

A diachronic account of phonological unnaturalness

1. Outline

- In many Norwegian dialects, / t d n s / become retroflexes after ‘r’-sounds.
- For some of these ‘r’-sounds, retroflexion is not phonetically motivated.
- Historical mergers, innovations, and borrowings account for the current ‘unnatural’ rules.
- Norwegian retroflexion has increased in unnaturalness over time, yet remains productive.

2. Norwegian retroflexion

- In Standard Norwegian (= ‘Urban East Norwegian’), morpheme initial **laminal alveolars** / t̪ d̪ n̪ s̪ / become **apical postalveolars** (=‘retroflex’) [t̪̺ d̪̺ n̪̺ s̪̺] when directly preceded by the **apical alveolar** / r /, which itself deletes:

- (1)
- | | | | | |
|-----------------------|---|-----------------|---|--------------|
| / bɑ:r / ‘bare-ADJ’ | + | / -t̪ / ‘ADJ-N’ | → | [bɑ:t̪̺] |
| / t̪ɑ:r / ‘take-PRES’ | + | / -d̪ə / ‘it’ | → | [t̪ɑ:d̪̺ə] |
| / t̪ɑ:r / ‘take-PRES’ | + | / -n̪ / ‘he’ | → | [t̪ɑ:n̪̺] |
| / t̪ɑ:r / ‘take-PRES’ | + | / -s̪æ / ‘REFL’ | → | [t̪ɑ:s̪̺æ] |

- A puzzling aspect of this process is that two alveolars in the input give a postalveolar in the output (Endresen 1974):

/ **alveolar** / + / **alveolar** / → [**postalveolar**]

3. Retroflexion by diachronic merger

- In the eastern dialects of Old/Middle Norwegian, / r / and / l / acquired an **apical postalveolar** allophone / ɾ / (Seip 1955).
- / ɾ / later became an independent phoneme in these dialects, contrasting with / r / and / l /:

- (2)
- | | | |
|----------------------|------------------------------|------------------|
| / kʰɑ:r / ‘cure’ | / kʰɑ:l / ‘cool’ | / kʰɑ:ɾ / ‘bump’ |
| / stø:r / ‘sturgeon’ | / stø:l / ‘shieling’ | / stø:ɾ / ‘sore’ |
| / hɑ:r / ‘have-PRES’ | / hɑ:t̪ / ‘haul-IMP’ | / hɑ:ɾ / ‘hard’ |
| / bu:r / ‘live-PRES’ | / bu:l / ‘anabolic steroids’ | / bu:ɾ / ‘hive’ |

- In Standard Norwegian, the **apical postalveolar** / ʀ / creates postalveolars just like the **apical alveolar** / r / does (1):

(3)

/ gʷʀ:/ ‘yellow-ADJ’	+	/ -ʀ/ ‘ADJ-N’	→	[gʷʀ:/]
/ sʰtæ:ʀ/ ‘steal-IMP’	+	/ d̥iŋ/ ‘your’	→	[sʰtæ:d̥iŋ/]
/ sʰtæ:ʀ/ ‘steal-IMP’	+	/ -ŋ/ ‘it’	→	[sʰtæ:ŋ/]
/ sʰtø:ʀ/ ‘sore-ADJ’	+	/ s̥om/ ‘as’	→	[sʰtø:s̥om/]
/ postalveolar /	+	/ alveolar /	→	[postalveolar]

- In many dialects, however, / r / and / ʀ / trigger two distinct processes (Larsen 1894, Riksheim 1921, Mo 1922, Rypdal 1929, Skånland 1933, Olssen 1958, Stemshaug 1968, Holten 1974, Haugen 1982, Sandøy 1982, Jenstad 1985, Brekke 2000):

Apical alveolar	+	laminal alveolar	→	apical alveolar
/ r /		/ t̥ d̥ ŋ s̥ /		[t̥ d̥ ŋ s̥]
<hr/>				
Apical postalveolar	+	laminal alveolar	→	apical postalveolar
/ ʀ /		/ t̥ d̥ ŋ s̥ /		[t̥ d̥ ŋ s̥]

- In Standard Norwegian, all **apical alveolars** and **apical postalveolars** other than /r/–/ʀ/ merged into a single **postalveolar** category (Storm 1884, Hoff 1949).

