

# Synchrony and Diachrony

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## 1 Introduction

### 1.1 'Beyond explanatory adequacy'

Consider the following Optimality Theoretic markedness constraint (Prince & Smolensky, 1993):

- (1) NOCODA: Syllables do not have codas.

Like most OT constraints (or, as a matter of fact, most phonological generalisations proposed in any framework) this is a markedness tendency rather than a true linguistic universal in the sense that every language obeys it completely. This constraint serves several purposes at the same time. Most importantly, it expresses:

1. the fact that open ('CV') syllables are universal in human language (there is no language which disallows them), while closed syllables are allowed only in a subset
2. the fact that even those languages which do have open syllables, tend to avoid them: E.g. (tautomorphemic) VCV presumably is universally syllabified as V.CV, not as \*VC.V.

Every modern theory of phonology uses some mechanism which expresses these generalisations:

- In rule-based theory (Clements & Keyser, 1983), it is assumed that a rule syllabifying CV is basic and universal, whereas rules syllabifying postvocalic consonants are language-specific and apply in a later module

- In purely representational approaches, like (certain versions of) Government Phonology (Scheer, 2004), it is assumed that CV is the only available syllable type. Something that phonetically looks like CVC phonologically really is CV<sub>1</sub>.CV<sub>2</sub>, where V<sub>2</sub> is an empty vowel, subject to a number of specific constraints and (therefore) marked.

In this course, however, we will concentrate on Optimality Theoretic constraints such as the one in (1). If we use NOCODA in some analysis, we may say that this constraint 'explains' a certain set of facts. For instance, some OT analyses of French liaison will use this constraint to 'explain' those facts. The following tables are an example (from Féry, 2003)

(2) a.

/pəti(t)/ pinson 'finch'	NOHIATUS	NOCODA
a. $\text{p}^{\text{h}}[\text{p}^{\text{h}}\text{eti}]$ pinson		
b. $[\text{p}^{\text{h}}\text{eti}]$ pinson		*

b.

/pəti(t)/ aigle 'eagle'	NOHIATUS	NOCODA
a. $[\text{p}^{\text{h}}\text{eti}]$ aigle	*	
b. $\text{p}^{\text{h}}[\text{p}^{\text{h}}\text{eti}]$ aigle		

The constraints NOHIATUS and NOCODA are part of an explanation of liaison in these tableaux to the extent that they (i) are independently motivated, and (ii) help to derive the observed results.

At the same time, constraints such as these are obviously themselves in need of an explanation: why are our constraints (or our rules, or our representations) the way they are and not otherwise? In the case at hand, why is there constraint NOCODA and not, alternatively, a constraint CODA? In the terminology of Chomsky (2004), we are going 'beyond explanatory adequacy' if we try to answer these questions: we try to explain why UG is shaped the way it is.

It turns out that the answer to this question is very much dependent on our idea of the place of phonology within linguistics, or its relation to phonetics:

1. We might assume that these constraints are 'grounded' in the phonetics. E.g., we know that obstruents, and more specifically stops, are harder to articulate and perceive after a vowel than before it. This gives a motivation for NOCODA, whereas CODA is quite absurd.
2. Alternatively, we might try to find an explanation in the way in which cognitive structures are realized. For instance, we may try to relate the fact about syllable structure to the idea of Kayne (1994) that the syntactic structures of all languages are SVO. If both subjects and syllable onsets are linguistic 'specifiers', we have discovered some similarity to

the two. Obviously, still the question needs to be answered *why* specifiers occur on the left-hand side. Under this view, it might even be possible that coda's are more difficult to perceive, because human beings know that they are less prominent Carstairs-McCarthy (1999).

If we take the 'grounded' position, we have to deal with the question how exactly the phonetics can influence phonology. Here there seem to be roughly three positions:

1. Constraints such as NOCODA are part of Universal Grammar. The problem with this account is one of *duplication*: we have to assume that NOCODA somehow is part of the 'outside world' — the speech signal, the auditory system — and at the same time of the 'inside world' — the innate capacities of human beings. A reason for this might be evolutionary: the language system has adapted over time to the way in which language is used. But it is unclear that there has been enough evolutionary time to get to this point. There is no clear representative of this position ('nativists' seem to usually prefer a cognitive point-of-view).
2. The second option is to assume that the language-learning child constructs constraints such as NOCODA on the basis of what she observes in her own speech and speech errors. The child thus acts as a small experimental phonetician (or 'laboratory phonologist'). This approach has been defended by Hayes (1999), among others (see below).
3. The third option is that these constraints are not part of grammar at all. Their explanation has to be sought elsewhere, and the most obvious place to look is the diachrony: languages change because of misperception or misarticulation, and when children acquire the language, they simply pick up whatever centuries of phonetically initiated change have made out of the system.

