

# **Advanced Phonological Theory B – Lecture 8: Who's afraid of inventories?**

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March 9, 2005

# UPSID

- The UCLA Phonetic Segment Inventory Database contains inventory information for a range of languages
  - ◆ UPSID<sub>317</sub>: 317 languages ([Maddieson, 1984](#))
  - ◆ UPSID<sub>451</sub> (current): 451 languages ([Maddieson & Precoda, 1989](#))
- Based (mostly) on transcription data in the descriptive literature
- Sampled to avoid genetic (but not areal) bias

# Who needs it

- UPSID allows phonologists to investigate patterns in the phonological organisation and phonetic manifestation of segment inventories
- Key assumption: UPSID provides a sufficiently representative sample of languages to support claims about what is (relatively) **common** in language
- To some, this is not an area phonology proper is concerned with (**Hale & Reiss, 2000**)

# UPSID<sub>451</sub> vowel frequencies

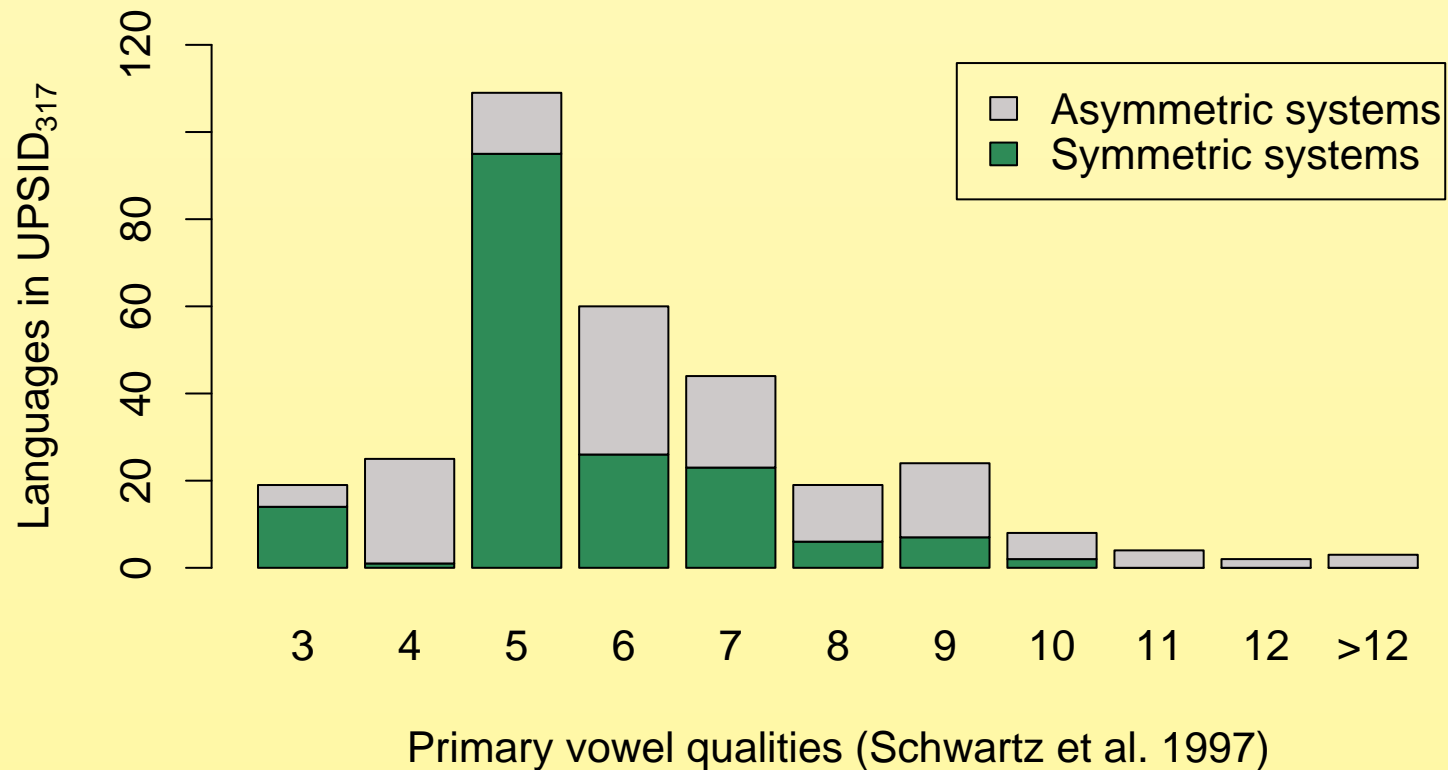
- Raw frequencies of vowels in UPSID<sub>451</sub> (Maddieson & Precoda, 1989) by height, backness and rounding:

	fr		cen		bk	
	-rnd	+rnd	-rnd	+rnd	-rnd	+rnd
hi	444	28	67	8	46	416
himid	142	15	22	4	14	153
mid	181	4	86	6	9	191
lomid	192	8	16	1	10	174
lo	76	0	409	1	34	21

