

PLIN0068 Constructed Languages

2024-25

Lecture 2: Phonology

Phonology

- Traditionally **phonology** is about linguistic sounds
- Now phonology includes the phonology of sign languages
- More generally phonology is about the smallest units of *linguistic form*
 - Morse code (a relex): dots and dashes
 - iPad gesture language: tap, hold, swipe, pinch open, pinch close, etc.

Phonology of the pedestrian traffic light

We can see the pedestrian traffic light as a (finite) language

Red = Stop! **Green** = Go! **Flashing green** = will be Red soon

Design considerations

- Why these colours? (not, e.g., Green vs. Blue)
- Why not the other semantic mapping?
- Why is Red above Green?
- Why vertical arrangement?
- Why flashing Green, rather than flashing Red?



Dialectal phonology of the pedestrian traffic light



Building blocks of spoken languages

- Phonemes/segments
 - Vowels
 - Consonants
- Suprasegmental/prosodic structure
 - Syllables and feet (for accents/tones)
 - Larger intonational units

To keep our projects manageable, we won't discuss much about suprasegmental phonology, beyond some elementary aspects of syllable structure and accent.

Consonants

Basic properties of consonants

- **Manner of articulation** (stop, fricative, affricate, approximant, etc.)
- **Place of articulation** (bilabial, labio-dentail, alveolar, palatal, velar, uvular, etc.)
- Laryngeal features (voicing, aspiration)

Other features

- Length (gemination)
- Labialisation
- Velarisation
- Prenasalisation
- Ejectives
- Implosives
- Retroflexion

Consonantal inventories

- English has (about) 24 consonants (cf. [Wikipedia](#))
- Some languages have fewer than 10 consonants
 - Rotokas: /p, t, k, β, r, g/
 - Hawaiian: /p, k, ʔ, l, m, n, h, w/
- Some languages have more than 80 consonants, e.g., !Xu has 95, Archi has 81.
- Most languages have at least one fricative, nasal, and approximant
- Some languages have no nasals (e.g., Rotokas)

Consonantal universals

- Every language has stops
 - Most languages have **voiceless** stops
 - (Voiceless)Stop + Vowel sequences maximise contrast between adjacent segments
- Every language contrasts phonemes for place of articulation
 - Languages may lack some of /p t k b d g/, especially /p/ and/or /g/
- Every language has coronal phonemes (may lack labial or velar phonemes)
 - Coronals are loud

Consonantal contrasts

- In some languages, voicing contrast among stops is enhanced by aspiration of the voiceless series (e.g. English), or pre-nasalisation of the voiced series (e.g., Fijian)
- More contrasts in coronals, e.g. English fricatives /θ ð s z ʃ ʒ/

Clicks

Bilabial	Dental	Alveolar	Palato-alveolar	Lateral
ⱱ	ǀ	ǃ	ǂ	ǁ

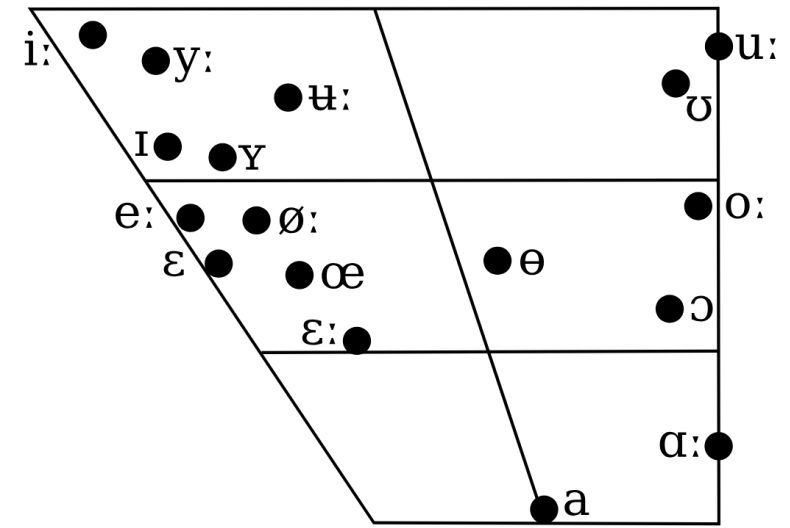
The inventory of clicks can multiply with different way of releasing

