventories** **Syllables**

- Phonetics and Phonology
- Consonant and Vowel Inventories
- Segmental Processes
- Syllables: structure and patterns
- Syllable repair processes
- Suprasegmentals: Stress, length, tones

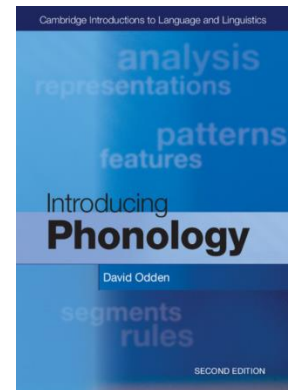
Magda Sevčíková & Anna Nedoluzhko & Zdeněk Žabokrtský

Linguistic Typology - Motivation

- Informs what is common/uncommon

David Odden, 2013: „It is very difficult to refuse a claim of the form „X is more common than Y,” except if a very detailed numerical study is undertaken.“

- ‘basic’ SVO word order
- anaphoricity of the definite article
- unstressed vowel reduction, length and stress correlation
- Markedness
 - a comparative concept
 - marked = something atypical, variants, special cases
 - *Example:* In phonology, not all segments have equal status



Markedness

X is marked (relative to Y):

[ʕ] is more marked than [q]

[q] is more marked than [k]



pharyngeals are marked sounds
relative to other sounds of the
world's languages

velar

uvular

pharyngeal



	ŋ		N	
k	g	q	G	
x	ɣ	χ		ħ
			ʁ	
	ɯ			ʕ

stop consonants:
unmarked system

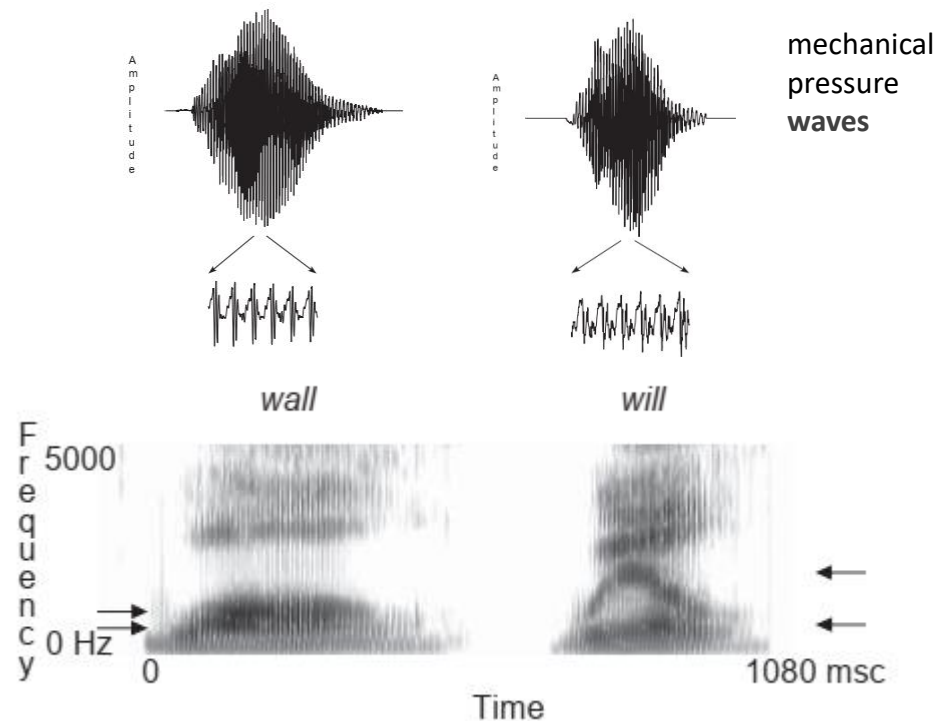
voiceless uvular plosive or stop
used in more than 50 languages
(some dialects of English and
German, Biblical Hebrew)

voiced pharyngeal fricative used
in no more than 15 languages
(some dialects of Arabic, Hebrew)

Phonetics

Phonetics is the manifestation of language sound

- Acoustic properties of language sounds
 - The tools of phonetic analysis provide very detailed and precise information about the amplitude, frequency and time characteristics.
 - Expanded view of the vowel part of the waveforms shows differences in the overall shape of the time-varying waveforms.
 - Too much information – a lot of information needs to be discarded to get at something more general and useful.
 - **Spectrogram**: reducing the absolute amplitude properties of a wave at an exact time to a set of (less precise) amplitude characteristics in different frequency and time areas