# UPSID<sub>451</sub> vowel frequencies



# UPSID<sub>317</sub> vowel systems



# Vowel inventories: generalisations

- Inventories show a marked preference for peripheral vowels:
  - ◆ High front unrounded vowels such as [i]
  - ◆ High back rounded vowels such as [u]
  - ◆ Low central unrounded vowels such as [a]
  - ◆ (Less so) front non-low unrounded vowels such as [e, ε]
  - ◆ (Less so) back non-low rounded vowels such as [o, ɔ]

# Vowel inventories: generalisations

- In non-peripheral areas there are weak(er) preferences for:
  - ◆ High vowels such as [y, i, u]
  - ◆ Centralised vowels such as [ə]

# Vowel inventories: generalisations

- 109 vowel inventories in UPSID<sub>317</sub> (34%) exhibit 5 primary vowel qualities ([Schwartz et al., 1997](#))
- Of these, 95 inventories are ‘symmetric’ [i]-[e]-[a]-[o]-[u]-type systems comprising 3 peripheral vowels, a mid front unrounded vowel, and a mid back rounded vowel

# Modelling inventories

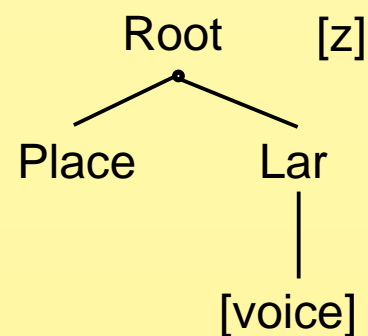
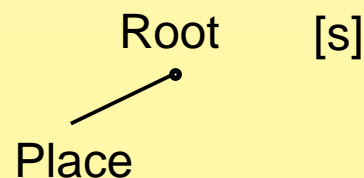
- So how can generative phonological theory capture generalisations about (vowel) inventories?
- Note first that it is unlikely that lexical inventories are represented **as such**
- Consequently, constraints/rules will have to be stated over the phonological forms of morphemes/words
- **Declarative** formalisms such as OT offer devices that allow this

# Modelling inventories

- OT provides a formalism for modelling inventories but (of itself) not a theory of preferred sounds
  - ◆ Constraints such as  $*[a]$  are as easy to state as  $*[\text{æ}]$
- As a form of ‘markedness’ it would seem attractive to treat inventory asymmetries in terms of underspecification / complexity
  - ◆ Example: plain voiceless sounds are (deemed to be) frequent crosslinguistically, and have been treated as laryngeally unmarked (Kaye et al., 1990; Harris, 1994; Iverson & Salmons, 1995)

# Modelling inventories

- Assuming that [-voice] obstruents are laryngeally unmarked  $*LAR \gg MAX_{Lar}$  (cf. [Lombardi 1999](#)) allows [p, t, k, f, s, x] etc.
- $MAX_{Lar} \gg *LAR$  allows [p<sup>h</sup>, t<sup>h</sup>, k<sup>h</sup>, b, d, g, v, z, ʒ] etc. as well as [p, t, k, f, s, x] etc.



# Modelling inventories

- Problem: favoured feature values can be phonologically active
  - ◆ Voiceless obstruents are often deemed to be favoured over obstruent belonging to different laryngeal categories (voiced, aspirated, ejective)
  - ◆ There's a good case to be made at least for **sibilant fricatives**: 397 languages with voiceless sibilants vs. 147 with voiced sibilants in UPSID<sub>451</sub>
  - ◆ [-voice]/[spread glottis] active in plosives and (especially?) fricatives (**Vaux, 1998**; **Mascaró & Wetzels, 2001**)

# Modelling inventories

- **N.B.:** UPSID does not code the distinction between prevoiced and short lag /b, d,  $\widehat{d}_3$ , g/ etc. and is unreliable wrt plain voiceless vs. voiceless plosives, which makes impossible to verify any claims about the unmarkedness of plain voiceless stops

# Modelling inventories

- Voiceless fricatives pattern with aspirated rather than plain plosives in New Julfa Armenian ([Vaux, 1998](#)):

/k-t-a-m/	[kətam]	‘I will give’
/k-kien-a-m/	[kəkienam]	‘I will exist’
/k-t <sup>h</sup> oʋ-n-ie-m/	[k <sup>h</sup> ət <sup>h</sup> oʋniem]	‘I will allow’
/k-t <sup>h</sup> ʃap <sup>h</sup> -ie-m/	[k <sup>h</sup> ət <sup>h</sup> ʃap <sup>h</sup> iem]	‘I will measure’
/k-χnd-a-m/	[k <sup>h</sup> əχəndam]	‘I will laugh’
/k-savor-ie-m/	[k <sup>h</sup> əsavoriem]	‘I will grow accustomed to’