- [g] throughout
- [ŋ] throughout
- release into [x]
- release into [q]

Vowels

Vowels

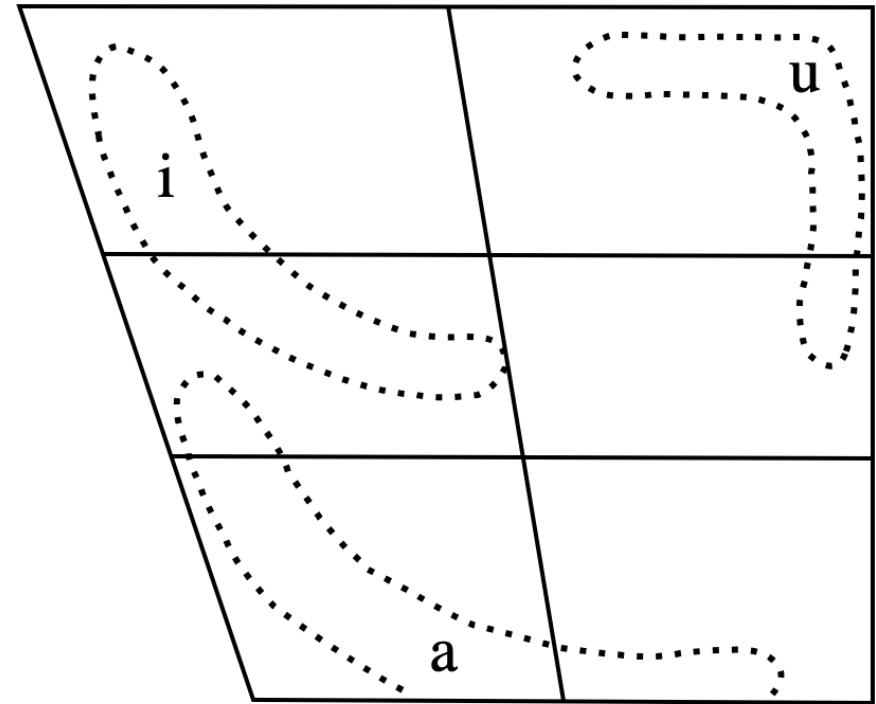
- English has about 15–20 vowels, depending on the dialect; Swedish has 17
- Some languages only have 3 vowels, e.g., Haida: /i, a, ʊ/; Pirahã: /i, a, o/.
- Some languages contrast vowel length, in addition to quality (cf. diphthongisation)



Swedish (Engstrand 1999: p. 140)

Phonetics vs. phonology

- Languages with a small vocalic inventory tend to have many **allophones**, e.g., West Greenlandic



(Fortescue 1990: p. 140)

Vocalic contrast

- The simplest vocalic system is **triangular**, with /i a u/ or their variants
- Larger inventories are often built with additional vowels, e.g. /i a u e o/
- Flemming (1995, 2004): /i a u/ maximises **contrast**
 - As far as articulation is concerned, /y a ʊ/ is a equally sensible system
 - Rounding lowers F2, making a back vowel sound more back, so /i u/ are farther apart than /y ʊ/
- More contrast among front vowels

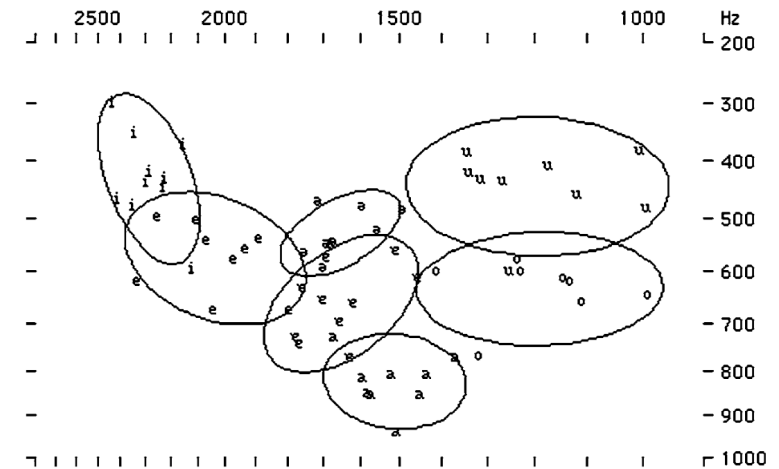
F2						
6	5	4	3	2	1	
i	ɪ	y	ɨ	ʉ	u	1
	ɪ	ʏ			ʊ	2
	e	ø		ɤ	ɔ	3
	e	ø	ə	ɤ	o	4
		ɛ	ɜ	ʌ	ɔ	5
		æ	ɐ		ɑ	6
			a	ʌ		7

