Ling 105
Sounds of Language

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Airstream mechanisms: overview

- Air pressure source
  - Pulmonic
  - Glottalic
  - Velaric
- Direction of flow
  - Egressive (via compression; exhalation if pulmonic)
  - Ingressive (via rarefaction; inhalation if pulmonic)

Pulmonic

- Pulmonic egressive
- Pulmonic ingressives sometimes paralinguistic
- !Xóõ [ŋ̊!ʰ] uses pulmonic ingression

  > "This !Xóõ click is probably unique among the sounds of the world's languages in that, even in the middle of a sentence, it may have ingressive pulmonic airflow" (Ladefoged & Maddieson 1996: 268)

Airstream mechanisms

- Don't confuse phonation (type of voicing) with airstream mechanism (pressure source & flow direction)
    - Pulmonic (normally egressive) = most sounds
    - Glottalic egressive = ejective
    - Glottalic ingressive = implosive
    - Velaric (normally ingressive) = click

CONSONANTS (NON-PULMONIC)

Clicks		Voiced implosives		Ejectives	
ʘ	Bilabial	ɓ	Bilabial	ʼ	Examples:
ǀ	Dental	ɗ	Dental/alveolar	pʼ	Bilabial
ǃ	(Post)alveolar	ʄ	Palatal	tʼ	Dental/alveolar
ǂ	Palatoalveolar	ɠ	Velar	kʼ	Velar
ǁ	Alveolar lateral	ʛ	Uvular	sʼ	Alveolar fricative

Glottalic egressive (ejective)

- **Ejectives**: air pressurized & pushed outwards by pumping sealed larynx upward
- One strategy: make *k* while holding breath
- Lakhota
  - [kah] "that" ♪ (Praat)
  - [k'u] "to give" ♪
  - [t̪uwa] "who" ♪
  - [t̪'uʃɛ] "at all costs" ♪

Ejectives

- Found especially in
  - Western North America
  - Sub-Saharan Africa, esp. Nigeria
  - Caucasus
- Rare in Europe, but not rare in general (about 1 in 5 languages)

Ejective fricatives

- Ejectives are usually plosives, but affricates & fricatives also possible
- Hausa
  - [kaːràː] "put near" ♪
  - [k'aːràː] "increase" ♪
  - [saràː] "cut" ♪
  - [s'aràː] "arrange" ♪
- Lateral affricates in Navajo
  - [tɬʰah] "ointment" ♪
  - [niʃtɬ'aː] "left" ♪

Ejectives: trends

- Tube is typically sealed on both ends (harder to raise pressure if there are leaks)
    - Voiceless (glottal stop)
    - Obstruent (usually plosive)
- Usually high VOT (not due to aspiration)
- Further back place = more frequent (harder to raise pressure in bigger cavity)

Glottalic ingressive (implosive)

- **Implosives**: air sucked in by pulling down larynx, expanding pharyngeal cavity
- Rarefaction (opposite of ejectives)
- Usually voiced, and a way to exaggerate the percept of voicing
    - An expanding cavity favors voicing (implosives)
    - A contracting cavity disfavors voicing (ejectives)
- Strategies: fully voice; can prenasalize slightly; can sound gulpy/w-y
- Sindhi
    - [bənʊ] "forest" ♪
    - [ɓəni] "field" ♪

Sindhi (Khubchandani 1969)

- B'ani dialect: /ɓ, ɗ, ʄ, ɠ/
- Maṇḍvi dialect: /ɓ, ɗ/
- Vagdi dialect: /ɓ/
- Sanskrit *gardabha* > Prakrit *gaddaha* > Sindhi *gaɗahu* 'donkey'
- Sanskrit *grantha* > Prakrit *(g)gaṃthi* > Sindhi *ɠaɳdʱi* 'knot/book'
- How does implosion assist voiced geminates?

Implosives: trends

- Normally voiced (reverse ejectives, e.g. $\udtilde{g}$ = former ƙ, are possible but rare: *glug-glug* for some)
- Highly negative VOT
- Implosion enhances voicing
- Only stops (no fricatives this time; rare/no affricates)
- Front = easier and more frequent (opposite of ejectives); voicing is always easier with a bigger cavity
- Implicational universals:
    - ɠ ⇒ ɓ
    - p' ⇒ k'
    - g ⇒ b

Ejectives vs. implosives

- Aside from mechanism, know asymmetries in:
  - Voicing
  - Manner
  - Place

Pulmonic + glottalic

- For ejectives (and voiceless implosives), pulmonic airflow plays no role
- Implosives usually combine glottalic ingressive with pulmonic egressive (sometimes for a net pressure change of zero)

Implosives in Owerri Igbo

- [ípa] "to carry" ♪
- [íba] "to get rich" ♪
- [íɓ̥a] "to gather" ♪ (voiceless implosive a.k.a. reverse ejective; uncommon)
- [íɓa] "to dance" ♪

Airstream mechanisms: summary

- Pulmonic
  - Egressive
  - Ingressive
- Glottalic
  - Egressive (ejectives: p', t', k', etc.; never voiced)
  - Ingressive* (implosives: ɓ, ɗ, ɠ, etc.; rarely voiceless)
    *usually accompanied by pulmonic egression
- Velaric
  - Egressive
  - Ingressive (clicks)