✓ As a result of this merger, the **apical alveolar** / r / now creates **postalveolars** directly.

- Retroflexion in Standard Norwegian is a case of rule telescoping, where a diachronic process A > B > C is synchronically represented as A > C (Wang 1968):

History:	Starting point	/ rʀ /	Synchrony:	UR	/ rʀ /
	Assimilation	/ ʀ /			
	Alveolar/postalveolar merger	/ ʀ /		Retroflexion	/ ʀ /

- Several dialects in Norway never innovated the **apical postalveolar** / ʀ / at all (Western 1889, Skjekkeland 1997, Hødnebø 2005).
- Since the **apical postalveolars** [t̥ d̥ ŋ s̥] in Standard Norwegian originate from assimilations with / ʀ /, the dialects without / ʀ / would not have any historic source for **apical postalveolars** [t̥ d̥ ŋ s̥].
 - ✓ As a result, the **apical alveolar** / r / can only create **apical alveolars** [t̥ d̥ ŋ s̥] in these dialects (Brekke 1881, Storm 1884, Western 1889, Larsen 1907, Iversen 1917, Alnæs 1925, Christiansen 1933, 1976, Hødnebø 2005).

4. Retroflexion by synchronic markedness

- Under markedness theories, the phonological properties of a language are driven by phonetically motivated synchronic principles (Chomsky & Halle 1968).
- Endresen (1974) suggests that Standard Norwegian / r / creates **apical postalveolars** because these are less marked than **apical alveolars**.
- Yet, as seen above, there are many dialects where / r / creates **apical alveolars** rather than **apical postalveolars**.
- The challenge for markedness theories is to account for these differences in a way that goes beyond providing a formal description of the observable facts.

5. Unnatural retroflexion

- In some dialects of Norwegian, there is no / r / or / ʀ /, only a **dorsal uvular** / ʁ /.
- Many claim that retroflexion cannot exist in such dialects, since it would be “unnatural” and “phonetically implausible” for a **dorsal uvular** / ʁ / to trigger such a process (Torp 1983, Eliasson 1986, Sandøy 1993).
- Two / ʁ /-dialects are situated adjacent to retroflexing dialects; a sociolect in Oslo (Larsen 1907) and the dialect of Arendal (Voss 1940).
- Consultations with speakers of these dialects reveal that the **dorsal uvular** / ʁ / triggers retroflexion also there, and that it is productively applied to nonce formations:

(4)	<i>Oslo</i>	/ bɛmʁ / ‘nonce’	+	/ ɖɑ:g / ‘day’	→	[bɛmʁɖɑ:g]
		/ bɛmʁ / ‘nonce’	+	/ ʂɑ:k / ‘case’	→	[bɛmʁʂɑ:k]
	<i>Arendal</i>	/ ʂkɑ:ʁ / ‘nonce-ADJ’	+	/ -t / ‘ADJ-N’	→	[ʂkɑ:t]
		/ pʁ:ʁ / ‘nonce’	+	/ -ʂ / ‘POSS’	→	[pʁ:ʂ]

5.1 What is ‘unnatural’?

- By ‘phonologically unnatural’, it is typically meant what is unexpected from the experience and intuition of the linguist (Chomsky & Halle 1968).

- Somewhat more concretely, a phonological process is ‘unnatural’ when the changes applied to a target bear no articulatory or perceptual relation to the segment triggering the change.
- By this definition, / ɣ /-retroflexion is unnatural

$$\begin{array}{l}
 \text{t d n s} \rightarrow \text{t d ɳ s} \quad / \quad \text{ɣ} \quad \text{---} \\
 \left[\begin{array}{c} +\text{anterior} \\ +\text{distributed} \end{array} \right] \rightarrow \left[\begin{array}{c} -\text{anterior} \\ -\text{distributed} \end{array} \right] / \left[\begin{array}{c} +\text{consonantal} \\ +\text{continuant} \\ +\text{dorsal} \end{array} \right] \text{---} \\
 [\text{high F3}] \rightarrow [\text{low F3}] \quad / \quad [\text{high F3}] \quad \text{---}
 \end{array}$$