# Modelling inventories

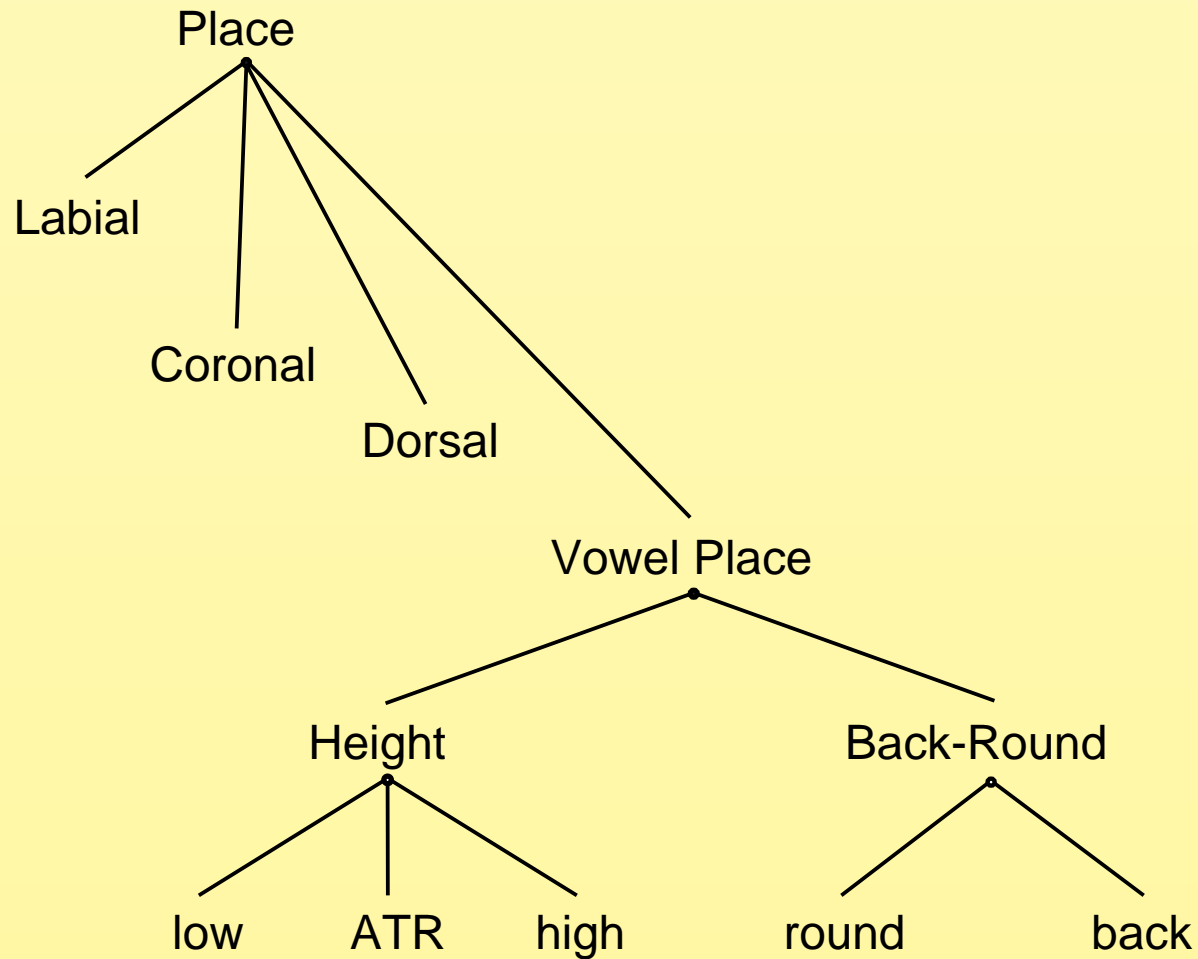
- Plain voiceless obstruents trigger VA in Hungarian ([Siptár & Törkenczy, 2000](#)):

/rɔb/ + /to:l/	[rɔpto:l]	from (a) prisoner
/ka:d/ + /to:l/	[ka:tɔ:l]	from (a) bathtub
/a:j/ + /to:l/	[a:cto:l]	from (a) bed
/mɛlɛg/ + /to:l/	[mɛlɛktø:l]	from (the) heat
/monta:ʒ/ + /sɛry:/	[monta:sɛry:]	montage-like
/igɔz/ + /ʃa:g/	[igɔʃa:g]	truth
/bridʒ/ + /sobɔ/	[britʃsobɔ]	bridge room
/vɔra:ʒ/ + /tʃɛruzɔ/	[vɔra:ʃtʃɛruzɔ]	magic pencil

# Modelling inventories

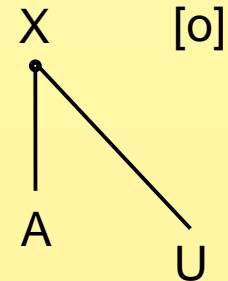
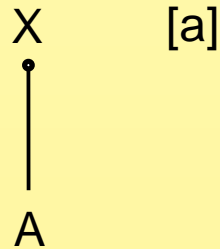
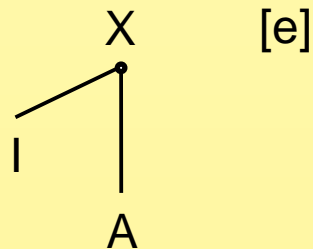
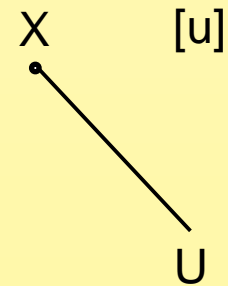
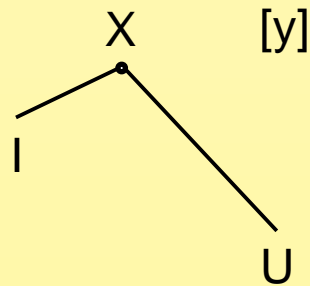
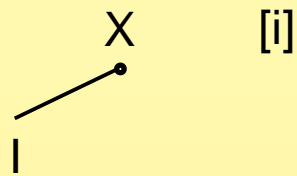
- Problem: sometimes preferred and dispreferred sounds are assigned equally simple/complex representations
  - ◆ Labiodental and dental/alveolar fricatives vs. velars
  - ◆ Mid front unrounded and mid back rounded vs. high front (or central) rounded vowels (some theories)
- Problem: sounds favoured by inventories can not always be characterised as structurally simpler than dispreferred sounds
  - ◆ Preferred vowels (several versions of Feature Geometry)
  - ◆ 4-way oral stop systems