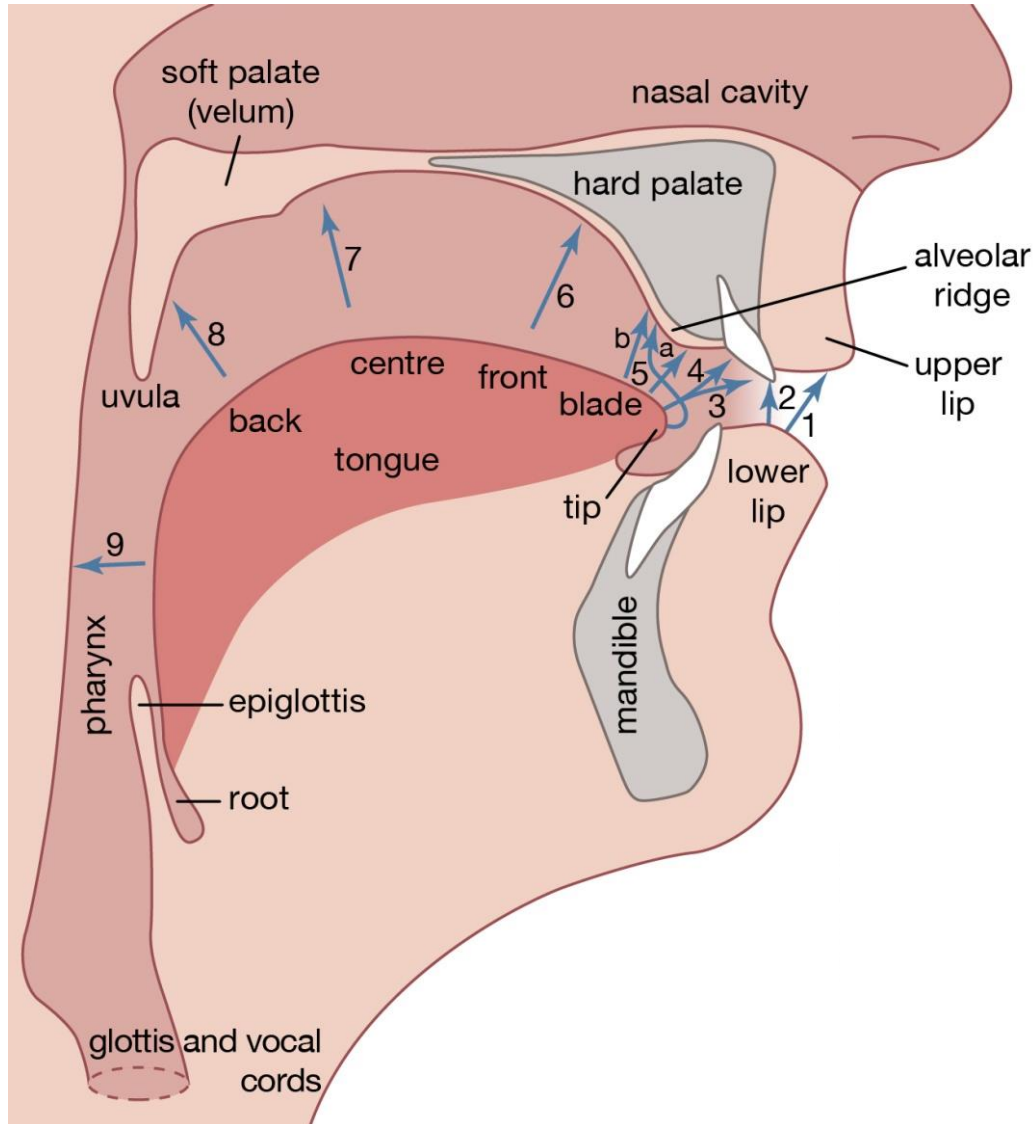


Phonetics

Phonetics is the manifestation of language sound

- Acoustic properties of language sounds
- Articulatory properties of language sounds
 - At **what place** in the mouth the sounds are formed and **how** they are formed

Articulatory Phonetics: PLACE



CONSONANTS

- (1) Bilabial
- (2) Labiodental
- (3) Dental and interdental
- (4) Alveolar
- (5) Postalveolar
 - (a) Retroflex
 - (b) Palato-alveolar
- (6) Palatal
- (7) Velar
- (8) Uvular
- (9) Pharyngeal

Articulatory Phonetics: MANNER

The airflow is completely blocked for a moment, then released for a moment, then released.

Air is forced through a narrow space, causing friction.

A combination of a plosive and a fricative.

Plosive	Fricative	Affricate
 /p/ /b/ /t/ /d/ pen, bat, top, dog	 /f/ /v/ /s/ /z/ fish, van, sun, zoo	 /tʃ/ /dʒ/ church, judge
Nasal	Approximant	Lateral Approximant
 /m/ /n/ /ŋ/ man, net, sing	 /r/ /w/ /j/ red, wet, yes	 /l/ light

Air flows through the nose while the mouth is blocked.

Articulators are close but not enough to create friction.

Air flows along the sides of the tongue.

Phonetics

Phonetics is the manifestation of language sound

- Acoustic properties of language sounds
- Articulatory properties of language sounds
 - At **what place** in the mouth the sounds are formed and **how** they are formed
 - Systematic limits on what sounds and combination of sounds are possible in a human language
 - Transcription: Systems of symbols and their phonetic properties, e.g. International Phonetic Alphabet (IPA) [+ others like X-SAMPA, Extended Speech Assessment Methods Phonetic Alphabet etc.]

International Phonetic Alphabet (IPA)

CONSONANTS (PULMONIC)

© 2018 IPA

	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			

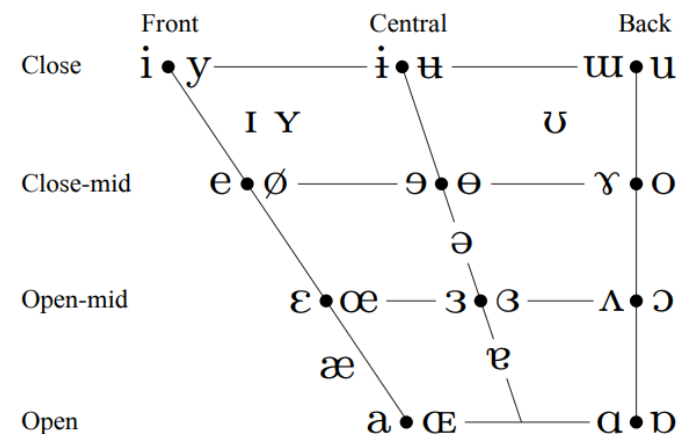
Symbols to the right in a cell are voiced, to the left are voiceless. Shaded areas denote articulations judged impossible.

CONSONANTS (NON-PULMONIC)

Clicks	Voiced implosives	Ejectives
◌ ɸ Bilabial	ɓ Bilabial	ʼ Examples:
ɗ Dental	ɗ Dental/alveolar	pʼ Bilabial
! (Post)alveolar	ɟ Palatal	tʼ Dental/alveolar
ɰ Palatoalveolar	ɡ Velar	kʼ Velar
Alveolar lateral	ɠ Uvular	sʼ Alveolar fricative

OTHER SYMBOLS

VOWELS



Phonetics and Phonology

- **Phonetics** – the manifestation of language sound
 - Acoustic properties of language sounds
 - Articulatory properties of language sounds
 - Transcription: International Phonetic Alphabet (IPA)
- **Phonology** – the study of sound systems
 - Looking for a way to represent just the essentials of language sounds, as *mental objects* which grammars can manipulate.
 - Reduces the great mass of phonetic information to a *cognitive minimum*, to a sequence of discrete segments.
 - Sounds (phonemes) are symbolic sounds, cognitive abstractions, which *represent but are not the same* as physical sounds.

Phonemes

- The smallest distinct acoustic unit in a language that may distinguish meaning of larger units
- A phoneme does not convey meaning itself
 - different phonemes if meaning changes

pin, tin, kin, fin, thin, sin, shin
dim, din, ding, did, dig, dish, dick
pin, pen, pan, pun, pain, pine, pawn
 - NOT different phonemes if meaning does not change
 - alveolar vs. dental R
 - different place of articulation in *ž*, *t* etc.



