AMP 2020

Sibilant Retraction

Edward Flemming (flemming@mit.edu)
Massachusetts Institute of Technology

The phenomenon

- When [s-ʃ] or [s-ʂ] contrasts are neutralized, the result can be either [s] or [ʃ/ʂ]
- Example: German and English both neutralize /s-ʃ/ word-initially before consonants
  - ➢ English: [s] only **s**pik *ʃpik 'speak'
  - ➢ German: [ʃ] only **ʃ**pʁɛçən ***s**pʁɛçən 'speak'
- German exemplifies sibilant retraction: s → ʃ (or ʂ)
- Sibilant retraction is surprising because [s] is usually regarded as being less marked than [ʃ] and [ʂ]
  - – If a language has just one sibilant, it is almost always [s]
- But sibilant retraction is attested in a number of languages

Patterns of sibilant retraction

- The outcome of sibilant neutralization in three contexts

language	#_C	V_C	V_#
English	s	s	s-ʃ
Standard German	ʃ	s	s-ʃ
Swabian German	ʃ	ʃ	s-ʃ
NE Brazilian Portuguese	-	ʃ	s
Acoma	ʂ	ʂ	-
Cariocan, Euro. Portuguese	-	ʃ	ʃ

Standard, Swabian German: Hall & Scott (2007), NE Brazilian, Cariocan Portuguese: Reinhardt (1970), European Portuguese: Mateus & d'Andrade (2000), Acoma: Miller (1965)

- – 's-ʃ' indicates that contrast is maintained in that context
- – Portuguese lacks initial /SC/ clusters
- – Acoma does not allow word-final consonants

Notes:

- English neutralizes to [ʃ] before [ɹ], e.g. [ʃɹaɪn] 'shrine', due to assimilation.
- German neutralizes s-ʃ /V_C within morphemes
  - Standard [pɔst] 'mail' *[pɔʃt] Swabian [pɔʃt] 'mail' *[pɔst]
  - – but the ill-formed clusters can be derived through suffixation
  - Standard [vɛʃ-t] 'wash (3sg.)' Swabian [pas-t] 'fit (3sg.)'
- Both varieties of German have [sk] clusters in loanwords, e.g. [skelɛt] 'skeleton'
- The status of retraction in C_# is unclear. Only German permits CS# clusters, and the distribution of [s] and [ʃ] is complicated, involving several marginal contrasts.

Acoma

- Acoma contrasts [s, ʃ, ʂ] before vowels, with neutralization before stops.
  - – Neutralization always involves sibilant retraction:
    - ➢ to [ʃ] before non-retroflex coronals and front vowels
      ʃt'i²itʃi 'it is straight' su**ʃ**t'á 'I took water' wʔi²i**ʃ**p'i 'cigarette'
    - ➢ [ʂ] elsewhere (Miller 1965).
      ʂpúuná 'pottery' **ʂ**k^{h}úujʔu 'giant' ʔé**ʂ**ká 'rawhide'
  - – Retraction preferentially yields [ʂ], with [ʃ] resulting from assimilation (cf. Goad 2012)

Observations and analyses

- Neutralization of [s-ʃ/ʂ] contrasts can yield [s] or [ʃ/ʂ]
  - ➢ Outcome depends on the ranking of conflicting constraints favoring [s] vs. [ʃ, ʂ]
  - – Articulatory effort favors [s]: s ≻ ʃ ≻ ʂ
  - – Maximizing sibilant intensity favors ʂ ≻ ʃ ≻ s
- There is an implicational hierarchy between environments of retraction:
  - – V_# > V_C > #_C.
  - – Neutralization can be to [s] and [ʃ] in different contexts in the same language (e.g. Standard German, NE Brazilian Portuguese)
  - ➢ Maximizing sibilant intensity (retraction) is more important in contexts where other cues to the presence of a sibilant are more limited
    - ▪ Hierarchy of context-specific constraints favoring retraction
- Acoma suggests that the constraint favoring retraction is gradient: ʂ ≻ ʃ ≻ s
  - ➢ Sibilant intensity is gradient: ʂ > ʃ > s

Constraints

Articulatory effort

- ➢ *ʂ >> *ʃ >> *s (cf. Padgett & Zygis 2007, Flemming 2018)

Maximize Sibilant Intensity

- Maximizing intensity of sibilants serves to increase the distinctiveness of contrasts based on presence vs. absence (e.g. [spaɪ] vs. [paɪ], [moʊst] vs. [moʊt])
- More retracted sibilants generally have higher intensity (Shadle 1985:43, 150)
  - – Anterior sibilants have smaller front cavities and thus higher frequency resonances.
  - – Higher frequency resonances are more damped because radiation losses are greater at higher frequencies, resulting in lower overall intensity.
  - – Observed in English (Shadle 1985, Jongman et al 2000, Parker 2002), Mandarin Chinese (Svantesson 1986), Komi Permyak (Kochetov & Lobanova 2007).
- High intensity is more important in contexts where other cues to the presence of the sibilant are more limited.
  - – Adjacent to a vowel there are transitional cues
  - – singleton S-Ø contrasts are more distinct than SC-C contrasts because singleton S tends to be longer (e.g. Katz 2010:64, Fuchs & Koenig 2009), and because its deletion eliminates the entire consonantal interval.
  - ➢ MAXSIBINT/C: Assign one violation to [ʃ] and two violations to [s] in C
  - ➢ MAXSIBINT/#_C >> MAXSIBINT/V_C >> MAXSIBINT/V_#

