Phoneme Split in OT

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1 Introduction

Phoneme split, whereby phones in complementary distribution with one another become contrastive over time, due to neutralization of conditioning environments, can only be accounted for by appeal to misperception. This is important from the standpoint of analysts of language change working in Optimality Theory, a theory in which regular sound changes are supposed by many to be attributable to constraint re-ranking. Within the grammar of a single speaker, phoneme split would entail what I will call instantaneous double re-ranking, an entailment which makes it dubious that a single speaker's grammar could achieve phoneme split at all. Instead, I argue, split can only be achieved by means of a crucial stage of misperception in the transmission from speaker to hearer: the speaker must perceive the phones in question as predictable variants, but at least one of the environments which condition the alternation must be difficult to perceive, leading the hearer to conclude that there is no conditioning environment at all, and therefore that the distribution of the phones is not predictable, but contrastive.

2 A Problem

Consider the rise of the voicing contrast between [θ] and [ð] in English. At one time, these were allophones: [ð] occurred intervocalically, while [θ] occurred elsewhere. For instance, in the verb *teethe*, orthographic final <e> represents historical schwa. Thus the interdental fricative was intervocalic, and underwent voicing. The plural noun *teeth*, which had no schwa, retained the voiceless fricative. The pair came to contrast only after the schwa had been lost, making voicedness unpredictable.

But the schwa could not have been lost abruptly. Instead, it must have continued to lenite gradually, such that a time came when the vowel – probably little more than a release at this point – still conditioned voicing in the speaker's grammar, but was too slight to be perceptible to the hearer. Were the vowel to be utterly lost in the speaker's grammar, then the fricative should no longer be voiced.

Consider a constraint re-ranking that would result in immediate elimination of the unstressed schwa. Let's assume that the relevant markedness constraint is *PK_σ/ə (Gouskova 2003; Prince and Smolensky 1993/2004), which penalizes schwa – a low-sonority vowel – in syllable nuclei. This constraint stands in a fixed ranking, such that vowels with higher sonority are preferred as syllable peaks. The re-ranking that would result in immediate loss of schwa would be that shown in (1), where it is assumed that MaxV is demoted.

(1) Syncope of Schwa

Stage 1: MaxV ≫ *PK_σ/ə

Stage 2: *PK_σ/ə ≫ MaxV

Now, this ranking will achieve vowel syncope, but it should at the same time eliminate some instances of surface [ð], since the ranking in (2) must also hold at the time syncope

occurs.

(2) Intervocalic Voicing: *θ/V_V ≫ *ð ≫ IDENT[voice]

The loss of alternation predicted by the re-ranking in (1), assuming that all else stays the same, is shown in (3). Notice that it doesn't matter whether the input has a voiced or voiceless fricative: due to the inactivity of IDENT[voice], the output will be voiceless. Since we cannot rule out input /ð/ under the assumption of the Richness of the Base (Prince and Smolensky 1993/2004), it is important that the constraint ranking would force it to devoice anyhow. This is shown in (4).

(3) Neutralization of Voicing Alternation

Input: /ti:θə/		*PK$_\sigma$/ə	MAXV	*θ/V_V	*ð	IDENT[voice]
optimal	[ti:θ]		*			
	[ti:ð]		*		*!	*
	[ti:ðə]	*!			*	*
	[ti:θə]	*!		*		

(4) Neutralization, ROTB

Input: /ti:ðə/		*PK$_\sigma$/ə	MAXV	*θ/V_V	*ð	IDENT[voice]
optimal	[ti:θ]		*			*
	[ti:ð]		*		*!	
	[ti:ðə]	*!			*	
	[ti:θə]	*!		*		*

In order for phoneme split to be actuated within an individual speaker's grammar, not only must MAXV be demoted below *PK$_\sigma$/ə, but so must *ð be demoted below IDENT[voice].

Moreover, the re-rankings must be essentially simultaneous: if syncope precedes demotion of *ð, then the result will be as shown above, where hypothetical /ð/ and /θ/ simply neutralize in the relevant environments. Lexicon Optimization (Prince and Smolensky 1993/2004) would then reify only the voiceless forms in underlying representation; split would not have been achieved.

