Phonological typology

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1Relying heavily on material by Gerhard Jäger and David Erschler
Different sound systems

- Given that we all have more or less identical articulatory organs, we could expect that sound systems would be very similar.
- The sounds are not arbitrary
- Sound systems / phoneme inventories vary across languages.
- We often fail to hear contrasts absent from our native languages.
- Less trivially, the sizes of inventories vary as well.
Eimas’ (1985) experiment

- Can infants distinguish phonemes?
- Observe gaze direction or sucking rate, depending on age
- A loudspeaker plays /a/ sounds, occasionally an /i/
- /i/ causes the child to look towards the source of the sound
- Thus the child noticed the contrast
- Infants are also reported to be able to distinguish contrasts absent from the language of their parents
- Phonology has to be learned
How do phoneme inventories develop?

- As with grammars, languages with a more ‘primitive’ phoneme inventory are unheard of.
- Phonemes can be borrowed, like words
- and lost through sound change
- Very similar sounds may develop in completely unrelated languages
Most languages of the Caucasus have ejectives.

The glottal constriction in stop consonants is enhanced by raising the larynx in the throat.

This gesture compresses the air behind the oral closure; when it is released, a sharp, crackling sound is produced. (description from Kenstowicz 1994)
Ejectives in Ossetic

- Ossetic is an Iranian (Indo-European language), spoken in the Caucasus. Normally, Iranian (and other modern I-E) languages do not have ejectives.
- However, Ossetic developed a series of ejectives.
  - k’, p’, t’, řf’, ts’
  - řf’iri ‘pie’
  - k’aχ ‘foot, leg’
  - t’ang ‘intestine’
Borrowing of Phonemes: Subapical Retroflex Consonants

Figure: Articulation of retroflexes
Subapical Retroflex Consonants

- These are present in all Dravidian languages.
- Malayalam: kaṇṭi
- But also present in: all Indo-Aryan languages, Nuristani languages, some Eastern Iranian languages (Pashto, Wakhi, Ishkashimi, Sanglichi, Munji, Yidga); Western Iranian Balochi (spoken in Pakistan); and in Burushaski.
- i.e. the Indian peninsula and some areas to the North-West of it.
Similar phonemes in non-related languages

- At some stage all Germanic languages developed interdental fricatives \( \theta \) and \( \delta \). (Now preserved in English, Icelandic, and Faroese.)

- Similar sounds independently emerged in many other languages of the world.

- For instance, while all other Turkic languages lack \( \theta \) and \( \delta \), Bashkir, spoken in the East of European Russia, shows these sounds.
Bashkiria
Similar phonemes in non-related languages

- It is clear that what happened in Bashkir was that $z \rightarrow \ddot{o}$ (in certain positions) and $s \rightarrow \theta$ (in certain positions).
- Similarly, these sounds developed in many Eastern Iranian languages.
- Moral: Presence of similar sounds is not indicative of genetic relatedness.
Size of phoneme inventories

- Small consonant inventory: Hawaiian (Austronesian)
  - Consonants: p, k, ?, h, l, m, n, w
  - Vowels: i, i:, e, e:, a, a:, u, u:, o, o:

- The range of inventories in Maddieson (2011) extends from a low of 6 consonants [Rotokas, New Guinea] to a high of 122 [!Xóõ (Southern Khoisan; Botswana)]
Counting phonemes

- Phonemes are difficult to count
- Example: Should aspirated phonemes be analyzed as one entity or a sequence ‘stop + h’?
- A contrast that is non-phonemic in one language may be phonemic in another.
- English: certain stops are aspirated when word-initial or stressed-syllable initial: copy [kʰɔpɪ], but peak [pʰi:k]
- Eastern Armenian has series like k,kʰ,g (Vaux 1998)
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<th>Labial</th>
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Adyghe Vowels

- Only three phonemes: a, e, ə
- Phonetically: we = o; jə = i; wə = u
- So, depending on the analysis, the system is either extremely small, or relatively usual.
There are no known correlations between a language’s phonology and the rest of its grammar.