(Flemming 2004)

Vertical systems

- **Vertical systems** make no front-back contrast, e.g. Kabardian (/ə e a/)
- But they still have other vowels as **allophones** conditioned by surrounding segments, e.g. velarised consonants:

/ts'ək ^w /	[ts'uk ^w]	'small'
/g ^w ədʒ/	[gudʒ]	'wheat'
/dəɣ ^w /	[dɔɣ ^w]	'thief'
/q ^w ə/	[q ^w ɔ]	'pig'



(Gordon & Applebaum 2006: p. 182)

Kabardian consonantal inventory

The consonants in Kabardian encode part of vocalic contrast

	Labial	Denti-alveolar	Palato-alveolar	Palatal	Palatalized velar	Velar	Uvular	Pharyngeal	Laryngeal
Stops	p ^h p' b	t ^h t' d			k ^j ' g ^j	k ^{wh} k ^w '	q ^h q' q ^{wh} q ^w '		? ? ^w
Affricates		ts ts' dz							
Fricatives	f f' v[w]	s z	ʃ ʃ' ʒ	ç ʝ		x ^w ɣ ^w [g ^w]	χ ʁ χ ^w ʁ ^w	ħ	h
Nasals	m	n							
Laterals		ɬ ɬ' l							
Tap		ɾ							
Glides				j					

(Gordon & Applebaum 2006: p. 161)

Secondary characteristics

- Vowel length (short, long, over-long)
- Diphthongisation
- Nasalisation

These are sometimes used to enhance contrasts (e.g., English diphthongisation)

Secondary inventory

Some languages allow a subset of vowels in unstressed syllables (e.g. English, Russian)

Vocalic universals

- Every language has a height contrast, i.e., no language has a purely horizontal system, e.g. /i, ɪ, u/, /e, ə, o/, /e, ø, o/ etc.
- Languages may lack front vowels (e.g., Qawasqar: /ə, o, a/) and/or rounded vowels (Alawa: /ɪ, ʊ, e, a/)
- But every language has at least one front vowel or /j/
- Every language has at least one unrounded vowel
- Every language has at least one back vowel

Syllable structure

Syllable structure

- All(?) languages have CV syllables (potential exception, Arrernte)
- Some languages only have open syllables
- English permits syllables of up to CCCVCCC (e.g., *strengths* /strenθs/)
- Hawaiian only has (C)V(V) syllables (5 vowels and 8 consonants), e.g.:
 - Kapalakiko 'San Francisco'
 - kepakemapa 'September'
 - Kalikimaka 'Christmas'

Syllable structure

- **Nucleus**: The most sonorous element
- **Onset**: Consonant(s) before the nucleus
- **Coda**: Consonant(s) after the nucleus

The nucleus is typically a vowel, but need not be in some languages

- *possible* in English (vs. French)
- *trh* 'market' in Czech
- Tashlhiyt Berber allows fricatives to be nuclei, e.g. *k.kst.tš.št:^h* 'remove it an deat it' (Dell & Elmedlaoui 2002: p. 74)

Sonority scale

What can be a nucleus?