# Vowels: Odden(1991)

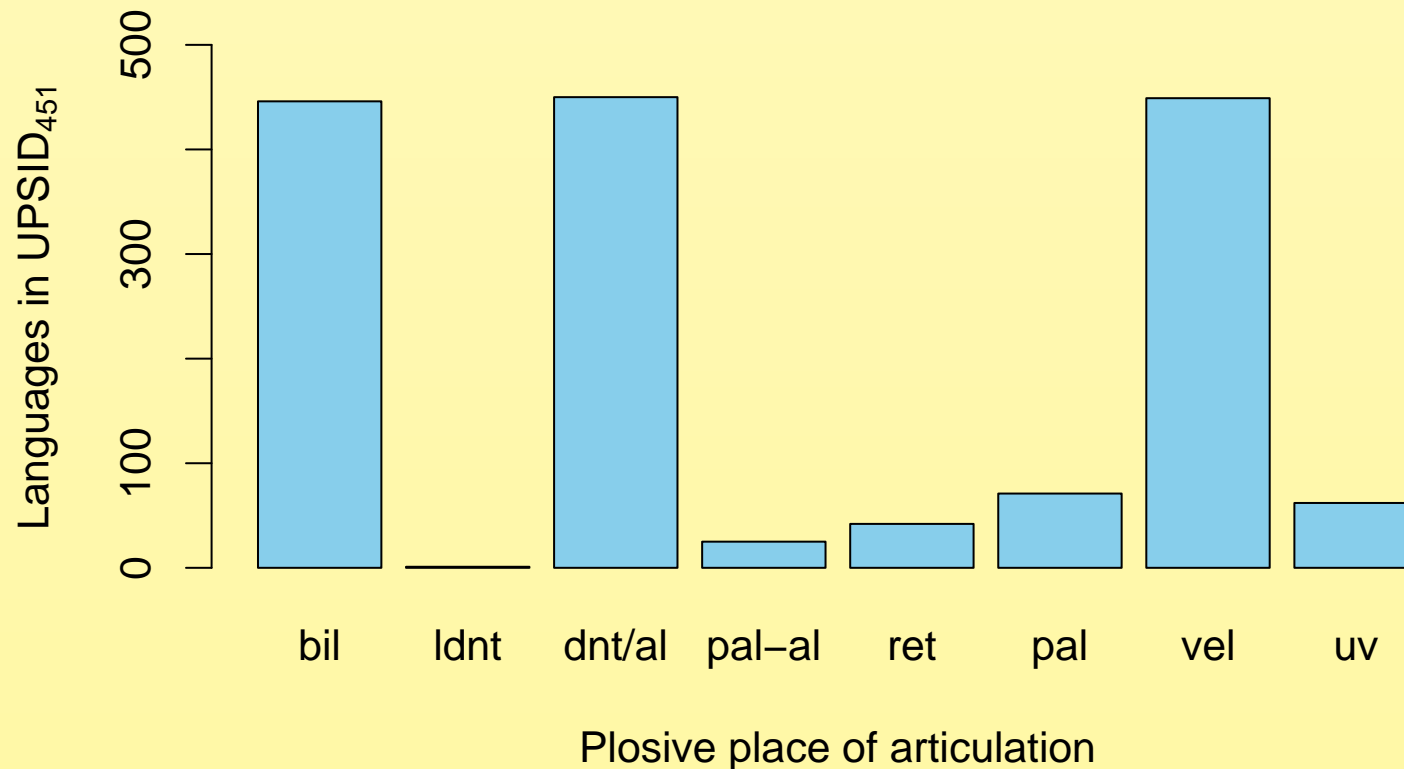


# Quasi-acoustic representations

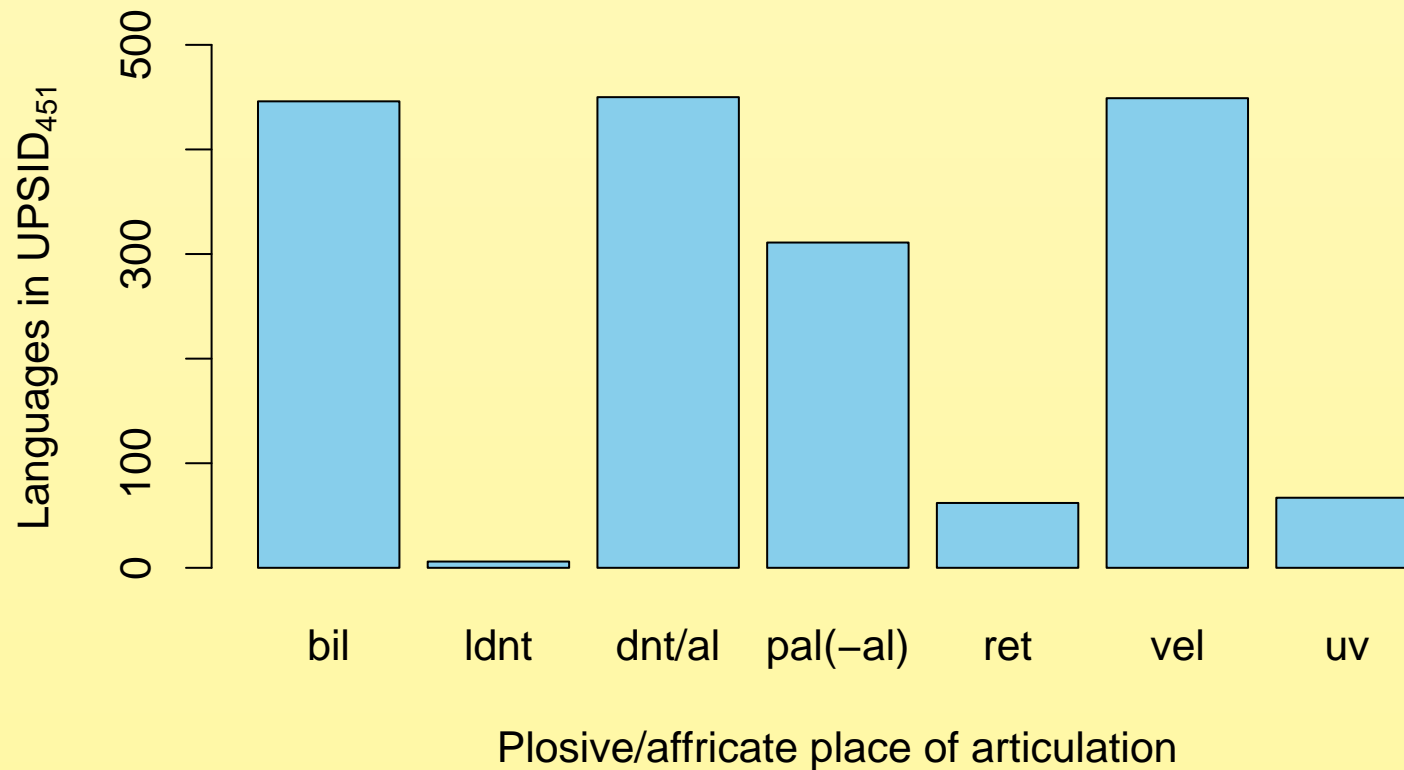
- primes/elements/articles (e.g., Schane 1984; Anderson & Ewen 1987; Kaye et al. 1985; Harris 1994) provide a better handle on preferred vowel systems:



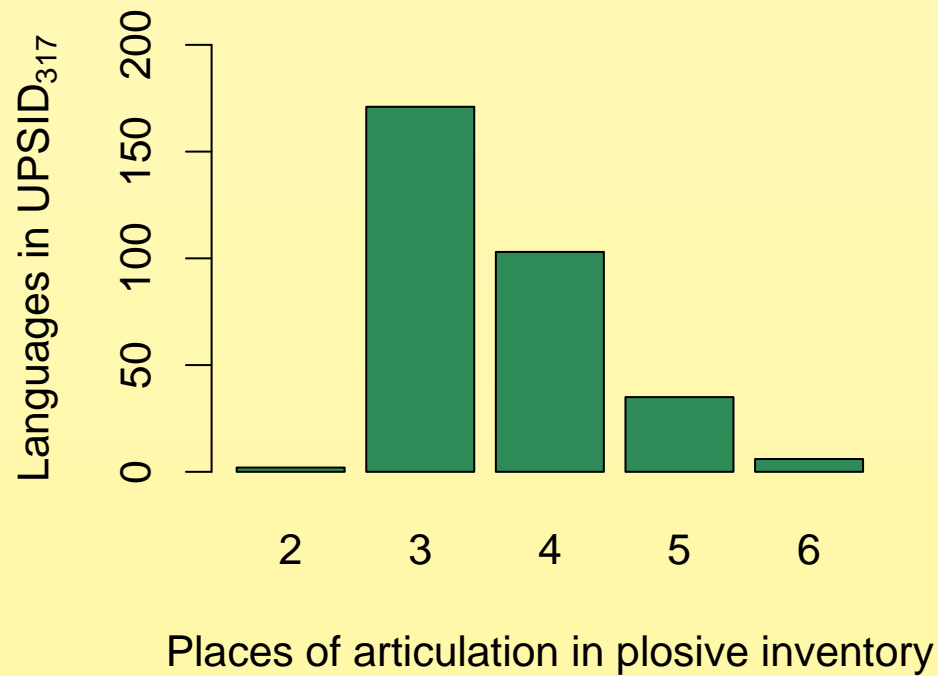
# UPSID<sub>451</sub> plosive frequencies