“Over the last 250 or so years it has not been established that phonology co-varies with morphology and syntax. But then, it has not been established either that it does not.” Plank (1998)

Nevertheless, there has been recently discovered an unexpected correlation between the population size and phonetic inventory. (Hay & Bauer 2007)
**Figure:** Phonological complexity vs. geographically location (Atkinson)
Figure: Modelling of the ‘genetic’ origin of language by phonological complexity (Atkinson)
**Figure:** Consonant inventory size (WALS)

- Small (blue) (90 languages)
- Moderately small (light blue) (121 languages)
- Average (white) (182 languages)
- Moderately large (pink) (116 languages)
- Large (red) (54 languages)
Figure: Vowel inventory size (WALS)

- Small (2-4) blue (93 languages)
- Average (5-6) white (288 languages)
- Large (7-14) red (183 languages)
Maddieson (2011)

“[T]he occurrence of a large consonant inventory with a small number of vowel distinctions is not part of a general pattern in languages but reflects a geographically restricted tendency that can be found in a few areas (primarily in southern Africa, the Caucasus and the American north-west).”
Hay & Bauer (2007)

- Observed a positive correlation between how many phonemes a language has and how many speakers it has. This correlation exists both within the vowel inventory and within the consonant inventory.

“This is not an artifact of language family. We do not know what the underlying causes of this correlation are. But it is certainly intriguing, and we hope that this report will generate some discussion of the possible causes of such a relationship.”
Figure: Vowels vs. population
Figure: Consonants vs. population
Phoneme inventory vs. morpheme length

- There is an inverse relationship between the number of phonemes in a language and the average length of its morphemes.

- Milewski (1973) calculated that with smallish systems of little more than about a dozen phonemes, as in Aranda or Hawaiian, the mean length of morphemes is as long as four phonemes, while with unusually large systems of 45-75 phonemes, as in certain North American or North Caucasian languages, morphemes are shorter than 1.5 phonemes on average.
Common phonemes

- Some classes of phonemes are fairly common
- Bilabials are present virtually everywhere
- Ditto for fricatives
- Ditto for nasals
- Although there are a number of languages which can be analyzed as having no nasal consonants, extremely few of the world’s languages fail to make use of nasality either as a part of their consonant system or as part of their vowel system
Clicks

- Very frequent in Khoisan languages, South Africa (!Xóõ, !Xũ, Nama . . . )
- With lower frequency, they occur in a number of Bantu languages of South Africa: Zulu, Xhosa, and some others
- In East Africa: Sandawe and Hadza, language isolates (?) of Tanzania
- Dahalo, a Cushitic language of Kenya (only about 40 words, Ladefoged & Maddieson 1996)
Mechanism for making clicks

A. Two closures in mouth
B. Expansion of enclosed space
C. Release of front closure
Types of Clicks

- Bilabial ʘ
- Dental |
- Alveolar !
- Palatal ŋ
- Lateral ||
- Relatively few languages use all types of clicks
<table>
<thead>
<tr>
<th>Articulation</th>
<th>Word 1</th>
<th>Word 2</th>
<th>Word 3</th>
<th>Word 4</th>
<th>Word 5</th>
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<td>ʘ?ôo</td>
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<tr>
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<td>k</td>
<td>?âa</td>
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<td>Alveolar</td>
<td>k!’áã</td>
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<td>Palatal</td>
<td>kǂ?āa</td>
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<tr>
<td>Lateral</td>
<td>kǁ?àa</td>
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</table>

- ʘ?ôo: ‘get stuck’
- k|?âa: ‘die’
- k!’áã: ‘be seated’
- kǂ?āa: ‘shoot you’
- kǁ?àa: ‘not to be’
Nama