Correspondence constraints

- IDENT[anterior] constraints derive the environments of neutralization
  - ➢ IDENT[ant]/_V >> IDENT[ant]/V_# >> IDENT[ant]/_C

Deriving the patterns

- Contrast is neutralized in context C if either *ʃ or the relevant MAXSIBINT (MSI) constraint ranks above IDENT[ant]/C.
- Whether neutralization yields [s], [ʃ] or [ʂ] depends on the ranking of *ʂ and *ʃ with respect to the MSI hierarchy
- Example: Standard German
  - ➢ Neutralization to [ʃ] in word-initial /SC/ clusters

	/spa/	*ʂ	ID[ant]/_#	MSI /#_C	*ʃ	MSI /V_C	MSI /V_#	ID[ant]/_C
a.	spa			**!				
b.	☞ ʃpa			*	*			*
c.	ʂpa	*!						

  - ➢ Neutralization to [s] in post-vocalic /SC/ clusters

	/aʃt/	*ʂ	ID[ant]/_#	MSI /#_C	*ʃ	MSI /V_C	MSI /V_#	ID[ant]/_C
a.	☞ ast					**		
b.	aʃt				*!	*		*
c.	aʂt	*!						

Implicational hierarchy of retraction environments

- Neutralization results in retraction to [ʃ]/[ʂ] in context C if MSI/C outranks *ʃ
  - – so ranking *ʃ at different points in the MSI hierarchy yields the attested implications between retraction environments

ranking	#_C	V_C	V_#
*ʃ >>MSI/#_C >> MSI/V_C >> MSI/V_#	s	s	s
MSI/#_C >> *ʃ >> MSI/V_C >> MSI/V_#	ʃ/ʂ	s	s
MSI/#_C >> MSI/V_C >> *ʃ >> MSI/V_#	ʃ/ʂ	ʃ/ʂ	s
MSI/#_C >> MSI/V_C >> MSI/V_# >> *ʃ	ʃ/ʂ	ʃ/ʂ	ʃ/ʂ

  - – If MSI/C also outranks *ʂ then there is full retraction to ʂ
  - – Predicts the possibility of, e.g., retraction to ʂ/#_C, ʂ/V_C, ʃ/V_#

Retraction is gradient - Acoma

- Gradient formulation of MSI constraints is required to derive the Acoma pattern – 'retract as much as possible'
  - – Retraction to [ʂ] is preferred where possible – before [p, k]

	/ʔeska/	ID[ant]/_V	AGREE[retro]	MSI /#_C	MSI /V_C	ID[ant]/_C	*ʂ
a.	ʔeska				*!*		
b.	ʔeʃka				*!	*	
c.	☞ ʔeʂka					*	*

  - – Partial retraction still applies where AGREE[retroflex] blocks full retraction to [ʂ] – before [t, tʃ]

	/sust'a/	ID[ant]/_V	AGREE[retro]	MSI /#_C	MSI /V_C	ID[ant]/_C	*ʂ
a.	sust'a				**!		
b.	☞ suʃt'a				*	*	
c.	suʂt'a		*!			*	*

- Evidence for finer gradience: English shows slight retraction of [s] word-initially before stops (Baker et al 2011, Stevens & Harrington 2016)

- The phenomenon of sibilant retraction confirms that markedness is multi-dimensional: a segment can be marked in one respect and unmarked in another
  - ➢ Articulatory effort: s ≻ ʃ ≻ ʂ
  - ➢ Distinctness from Ø: ʂ ≻ ʃ ≻ s

Baker, A., Archangeli, D., & Mielke, J. (2011) Variability in American English s-retraction suggests a solution to the actuation problem. *Language Variation and Change* 23, 347–374.
Flemming, E. (2018) Systemic markedness in sibilant inventories. Poster presented at AMP 2018, UCSD.
Fuchs, S., & Koening, L.L. (2009) Simultaneous measures of electropalatography and intraoral pressure in selected voiceless lingual consonants and consonant sequences in German. *JASA* 126, 1988-2001.
Goad, H. (2012) sC clusters are (almost always) coda-initial. *Linguistic Review* 29, 335-373.
Hall, T.A., & Scott, J.H. (2007) Inflectional paradigms have a base: evidence from s-Dissimilation in Southern German dialects. *Morphology* 17, 151-17
Jongman, A., Wayland, R., Wong, S. (2000) Acoustic characteristics of English fricatives. *JASA* 108, 1252-63.
Katz, Jonah (2010). *Compression effects, perceptual asymmetries, and the grammar of timing*. PhD dissertation, MIT.
Kochetov, A., & Lobanova, A. (2007) Komi-Permyak coronal obstruents: acoustic contrasts and positional variation. *JIPA* 37, 51-82.
Mateus, M.H., & d'Andrade, E. (2000) *The Phonology of Portuguese*. OUP.
Miller, W. (1965) *Acoma grammar and texts*. UC Press.
Padgett, J., Zygis, M. (2007) The evolution of sibilants in Polish and Russian. *Journal of Slavic Linguistics* 15, 291-324.
Parker, S. (2002) *Quantifying the Sonority Hierarchy*. Ph.D. dissertation, U.Mass, Amherst.
Reinhardt, K.J. (1970) Intrusive [i] before /S/ in Brazilian Portuguese. *Word* 26, 101-106
Shadle , C. (1985) *The Acoustics of Fricative Consonants*. Ph.D. dissertation, MIT.
Svantesson, J.-O. (1986) Acoustic analysis of Chinese fricatives and affricates. *Journal of Chinese Linguistics* 14, 53–70.