Phonetics and Phonology: Practice

- Are the following statements from phonetics or from phonology?
 - The sounds in the word *frame* change continuously
 - Towards the end of the word *frame*, the velum is lowered
- Give the phonetic symbols for
 - Dental nasal
 - Labio-dental fricative
 - Velar plosive (stop)
- How many phonemes are there:
 - *sit, judge, trap, fish, bite, ball, up, ox, through, often*

Phonemic Inventories Databases

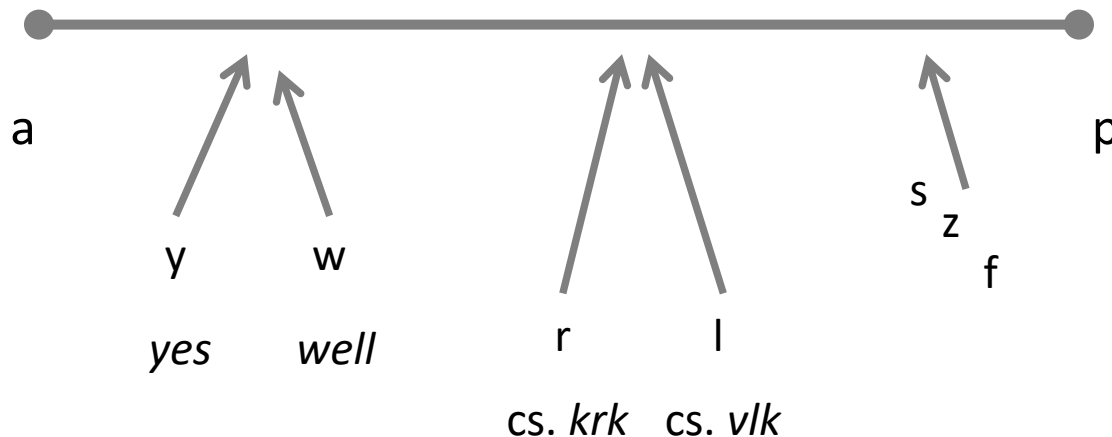
- SPA, Stanford Phonology Archive (Vihman, 1974)
 - first computerized database of phonological segment inventories, inspired by Joseph Greenberg's research on universals and his personal archive of data,
 - includes descriptions of phonemes, allophones and comments on phonological contexts for 197 languages.
- UPSID, UCLA Phonological Segment Inventory Database (Maddieson 1984, 1997)
 - statistical survey, phonemic inventories,
 - 451 languages in the last version
 - <http://web.phonetik.uni-frankfurt.de/upsid.html>
- Phonemic inventories within WALS (Maddieson 2013)
 - 564 languages
 - <http://wals.info/>
- The Database of Eurasian Phonological Inventories (Nikolaev, 2018)
 - collection and analysis of information on segmental inventories of Eurasian languages
 - <https://eurphon.info/>
- **PHOIBLE database** (Moran et al. 2014, updated in 2019)
 - segment inventories of 1,672 languages
 - IPA realizations
 - <https://phoible.org/>

Multiple Phonemic Inventories

- Phoneme analysis is a non-deterministic process
 - Different analysts can produce several equally valid, yet distinct, phonemic inventories for the same language
 - NLP models give also different outputs, but mostly comparable
- *Example:* in PHOIBLE
 - 9 inventories for English (39 to 45 segments)
 - 4 inventories for German (39 to 41 segments)
 - 5 inventories for Spanish (25 to 45 segments)
- Reasons for differences
 - different dialects
 - different attitudes

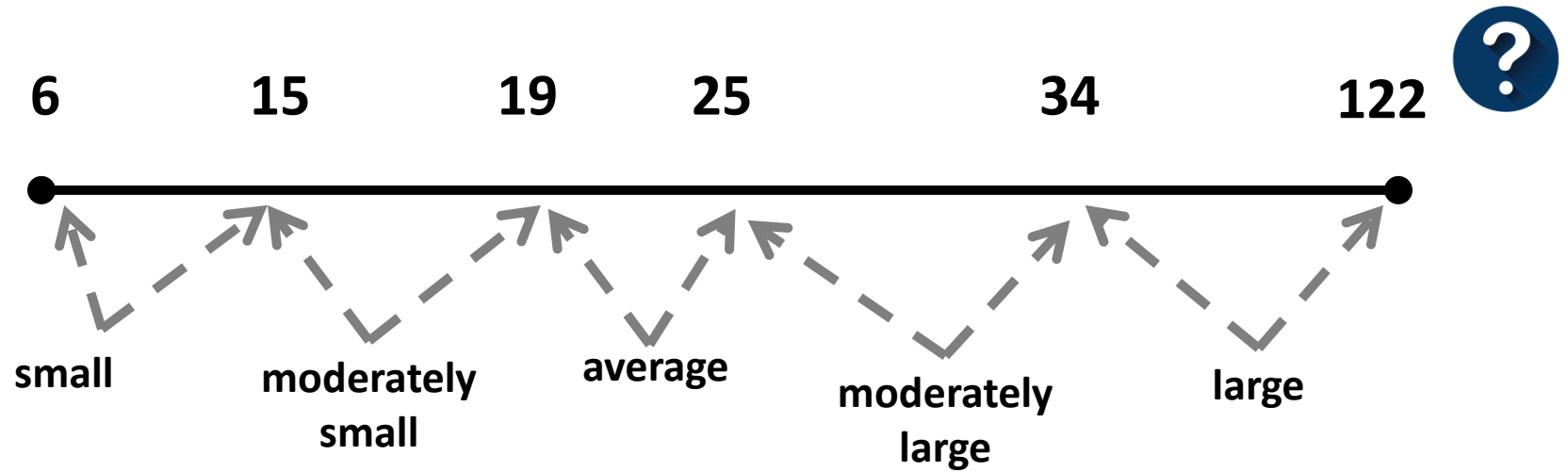
Vowels vs. Consonants

- Vowels are sounds with no audible noise produced by constriction in the vocal tract
 - make syllables
- Consonants are sounds with audible noise produced by a constriction in the vocal tract
 - obstacle
 - degree of this obstacle