	Vowels	Liquids	Nasals	Obstruents
Kabardian, Hawaiian, Japanese	✓			
Slovak	✓	✓		
English	✓	✓	✓	
Tashlhiyt Berber	✓	✓	✓	✓

Sonority Hierarchy Vowel > Approximant > Nasal > Fricative > Stop

Sonority Sequencing Principle

Sonority Sequencing Principle: Every syllable has one sonority peak

E.g., consonant clusters in English

- *great* /ɡreɪt/ vs. *rgate* /ɹgeɪt/, *clean* /kliːn/ vs. *lcean* /lkiːn/
- *bank* /bæŋk/ vs. *bakn* /bækŋ/, *bulk* /bʌlk/ vs. *bulk* /bʌkl/
- /s/ is somehow special, *stout*, *talks*

Complexity

Syllable structure has an effect on how many consonants you have (Maddieson 2005)

- Syllable complexity correlates with the number of consonants
- Syllable complexity does not correlate with the number of vowels
- The number of vowels does not correlate with the number of consonants

Stress

- Languages like English use **stress accent**
- A word has one syllable that is more prominent in terms of pitch, duration, intensity, etc. than the rest = **primary stress**
- In quantity insensitive (fixed stress) languages, primary stress is oriented to the word edge: Initial (e.g., Hungarian, Czech), Peninitial, Antepenultimate (e.g., Macedonian), Penultimate (e.g., Polish, Fijian), Final (e.g. Armenian)
- In quantity sensitive languages (e.g., English, Latin), heavy syllables (CVC, CVV, etc.) tend to attract primary stress
- CVC counts as heavy in Latin but not in Yidiny

Secondary stress

- Some syllables may carry **secondary stress**, e.g. *Màssachúsetts*
- Stressed and unstressed syllables usually alternate
- A pair of stressed + unstressed syllables is called a **foot**
 - Iambic: $[\sigma\acute{\sigma}][\sigma\acute{\sigma}][\sigma\acute{\sigma}]$
 - Trochaic: $[\acute{\sigma}\sigma][\acute{\sigma}\sigma][\acute{\sigma}\sigma]$

For your language

If it's a spoken language:

- Consonants
- Vowels
- Permissible syllable structures
- Stress pattern (if it's a stress language)

Klingon phonology

Klingon

- Klingon (a.k.a. tlhIngan Hol, /ˈtɬɪŋɑn xol/) was constructed by Mark Okrand, as the language of a fictional alien race, the Klingons, in *Star Trek*
- Okrand has a Ph.D. in linguistics

More information: https://en.wikipedia.org/wiki/Klingon_language#Phonology

Okrent (2009: Ch. 24) remarks:

The phonological system of [Klingon] is by design harsh, guttural, and alien, like Klingons, but it also makes a certain kind of linguistic sense. The language doesn't include barks, growls, or other sounds not used in human languages. And the sounds it does use are not even that exotic as far as real languages go: no clicks, trills, ingressives, or voiceless vowels.

"The goal was for the language to be as unlike human language as possible while at the same time still pronounceable by actors," I was told by Marc Okrand, the inventor of the Klingon language. "The alien character of Klingon doesn't stem so much from the sounds it uses as from the way that it violates the rules of commonly co-occurring sounds. There's nothing extraordinary about the sounds from a linguistic standpoint. You just wouldn't expect to find them all in the same language."

Consonants and vowels

plosive	voiceless	p ^h	t ^h			q ^h	ʔ
	voiced	b	d				
affricate	voiceless			tʃ	tʃ	qʃ	
	voiced				dʒ		
fricative	voiceless		ʃ			x	
	voiced	v				ɣ	
nasal		m	n			ŋ	
approximant		w	r	l	j		

high	ɪ	u
mid	ɛ	o
low		ɑ

Syllable structure: CV(C)(C)

- A syllable must have an onset consonant
- A syllable must have one and only one vowel
- A syllable often has a coda consonant or two

Example words:

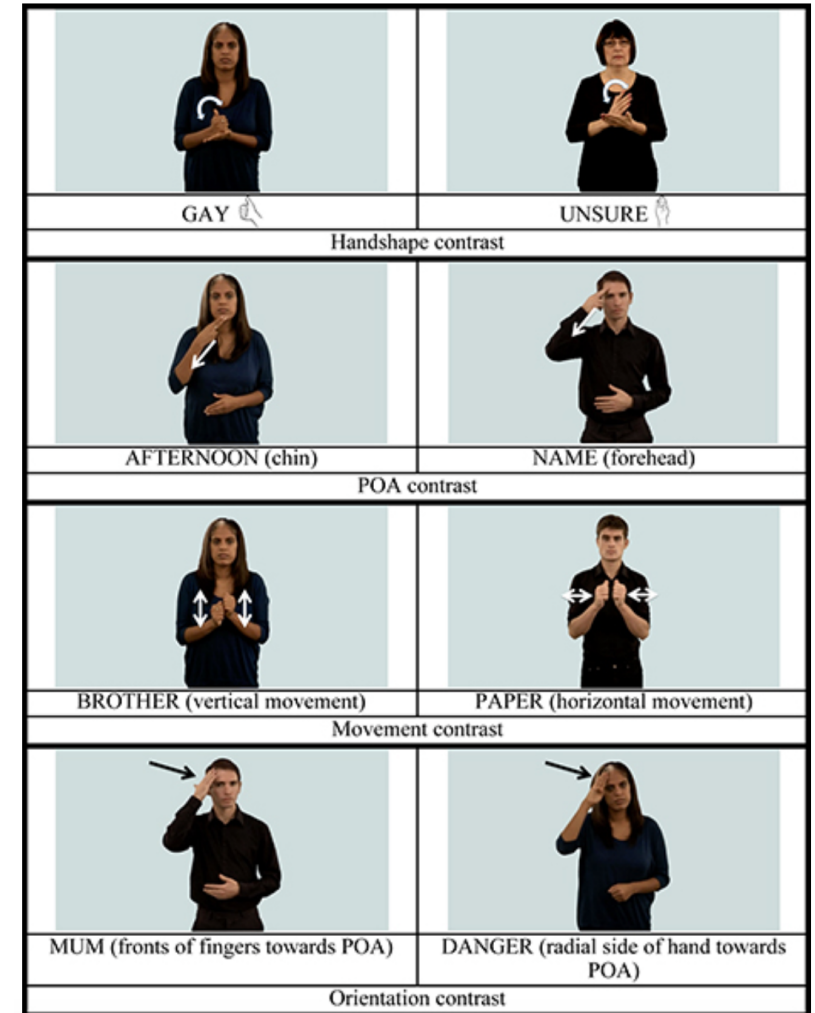
- /t^hɑ/ 'record'
- /t^hɑr/ 'poison'
- /t^hɑrɣ/ 'targ (a type of animal)'

Stress is largely predictable (see [Wikipedia](#))