<table>
<thead>
<tr>
<th></th>
<th>Voiceless unaspirated</th>
<th>Voiceless aspirated</th>
<th>Delayed aspiration</th>
<th>Voiced nasal</th>
<th>Glottal closure</th>
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<td>oa</td>
<td>k</td>
<td>h</td>
<td>o</td>
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<tr>
<td></td>
<td>‘put into’</td>
<td>‘play an instrument’</td>
<td>‘push into’</td>
<td>‘measure’</td>
<td>‘sound’</td>
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<tr>
<td><strong>Palatal</strong></td>
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<td>ʔ</td>
<td>ais</td>
<td>k</td>
<td>ʔ</td>
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<tr>
<td></td>
<td>‘calling’</td>
<td>‘small one’</td>
<td>‘baboon’s arse’</td>
<td>‘turtledove’</td>
<td>‘gold’</td>
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<tr>
<td><strong>Alveolar</strong></td>
<td>k</td>
<td>ʔ</td>
<td>oas</td>
<td>k</td>
<td>ʔ</td>
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<tr>
<td></td>
<td>‘hollow’</td>
<td>‘belt’</td>
<td>‘narrating’</td>
<td>‘pluck maize seeds’</td>
<td>‘meeting’</td>
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<td>‘writing’</td>
<td>‘strike’</td>
<td>‘special cooking place’</td>
<td>‘pointing’</td>
<td>‘reject a present’</td>
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<tr>
<td><strong>Voiceless unaspirated velar plosive</strong></td>
<td>ukúk</td>
<td>ola ‘to grind fine’</td>
<td>ukúk!oba ‘to break stones’</td>
<td>úk</td>
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<tr>
<td><strong>Voiceless aspirated velar plosive</strong></td>
<td>úkuk</td>
<td>hóla ‘to pick up’</td>
<td>ukúk</td>
<td>hola ‘perfume’</td>
<td>ukúk</td>
</tr>
<tr>
<td><strong>Murmured velar plosive</strong></td>
<td>úkug</td>
<td>óba ‘to be joyful’</td>
<td>ukúg</td>
<td>oba ‘to scoop’</td>
<td>ukúg</td>
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<tr>
<td><strong>Voiced velar nasal</strong></td>
<td>ukúŋloma ‘to admire’</td>
<td>ukúŋlola ‘to climb up’</td>
<td>ukúŋl</td>
<td>iba ‘to put on clothes’</td>
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<tr>
<td><strong>Murmured velar nasal</strong></td>
<td>ukúŋ</td>
<td>ola ‘to be dirty’</td>
<td>ukúŋ</td>
<td>ala ‘to go straight’</td>
<td>ukúŋ</td>
</tr>
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</table>
Labial-velar plosives

- Similarity to clicks: they also involve two closures
  - one at the back of the mouth and one at the lips
- Difference: the force for the explosive release comes from the lungs as in simple plosives
- IPA: /̱kp/ (voiceless), /̱gb/ (voiced)
- Occurrence: West and Central Africa (several families); eastern end of New Guinea
Vowel systems

- Crothers (1978) studied 209 languages (balanced for language family and geographical area), Schwartz et al. (1997) did more
- all following examples are from Crothers
- only “basic vowels” (see the problem of establishing phonemes)
3-vowel systems

- the minimum in Crothers’ sample, but see Ladefoged and Maddieson (1996, 286ff.)
- 27 languages: Yupik, Quechua, Tagalog, Australian languages
4-vowel systems

- Fill in the front
- 13 languages: Navajo, Mazatec, Malagasay

- Fill in the top
- 9 languages: Kwakiutl, Margi, Squamish
5-vowel systems

- 5-vowel systems are the most common type worldwide. They are also bifurcated.

- Add /ɔ/ to balance /ɛ/.
- 55 languages: Latin, Spanish, Japanese, Swahili, Russian.

- Add /ɛ/ if lacking.
- 5 languages: Nez Perce, Maranungku.
6-vowel systems

- 29 languages: Chuckchi, Delaware, Malayalam, Polish

- 7 languages: Lithuanian, Persian
7-vowel systems

- 11 languages: Italian, Bengali, Catalan
- 14 languages: Albanian, Mongolian, Amharic
8-vowel systems

- rare: Turkish

- Note that the vowels’ positions are language-specific here [Zimmer & Orgun (1999:155)]
9-vowel systems

- 7 languages: Lao
More than 9 vowels

- French [Fougeron & Smith (1993:73)]
- Without nasal vowels
Other contrasts

- Front rounded vowels are rare, but sometimes already enter as the 6th vowel
- Apparently, all languages have oral vowels
- Out of 244, 64 also have (phonemic) nasal vowels (WALS)
- length
- creaky voice, breathy voice
- tone