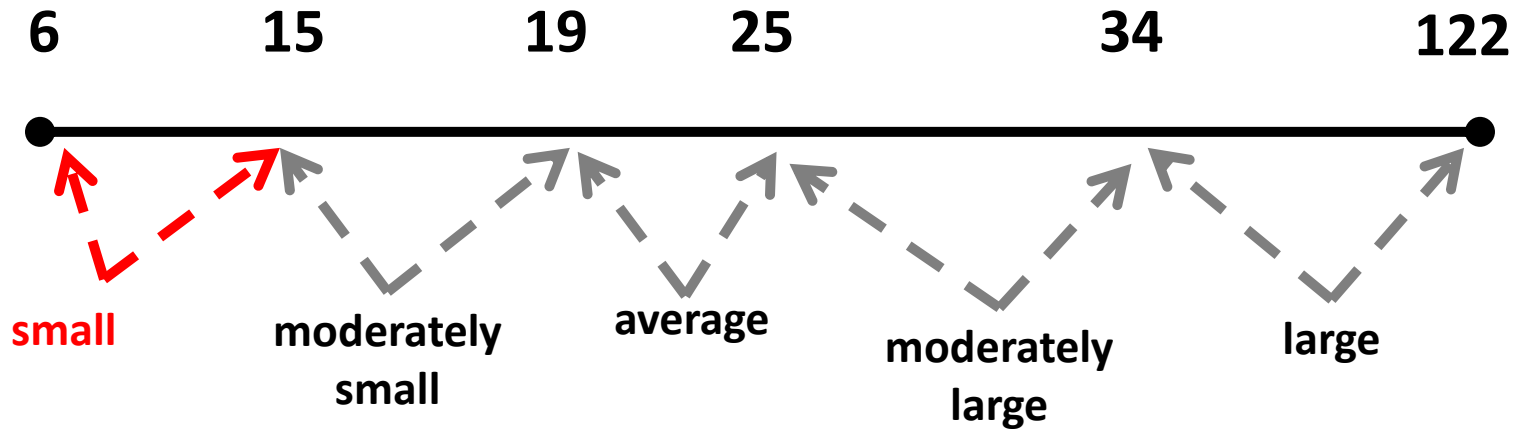


- The solution is convention
 - Typological research is still possible

WALS: Consonant Inventories



WALS: Consonant Inventories



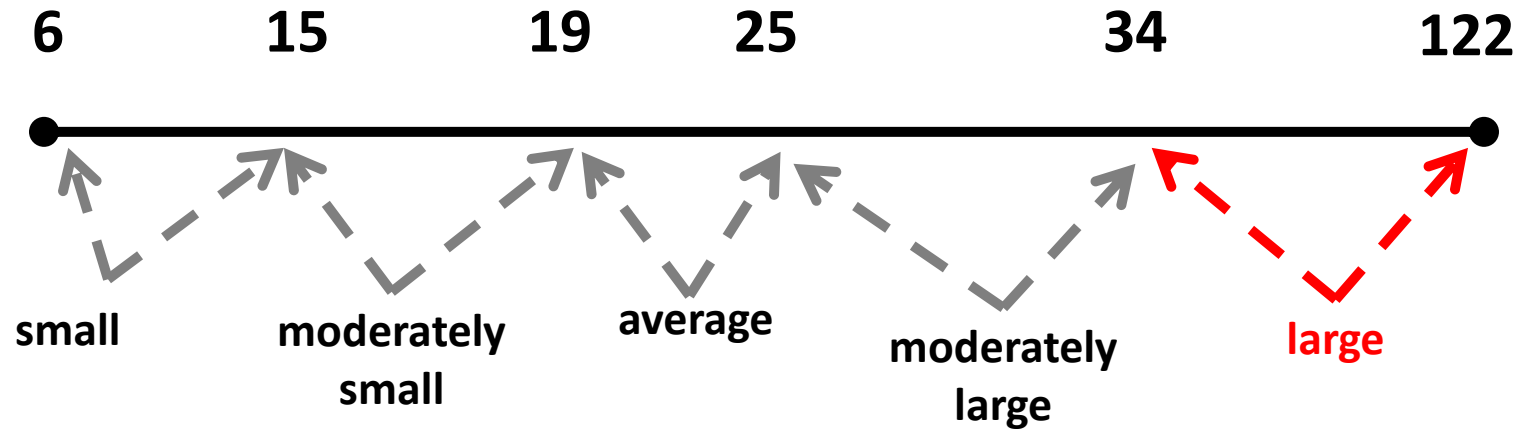
only 6 consonants
(/p, t, k, b, d, g/)

Rotokas



LANGUAGE	FEEDBACK
A language of <u>Papua New Guinea</u>	
ISO 639-3	roo
Population	4,320 (Wurm and Hattori 1981).
Location	Bougainville Province, Central Bougainville district, central mountains. 28 villages.
Language Maps	Papua New Guinea, Map 13
Language Status	5 (Developing). Statutory language of provincial identity in Bougainville Autonomous Region (2007, Education Plan, Section 1.1.3), not yet implemented (2012).
Classification	North Bougainville, Rotokas
Dialects	Aita, Atsilima, Pipipaia.
Typology	SOV.
Language Development	Literacy rate in L1: 50%–75%. Literacy rate in L2: 50%–75%. Dictionary. Grammar. NT: 1982.
Language Resources	OLAC resources in and about Rotokas
Writing	Latin script (Latn).

WALS: Consonant Inventories



- !Xóõ (Taa, Lone Tree)
- spoken in Botswana
- Tuu languages

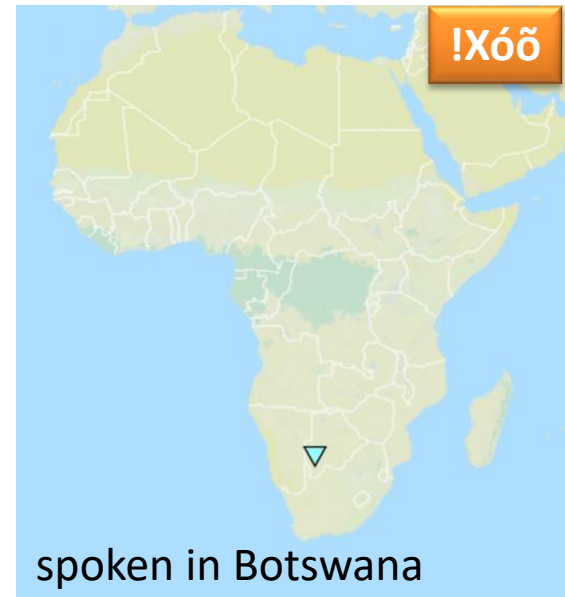


Why so many?