Technically, the re-ranking of *ð could precede syncope with the correct results; but prior to syncope there would be no observable effect of the re-ranking on any surface form, and therefore no obvious motivation behind it. Nothing requires re-rankings to be motivated, *a priori*, but we would do better to hold out for analyses in which a motivation could be identified, since it would considerably limit the variety of changes predicted by our model.

We will assume, then, that to achieve phoneme split within a single individual's grammar, instantaneous double re-rankings are required, in this example or more generally. But why would a speaker arbtirarily perform both demotions simultaneously? If this were a valid analysis of phoneme split, would we really expect such changes to be attested at all? It seems doubtful. It seems more likely that phoneme split is a development of misperception and reanalysis.

3 An Analysis

Suppose we proceed from the premise that speakers only modify their grammars given positive evidence that re-ranking is necessary. This constrains possible changes in grammars primarily to those that can arise due to perceptual difficulties.[1]

For instance, it has often been noted that full vowels in weak positions don't generally

[1]I make no claims here about analogical and paradigmatic sources of change, among other things.

syncopate wholesale in one generation. Instead, the vowel weakens over time, from full vowel to neutral vowel, then to a barely audible release, then to zero. This means that the scenario described in (1) is probably too simplistic: vowels aren't simply deleted by arbitrary re-ranking of markedness constraints, but are lost through successive generations of imperfect perception and reanalysis. These reanalyses naturally result in new constraint rankings, but they are not arbitrary.

The crucial stage of imperfect perception and reanalysis, in our English case, is one at which the speaker produces only the slightest vowel, represented below as a superscript <e>[2]. This mini-nucleus is still enough to motivate the voicing of the fricative in the speaker's grammar. But it is not enough for the hearer to reliably recognize the presence of a vowel. If the perception that the vowel is absent occurs frequently enough, the hearer will assume that the voicing of the fricatives is not predictable based on phonetic environment, and therefore that *ð is dominated by IDENT[voice], creating a voicing contrast previously unattested.

The speaker's grammar is exemplified by (5), where the vowel is present but minimal. The hearer does not perceive this minimal vowel, and models his grammar in accordance with the perceived surface form. The input in (6) is Richness of the Base-inspired, which I assume only for the purpose of showing that minimal vowels are deleted in this individual's grammar. The optimal and most likely input, /ti:ð/, would of course also map to [ti:ð].

(5) Speaker: produces [ti:ð^{e}]

[2]Because, for whatever reason, superscript schwa turns into the 'at' sign.

Input: /ti:θ^e/	MaxV	*Pk$_\sigma$/^{e}	*θ/V_V	*ð	Ident[voice]
optimal [ti:ð^e]		*		*	
[ti:θ^e]		*	*!		*

(6) Hearer: perceives [ti:ð]

Input: /ti:ð^e/	*Pk$_\sigma$/^{e}	MaxV	*θ/V_V	Ident[voice]	*ð
optimal [ti:ð]		*			*
[ti:θ]		*		*!	
[ti:ð^e]	*!				*

What should be clear is that, while the language – on whatever abstract level – has undergone a constraint re-ranking, it is not the case that a single individual needs to re-rank constraints in order for the change to occur. And in fact, phoneme split, possibly among other types of changes affecting the number of contrasts in a language, cannot be understood at all as a re-ranking in that sense.

4 Conclusion

This squib has aimed at showing that at least one type of sound change can only be accounted for by appeal to misperception. This result accords with a great deal of non- and even anti-OT work, for instance Blevins (2004) and McMahon (2000). Yet, I have shown that OT is capable of modeling phoneme split, all the same.

5 References

Blevins, Juliette (2004). *Evolutionary Phonology: The Emergence of Sound Patterns.* Cambridge: Cambridge University Press.

Gouskova, Maria (2003). *Deriving Economy: Syncope in Optimality Theory.* PhD dissertation, University of Massachusetts, Amherst.

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