Presently, there seem to be two paths to reach this conclusion. One is by assuming that phonology is only about 'hard universals', hence not about markedness. Phonology is a pure cognitive symbolic system in which there is no place for statistical tendencies. Since virtually no principle in phonology is 'hard', this means we void the theory from many modules that used to be part of it. This is the position defended most forcefully in Hale & Reiss (2000); Hale (2003) and related works. More or less the same conclusion has been reached by authors such as Bybee (2001), starting from the assumption that "language is a self-organizing system, and grammar, including both morphosyntax and phonology, is an emergent property of that system" (p. 190). In this view, phonology is all about statistical tendencies, and symbolic systems, if they exist at all, are seen as epiphenomenal. The child just acquires whatever is available, and this material will have been largely subjected to the principles of language use.

The two positions converge in the sense that most traditional objects of study for the phonology are delegated to a component of statistics. They may differ as to the role of language acquisition: the cognitive view will suppose that the phonetic facts still have to go through a filter of UG (be it one which is much leaner than traditional grammar has it), whereas Bybee (2001) basically assumes a blank slate model of the human mind.

All in all, we can see that the current discussion on markedness has connections to many very basic questions in linguistic theory, such as: what is the division of labour between synchronic and diachronic explanation? What is the role of language acquisition in linguistic change? And how are phonetic and phonological explanations of phenomena to be related?

## 1.2 The life cycle of sound patterns

The traditional point of view of the phonology-phonetics interface can be summarised as follows.<sup>1</sup> We assume that language change has its origins in phonetics; this origin will most likely (or in some models exclusively) be in the direction of greater ease of articulation and/or ease of perception. After a while, the results of this phonetic change may first become *phonologized*, and later *morphologized* or even *lexicalized*. Bermúdez-Otero (2005) traces this idea back to Baudouin de Courtenay (1895) and summarizes the ‘life cycle of sound patterns’ as follows:

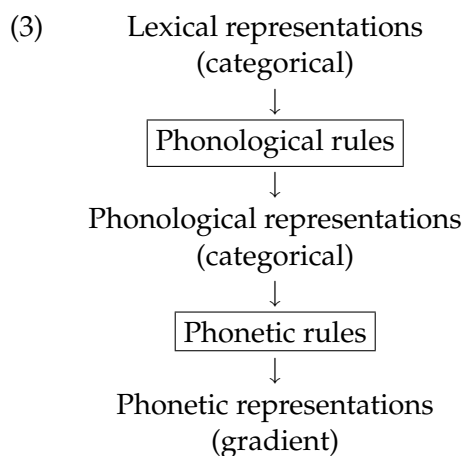
- *Phase I*  
The life cycle begins when, by Neogrammarian sound change, some physical of physiological phenomenon gives rise to a new cognitively controlled pattern of phonetic implementation. This development, known as *phonologization* (Hyman, 1976), involves the addition of a new phonetic rule to the grammar.
- *Phase II*  
Subsequently, this gradient sound pattern may become categorical. [...] Such a change would involve the *restructuring* of the phonological representations that provide the input of the phonological implementation, with the concomitant development of a new phonological counterpart for the original phonetic rule.[...]
- *Phase III*  
Reanalysis can also cause categorical patterns to change. Over time, phonological rules typically become sensitive to morphosyntactic structure, often with a reduction in their domain of application [...] Phonological rules may also develop lexical exceptions [...]

<sup>1</sup>This section relies heavily on Bermúdez-Otero (2005).

- *Phase IV*

At the end of their life cycle, sound patterns may cease to be phonologically controlled. Thus a phonological rule may be replaced by a morphological operation (*morphologization*), or may disappear altogether, leaving an idiosyncratic residue in lexical representations (*lexicalization*). [...]

As Bermúdez-Otero points out, this view of sound change fits very well into the standard generative view of the synchronic relation between phonology and phonetics, as it is exemplified in models such as Lexical Phonology and Stratal OT. and which can be summarised as follows:



Under this view, then, sound change moves ‘bottom-up’ in the grammar: a change which originates in the phonetics may in the course of time end up having an effect only in certain lexical representations.

Although Bermúdez-Otero (2005) does not discuss this point, notice that this view as a matter of fact implies that the explanation of markedness is essentially in the realm of phonetics, because this is where every rule or process will start its life cycle. On the other hand, the process of phonologization (which turns gradient phonetic facts into categorical phonological ones) will be in part the product of phonology. The phonology will then be responsible for the ‘universal’ aspects and the phonetics for the ‘markedness aspects’.