6. / ɣ /-retroflexion by diachrony

- / r /-retroflexion (to **apical alveolars** or **apical postalveolars**) in the Oslo region stretches back to Old/Middle Norwegian (Seip 1955).
 - ✓ In the Oslo sociolect, / ɣ / represents a fairly recent innovation for / r / (Larsen 1907).
 - ✓ Retroflexion has remained active in the language, despite having replaced the trigger / r / with a **dorsal uvular** / ɣ /.
- In Arendal, / r / was replaced by / ɣ / ca. 200 years ago (Torp 1997).
 - ✓ Originally, neither the / r /-dialects nor the / ɣ /-dialects in the region of Arendal had retroflexion (Voss 1940, Hødnebø 2005).
 - ✓ Retroflexion has gradually spread into this region (Kristoffersen 1980, Torp 1997, Hødnebø 2005), and is now being adopted by the / ɣ /-dialects.
 - ✓ / ɣ /-retroflexion in Arendal is a case of rule borrowing between dialects (Thomason 2006) mitigated by the consistent correspondence of / ɣ / and / r / across the dialects in this region.
 - ✓ Retroflexion is a property of the prestige dialect, Standard Norwegian, and its spread into Arendal’s / ɣ /-dialect indicates that phonological diffusion is not constrained by ‘naturalness’ (Hale 2007).

7. Unnatural processes in markedness theories

- The phonetically motivated principles of markedness theories are by definition not able to explain unnatural processes.
- Under these theories, unnatural processes are learned in a different manner than natural processes (Schane et al. 1974-75, Donegan & Stampe 1979, Hayes 1999), which should

be reflected in the greater ease with which natural processes are acquired (Schane et al. 1974-75, Wilson 2006, Hayes et al. 2009).

- Learning experiments comparing natural and unnatural processes, however, do not support the hypothesis that unnatural processes are harder to learn (Jusczyk et al. 2003, Saffran & Thiessen 2003, Pycha et al. 2003, 2006, Seidl & Buckley 2005, Kuo 2009, Skoruppa & Peperkamp 2010).¹

8. Increasing unnaturalness

- Bach & Harms (1972) point out that if phonetic motivations play an active role in language learning and transmission, then phonological changes should lead to an increase in naturalness.
- They claim that this is not the case, and others point out that the opposite seems to be true – phonological processes tend to become gradually less natural over time (Hyman 1975, Anderson 1981, Buckley 2000, Seidl & Buckley 2005).
- Norwegian retroflexion is a typical case of how unnaturalness increases with time:
 - ✓ At the outset, the **alveolar** / r / and **postalveolar** / ɾ / assimilate with following coronals to **alveolar** and **postalveolar** coronals – this is still the case in many dialects.
 - ✓ With the merger of **apical alveolars** and **postalveolars**, the **alveolar** / r / causes a following coronal to become **postalveolar** – this is the case in Standard Norwegian.
 - ✓ With the change of / r / to a **dorsal uvular** / ʁ / (Oslo), and with the borrowing of the retroflex rule (Arendal), we have in the end “an outmost unnatural rule” (Kristoffersen 1980) where a **dorsal uvular** / ʁ / causes a following coronal to become an **apical postalveolar**.

9. Conclusion

- Norwegian retroflexion has properties that lack synchronic motivation:
 - ✓ The **alveolar** / r / causes a following **alveolar** coronal to become **postalveolar** (Standard Norwegian).
 - ✓ The **uvular** / ʁ / causes a following **alveolar** coronal to become **postalveolar** (Oslo, Arendal).
- As with other unnatural processes, there are unremarkable historical accounts for these properties:

¹ These studies compare phonetically motivated with phonetically unmotivated processes, all other things being equal. This excludes studies which compare processes referring to natural classes with those that do not (cf. Cristia & Seidl 2008) and studies comparing ‘simple’ with ‘complex’ processes (cf. Moreton 2008).

- ✓ The **alveolar** / r / creates **postalveolars** in Standard Norwegian through rule telescoping.
- ✓ The **uvular** / ʁ / creates **postalveolars** in Oslo through a late independent change of the trigger / r / to / ʁ /.
- ✓ The **uvular** / ʁ / creates **postalveolars** in Arendal through rule borrowing from neighboring retroflexing / r /-dialects.
- It is not clear that markedness theories focusing on synchronic motivations for phonological processes can add anything to the diachronic account.
- There is no evidence that alternations that lack phonetic motivation are processed any differently from other alternations by language learners.

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