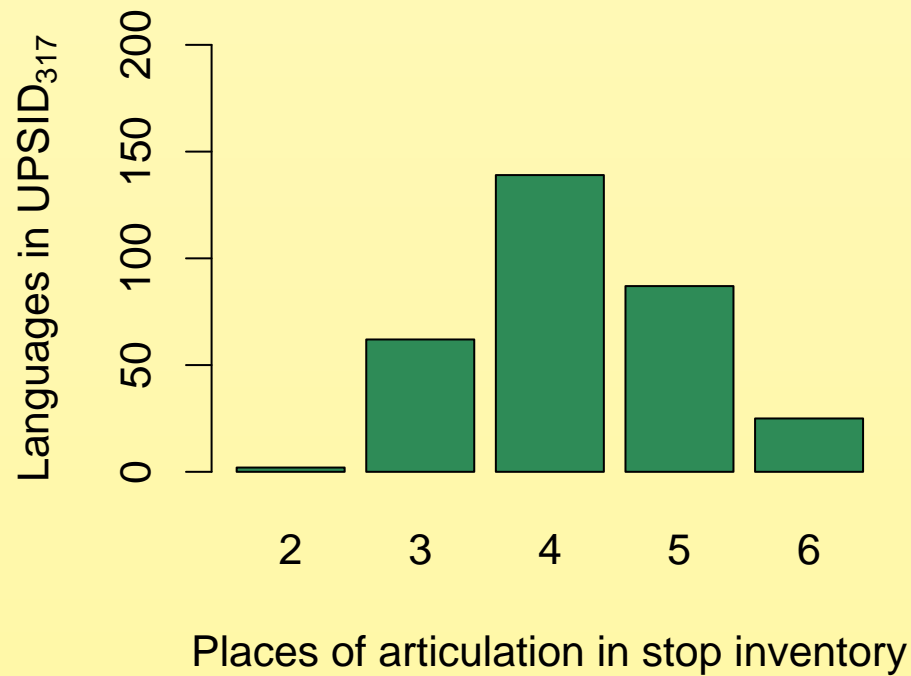
# UPSID<sub>451</sub> plosives/affricates



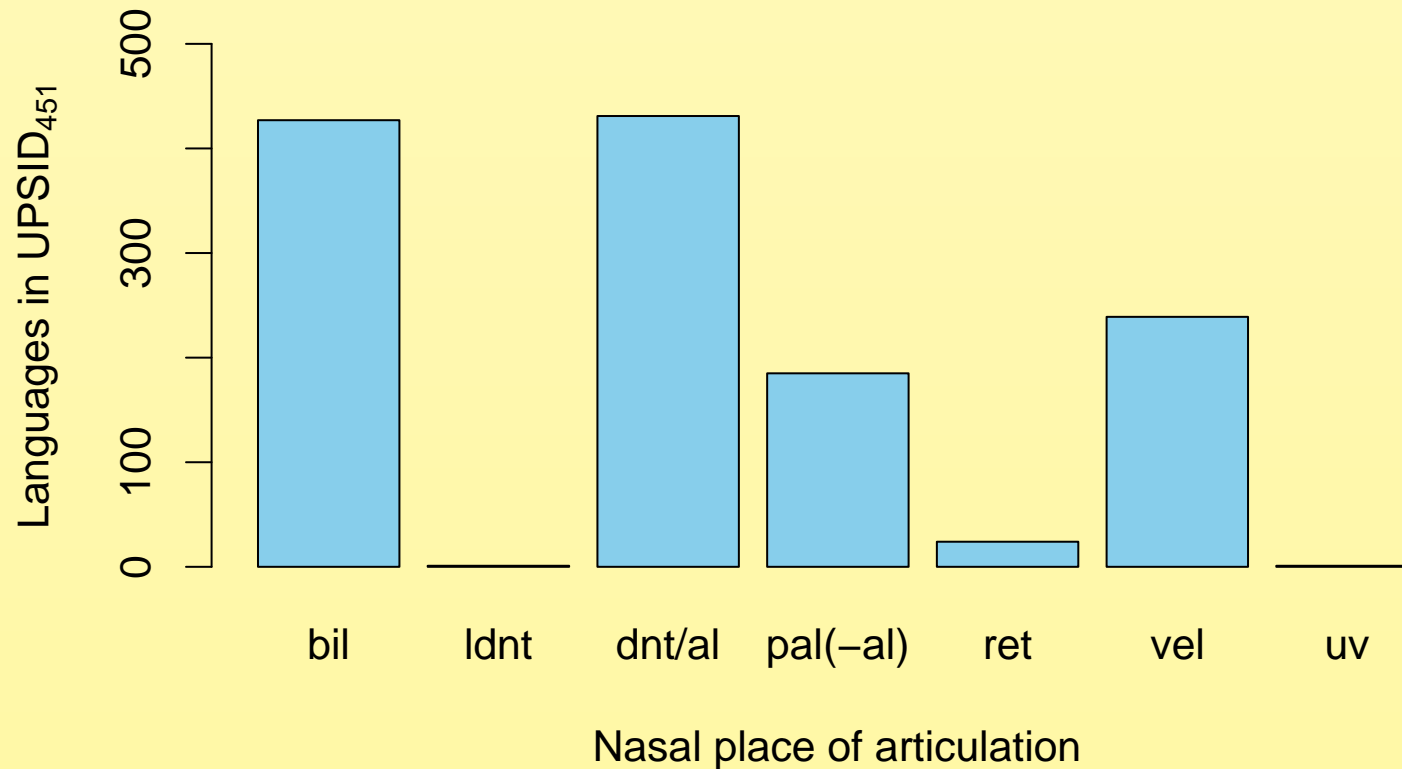
# UPSID<sub>317</sub> plosive inventories