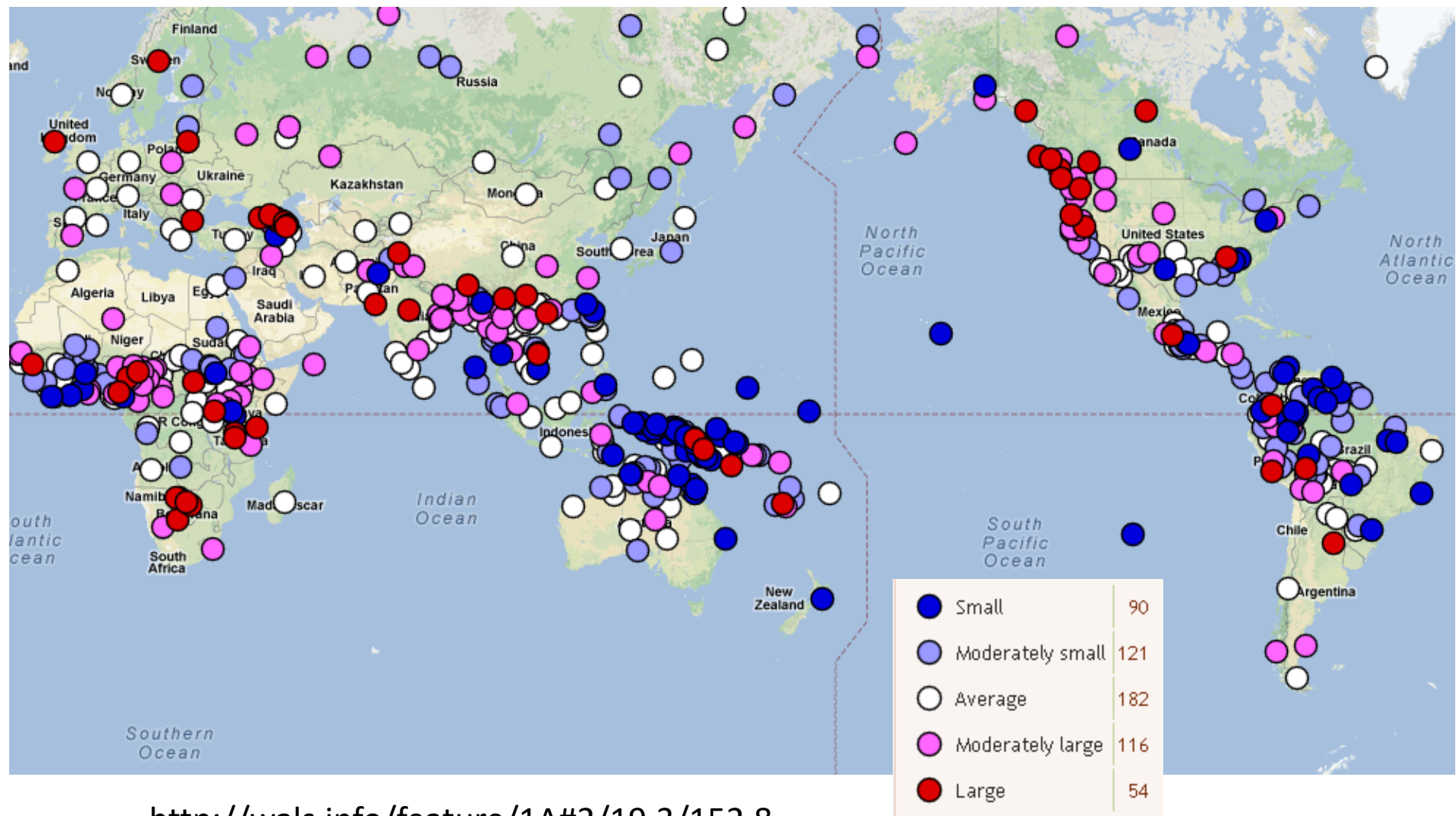
Clic sounds – in many languages of Southern Africa, articulated with two points of contact in the mouth, one forward and one at the back

How to pronounce click sounds?

<https://www.youtube.com/watch?v=31zzMb3U0iY>



WALS: Consonant Inventories



<http://wals.info/feature/1A#2/19.3/152.8>

Typology for Consonant Inventories: Correlations

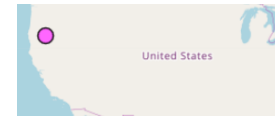
Hypothesis (Lindblom - Maddieson, 1988): There is an overall relationship between the size of a consonant inventory and the kind of consonants it includes.

Languages with special consonants by consonant inventory size

<u>C's inventory</u> size	<u>special C's</u>	<u>glottalized C's</u>
small	8.7%	8.7%
moderately small	13.1%	10.7%
average	22.1%	21.5%
moderately large	27.4%	39.3%
large	40.7%	66.7%

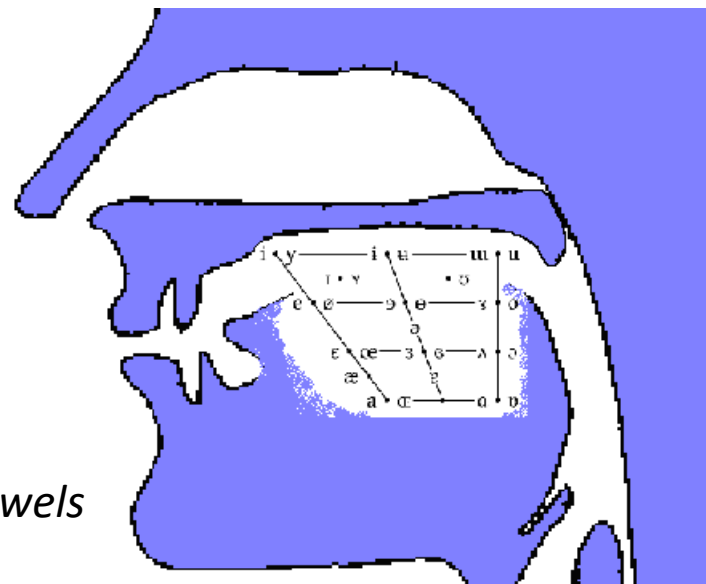
Typology for Consonant Inventories

- Place of articulation: Most languages have one laryngeal consonant, 'easier' pronounced (/h/ > /ʔ/ > /ħ/)
- Manner of articulation: stops > fricatives, nasals
- Most languages have at least one fricative (Klamath only /s/)
- Most languages have glides /w j/ – but in some languages, /w j/ do not contrast with high vowels
- Most languages have at least one nasal (some n. American languages lack them)