Sign language phonology

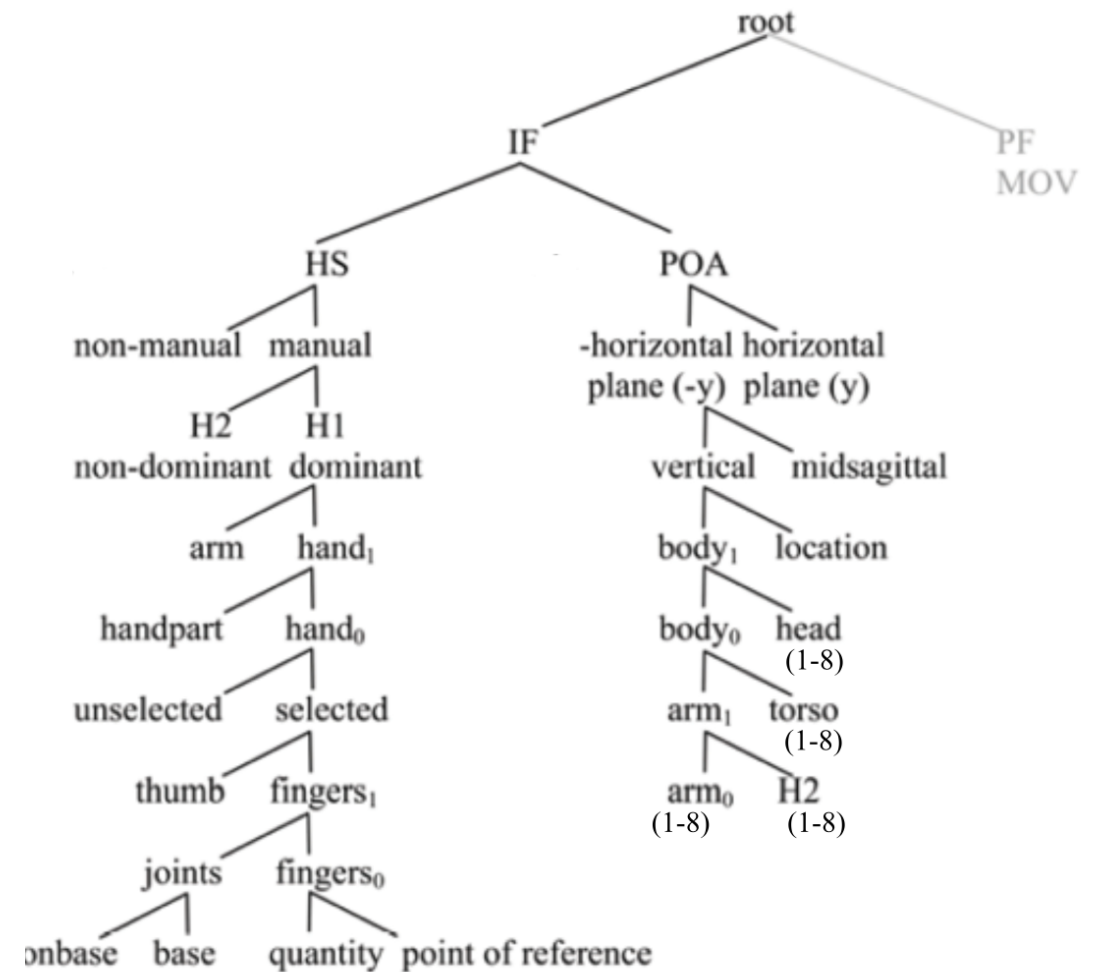
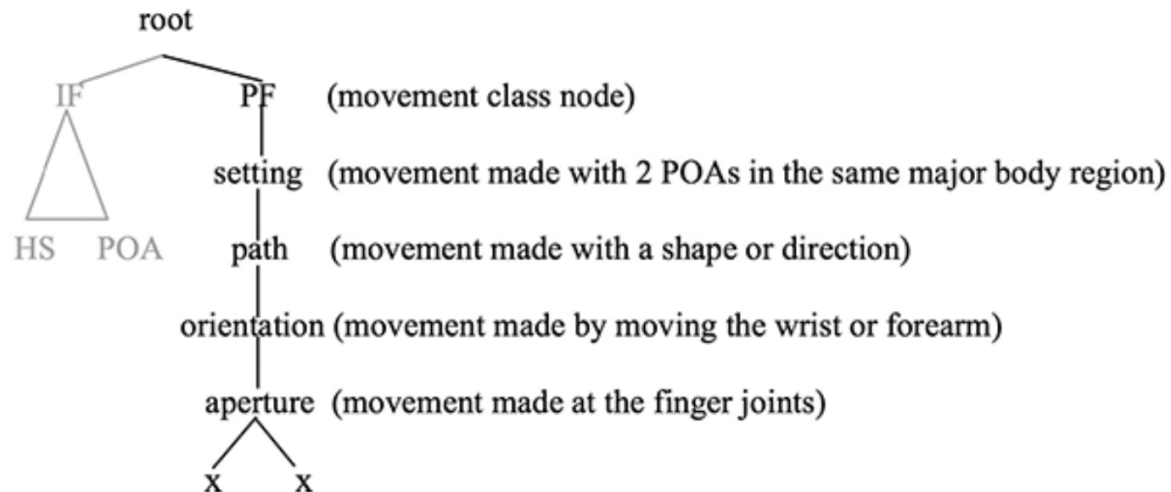
Building blocks of sign languages

- Sign language phonology is much less studied
- Signs contrast in:
 - Handshape
 - Place of articulation (e.g., chin vs. forehead)
 - Movement (e.g., vertical vs. horizontal)
 - Orientation (of the hand(s))



Prosodic Model

- Inherent Features (1 per root)
 - Handshape (HS)
 - Place of articulation (POA)
- Prosodic Features (≥ 1 per root)



(Brentari & Cormier 2018)

Homework

- Phoneme inventory
- Syllable structure (how to put phomenes together)
- Accent/stress