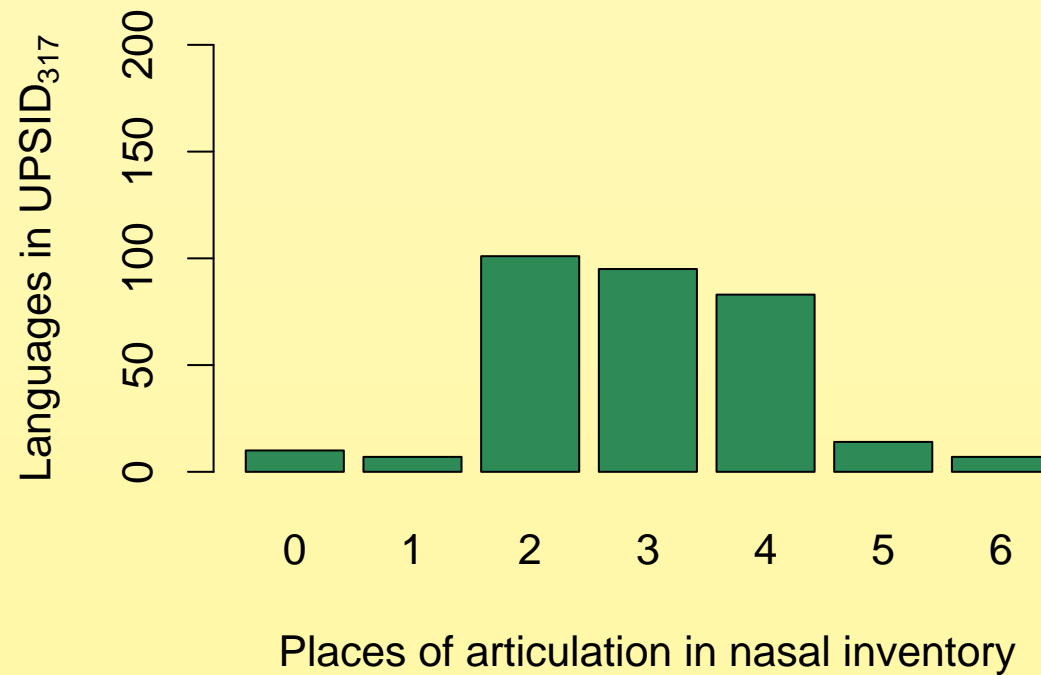
# UPSID<sub>317</sub> plosive/affricate inventories