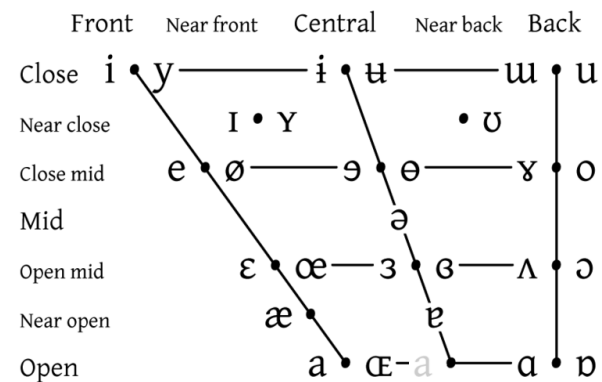


Vowel Quality Inventories

- Three scales
 - Front – Central – Back
 - Close – Mid – Open
 - Rounded - Unrounded
- Typological issues
 - e.g. *front rounded vowels* > *back unrounded vowels* (inventories like English are unusual)
 - no correlation between vowel and consonant inventories (Justeson-Stephens, 1984)



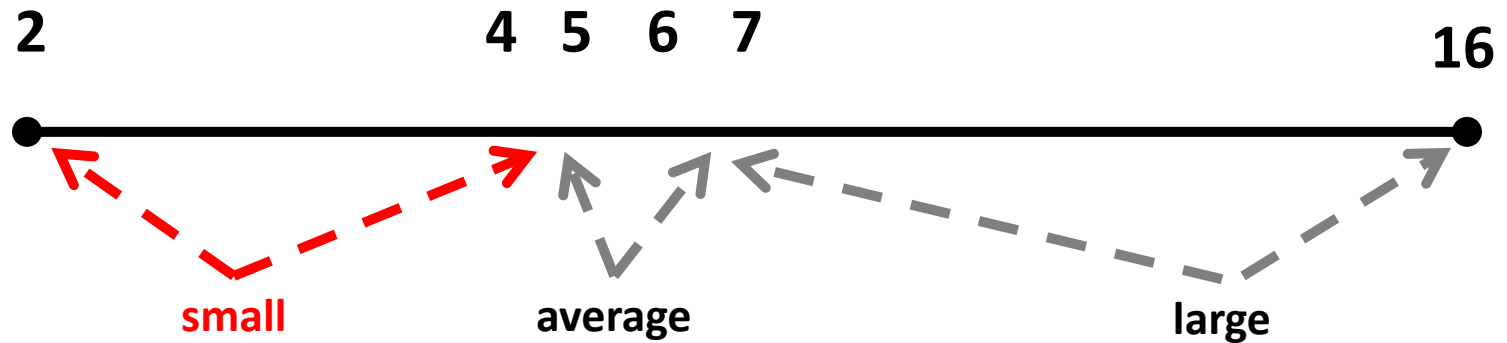
VOWELS



Vowels at right & left of bullets are rounded & unrounded.

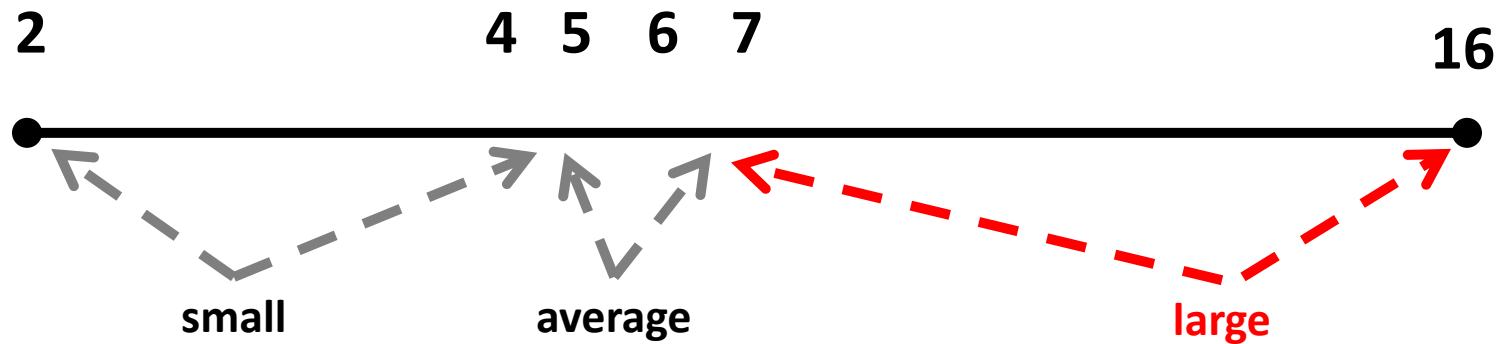


Vowel Quality Inventories

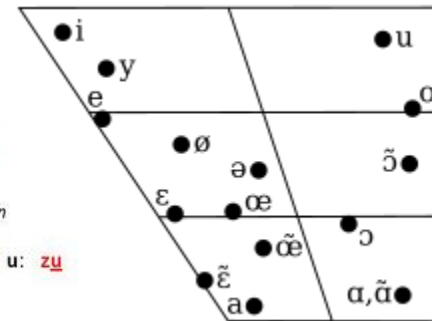
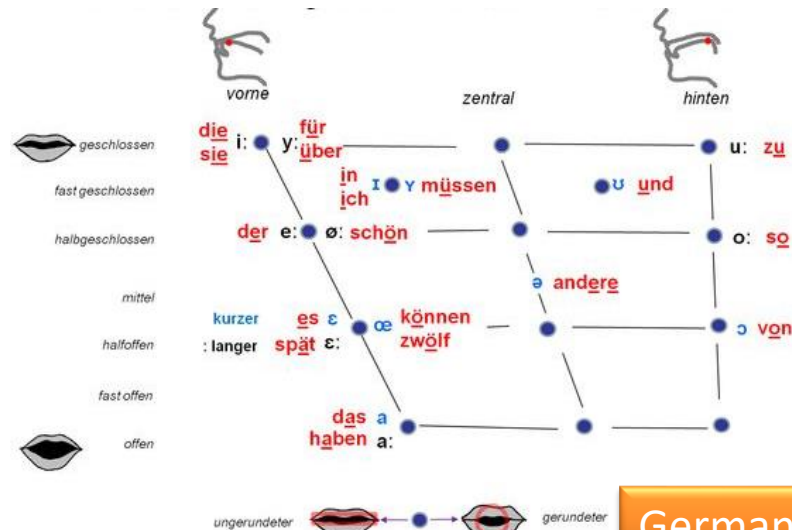