This might be easiest to see within a rule-based framework. Let us suppose that a language L at some point in its history will be subject to a phonetic change by which word-final consonants are gradually reduced. At some point, this might become phonologized to something like:

$$(4) \quad C \rightarrow / \_ \_ \_ \# C$$

What has happened, at this point is that a gradient reduction has turned into something categorical: now word-final consonants are deleted completely.

he same consonant may still show up in some other environment, e.g. before a vowel-initial word. The fact that this rule is a ‘natural’ rule (an implementation of NOCODA, so to say) is a consequence of the fact that it has originated in the phonetics, however. The only reason why rules such as (4) are (much) more frequent than rules such as (5) is that the latter does not have a plausible phonetic origin; from a purely phonological point of view, there is nothing wrong about it.

(5)  $C \rightarrow / \_ \_ \_ \# V$

At the same time, the effects of the phonetics may become obscured in due course, because new rules might follow this one. And then at some point, the rule may become lexicalized: it just happens that some words alternate word-final contexts according to context. (This may be the case of French liaison, which does not affect new words.)

As simple and elegant as this picture may be, there also are a few problems connected to it. Most importantly, it implies that the grammar of every generation is built on the basis of that of previous generations by addition of rules at the end of the grammar. One conceptual problem for this is that this means that every generation of language learners has to be able to see into the heads of their parents directly in order to see the grammars represented there (Hale, 2003).

Also, it is not very clear how this idea can be made compatible with Optimality Theory, precisely. On the one hand, Bermúdez-Otero (forthcoming) shows that the idea of phonologization/lexicalization can be explained more elegantly in OT than it could in rule-based theory, because of a principle of Lexicon Optimization — we will not go into that here. On the other hand, the only thing that can be manipulated in (classical) OT is constraint rankings. This then leaves the source of the constraint NOCODA still unexplained: if it is in the universal constraint set Con, how did it get there in the first place? If this constraint mirrors a phonetic generalisation, how does it do that? The only possibility would be, in fact, to say that Con contains all kinds of constraints, including NOONSET and CODA, and that the only reason why we do not see the latter is that they are unlikely to ever take effect. (And obviously there is always the alternative of rejecting the thought that the origin of sound change should always be phonetic in nature.)

In recent years, an alternative to the traditional view of sound change and the phonetics-phonology interface has been proposed under the rubric of ‘exemplar theory’. In this view, lexical items are not categorical — let alone underspecified. Rather, language users store individual phonetic soundshapes of tokens into their memory. These tokens, which are often referred to as ‘exemplars’, are associated to each other because they are of course phonetically very similar. But in the extreme versions of this theory, they are not categorized in any way. There is no independent phonological representation of a

given word, there is only a network of individual tokens and 'emergent generalisations' (cf. the quote from Bybee (2001) above). Actually semantically, phonetically and morphologically related words will also be connected, albeit with looser ties.

One consequence of this theory is that it predicts that there is no independent phonology: if generalisations can be made, they are due to phonetics, or processing, or other considerations. There is no grammar for individual languages, so by extension there can be no Universal Grammar, and indeed there can be no phonological universals (apart maybe from a few hard restrictions imposed on us by the vocal tract etc.) Also the existence of productive phonological alternations is effectively denied. Final devoicing in Dutch for instance is presumably 'represented' by the fact that all singulars of nouns end in voiceless obstruents, and some plurals have a voiced obstruent in a corresponding position.

Another consequence is that language change can only be gradient and lexically diffusing. The reason why it can only be gradient is because there is no categorial phonology, everything is gradient phonetics. The reason why it can only be lexically diffusing (i.e. affecting item by item, not taking one sound in the language and change it in every place where it occurs) is because there is no such concept of 'a consonant following a vowel': there only are individual occurrences of consonants following vowels in individual tokens of words. This means that the network of words may change in the direction of less and less prominently pronounced coda consonants, but there is no particular reason why the networks of other words should move in the same direction at the same time.

All of this obviously means that the whole idea of the life cycle of phonological rules is completely abandoned, which is a little bit too radical for many scholars, as may be the idea that there are no truly phonological alternations. For this reason, more moderate versions of this approach have been proposed, e.g. by Pierrehumbert. In any case, all of this shows that the studies of markedness, historical phonology and the phonology-phonetics interface are strongly intertwined. By studying them together, we may get a better view on each of them individually. This is what we hope to achieve in this course.

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