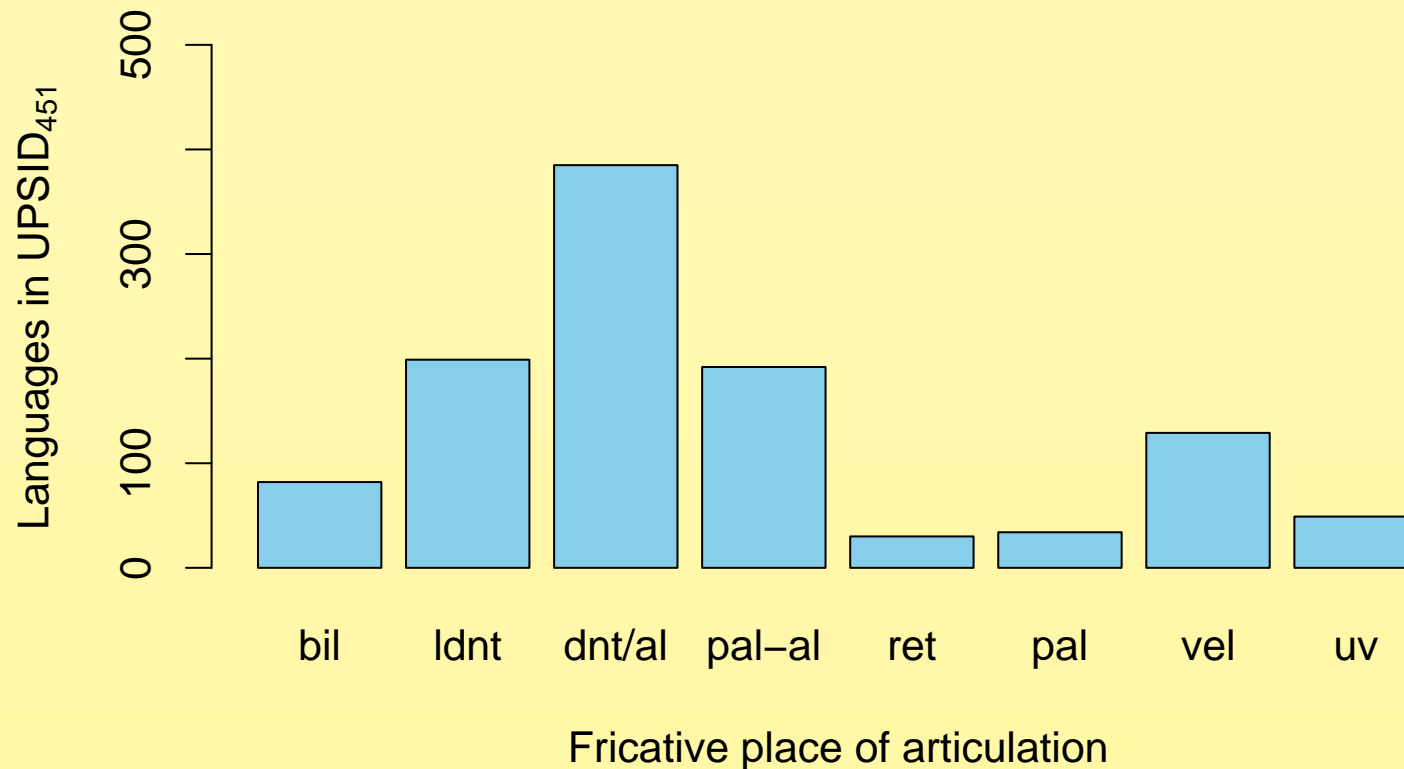
# UPSID<sub>451</sub> nasal frequencies



# UPSID<sub>317</sub> nasal inventories



# UPSID<sub>451</sub> fricative frequencies



# Place of articulation: generalisations

- The majority of oral stop inventories contrast:
  - ◆ Plain bilabial plosives (such as [p, p<sup>h</sup>, b])
  - ◆ Plain alveolar/dental plosives (such as [t, t<sup>h</sup>, d, t̪, t̪<sup>h</sup>, d̪])
  - ◆ Plain **palatal** plosives (such as [c, c<sup>h</sup>, ɟ]) **or** alveo-palatal/palatal affricates (such as [tʃ, tʃ<sup>h</sup>, dʒ, tʃtʃ, tʃtʃ<sup>h</sup>, ɟɟ])
  - ◆ Plain velar plosives (such as [k, k<sup>h</sup>, g])

# Place of articulation: generalisations

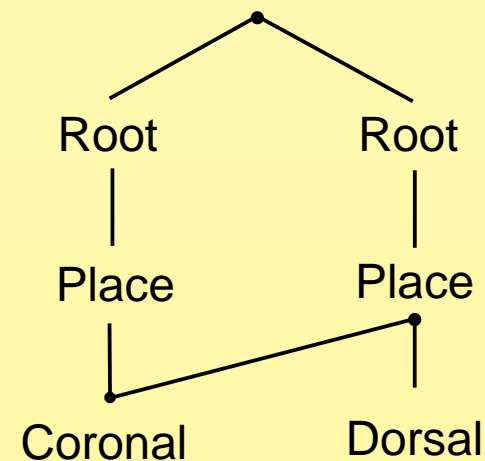
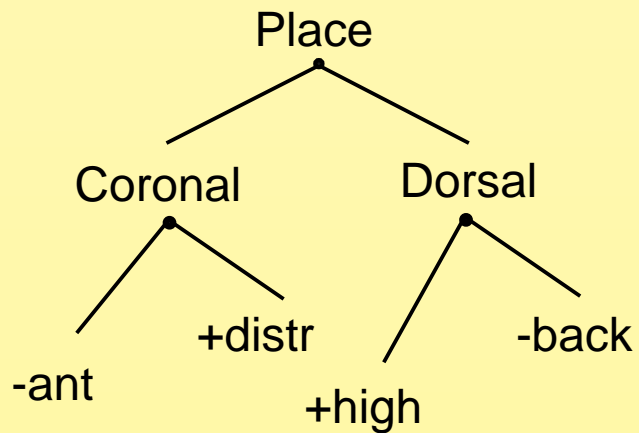
- Nasal inventories do not display the same preference for 4-way place systems
- ... in part as a result of the more restricted distribution of (alveo-)palatals and velars
- Fricative inventories exhibit a strong preference for a single dental or alveolar (sibilant), and weaker preferences for additional labiodentals, (sibilant) palato-alveolars, and velars

# Place of articulation: implications

- Most feature geometrical models treat (alveo-)palatals as considerably more complex than bilabials, front coronals, and velars (cf. [Lahiri & Evers 1991](#))
- This is especially true of alveo-palatal affricates (cf. [Clements & Hume 1995](#))
- Most (all?) feature geometrical models lack devices to capture manner-based place asymmetries in inventories

# Place of articulation: implications

- Partial representations of plain palatals and alveo-palatal affricates:



# Conclusions

- Generative feature theories are generally constructed on the basis of (synchronic) phonological processes
- It seems that these theories are less well-suited to capturing (some) generalisations about inventories
- Deeper and further-reaching problem (perhaps): speech is inherently **multimodal** (articulation, audition, visual perception) and therefore not amenable to the monomodal explanations offered by most phonological theories
- Need to look elsewhere for accounts of inventories

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