Yimas (Papua New Guinea): 2

Vowel Quality Inventories



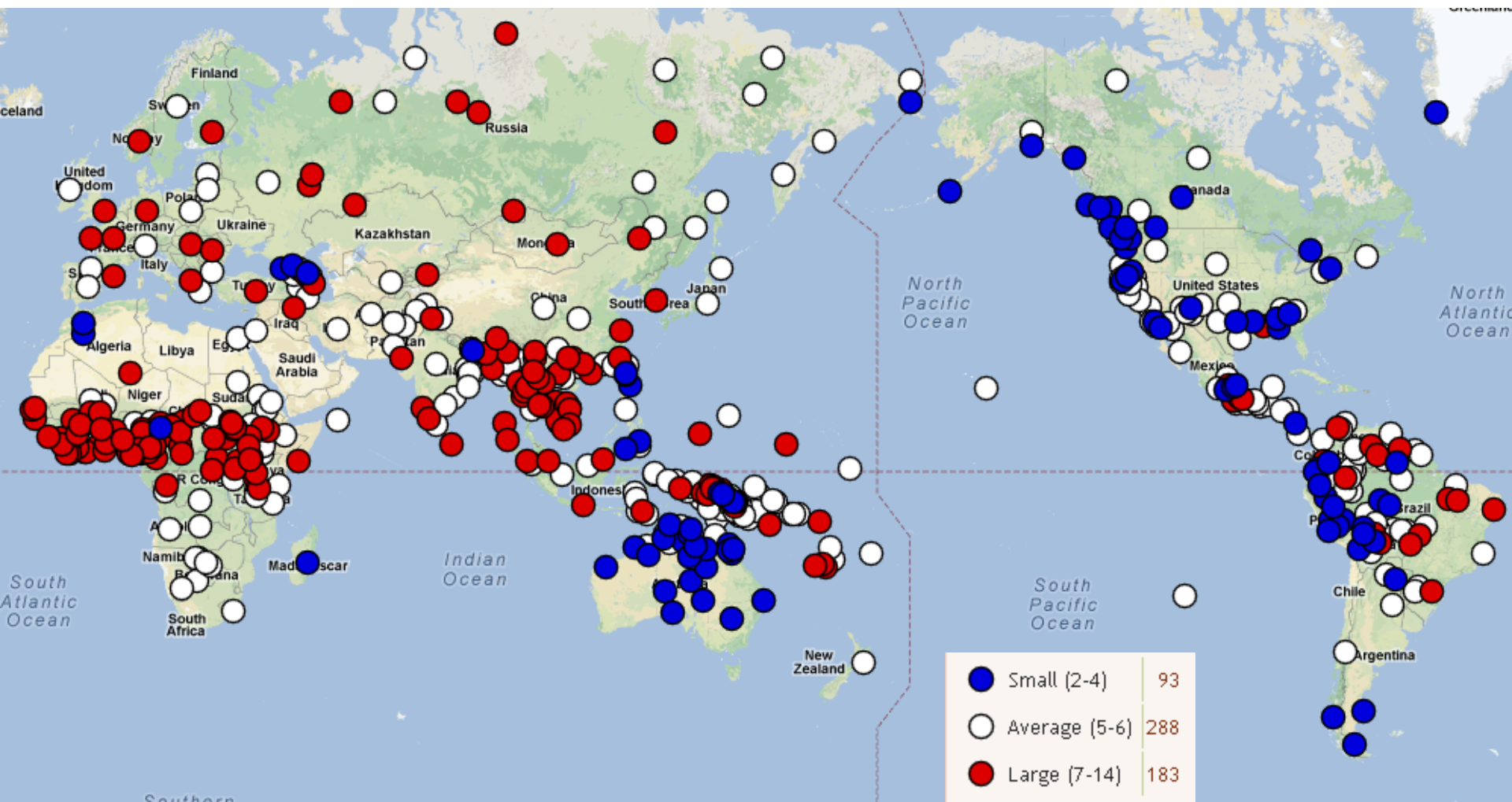
Yimas (Papua New Guinea): 2



French

German

Vowel Quality Inventories



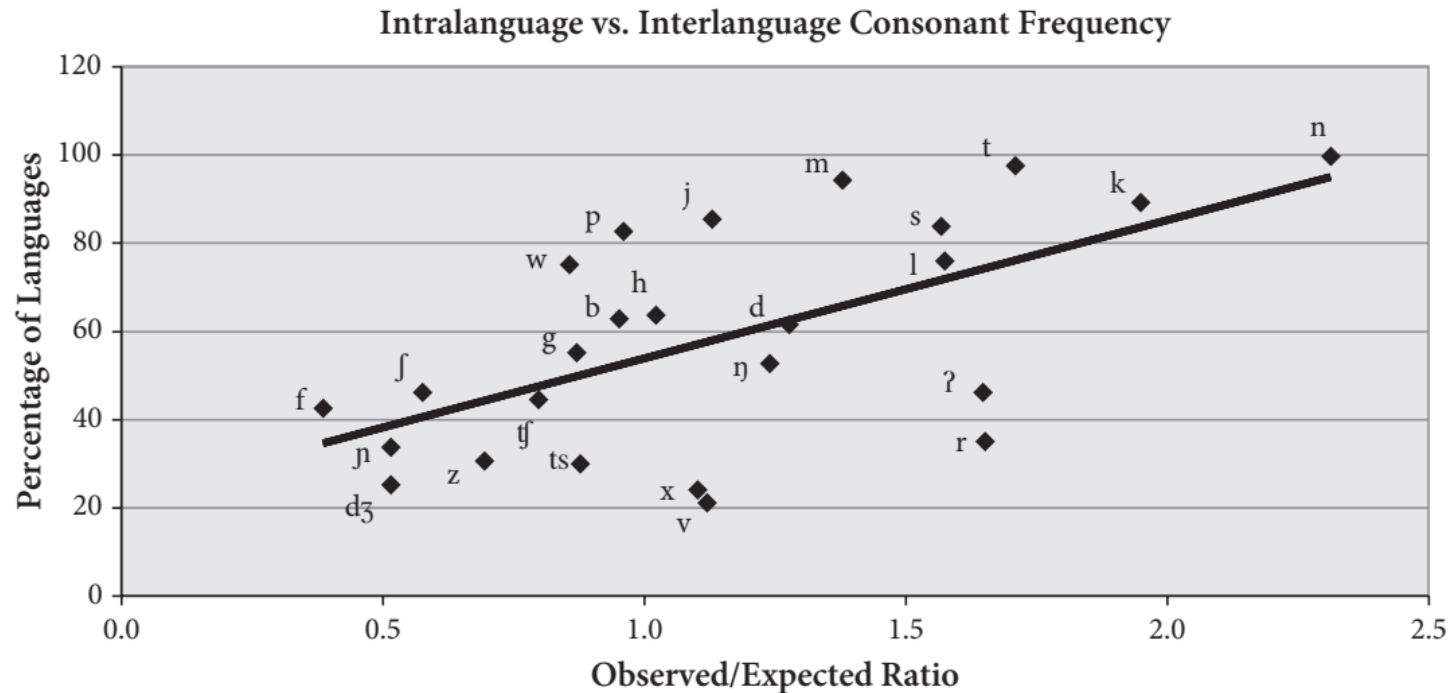


Why such inventories and not others?

- Why are phoneme inventories such as they are?
 - Most of research proposes explanations based on speech production and/or perception
 - *Perceptual factors*
 - *Articulatory factors*
- } often compete *(maximization of perceptual distinctness and minimization of articulatory effort)*

Frequency Distributions Within Languages: Consonants

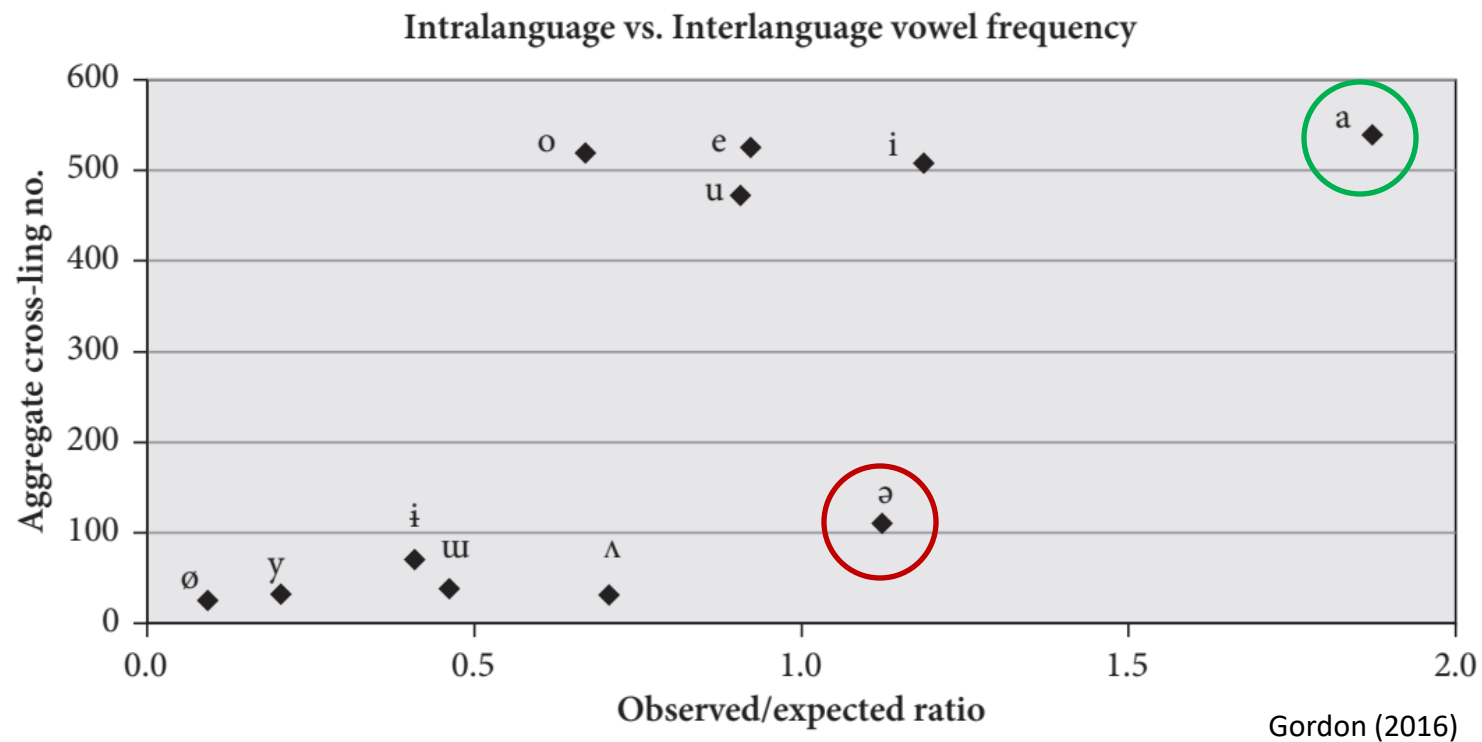
- There is a strong correlation between the typologically most common consonants and their frequency within languages



Gordon (2016)

Frequency Distributions Within Languages: Vowels

- Schwa [ə] occurs with greater frequency within languages than three of the cardinal vowels /e, o, u/, even though schwa is considerably less common across languages.



Phoneme Inventories: Summary

- Although there is a large number of sounds attested in languages of the world, most languages only employ a relatively small subset of them to make contrasts.
- There are certain consonants and vowels that are much more common than others both cross-linguistically and within languages.