The life cycle of phonological processes and rule scattering

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Session ❻ (History 1)
in Alternation types: computation, storage, history
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<table>
<thead>
<tr>
<th>§1</th>
<th>This session surveys the <strong>life cycle of phonological processes</strong>, showing that, in their diachronic evolution, sound patterns typically follow a unidirectional trajectory of change consisting of the following stages:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td><strong>phonologization</strong> a mechanical phonetic effect is reanalysed as a cognitively controlled, language-specific, gradient process of phonetic implementation;</td>
</tr>
<tr>
<td>(ii)</td>
<td><strong>stabilization</strong> this gradient process of phonetic implementation is reanalysed as a categorical phonological rule applying across the board at the phrase level;</td>
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<tr>
<td>(iii)</td>
<td><strong>domain narrowing</strong> the phonological process thus born climbs from the phrase level to the word level, and thence to the stem level, as phonological properties generated in the output of a stratum $S$ are reanalysed as already present in the input to $S$;</td>
</tr>
<tr>
<td>(iv)</td>
<td><strong>morphologization</strong> or <strong>lexicalization</strong> finally, the phonological process ceases to operate, replaced either by a morphological rule of exponence or by a residue of listed allomorphy.</td>
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</tbody>
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<thead>
<tr>
<th>§2</th>
<th>Associated with this life cycle are two other diachronic phenomena of considerable importance:</th>
</tr>
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<tbody>
<tr>
<td>(i)</td>
<td><strong>rule generalization</strong> the scalar nature of the phonetic precursors of sound patterns may cause a series of related successive innovations, each giving rise to a more general version of the same phonological process;</td>
</tr>
<tr>
<td>(ii)</td>
<td><strong>rule scattering</strong> the older (‘lower’) versions of a sound pattern often persist diachronically and coexist in the grammar with the newer (‘higher’) versions created by the life cycle.</td>
</tr>
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<thead>
<tr>
<th>§3</th>
<th>The life cycle of phonological processes, with its associated phenomena, is crucial to the theory of phonological alternation presented in this course (§1§6, §35§38) for several reasons:</th>
</tr>
</thead>
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<tr>
<td>(i)</td>
<td>the life cycle provides empirical support for a <strong>stratal-cyclic architecture of phonology</strong> (§76), since the latter obviously lays down the track for the former;</td>
</tr>
<tr>
<td>(ii)</td>
<td>an understanding of rule scattering enables us to dispose of several putative counterinstances to <strong>modularity</strong> (§30, §19), insofar as different synchronically copresent avatars of the same sound pattern are sensitive to different factors active in different components of the grammar;</td>
</tr>
<tr>
<td>(iii)</td>
<td>understanding the mechanisms causing domain narrowing is crucial to the as yet incomplete task of explaining the <strong>historical genesis of stratal splits</strong> in morphophonological systems (§35§37, §38) and mapping the diachronic life cycle of affixes (§38).</td>
</tr>
</tbody>
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**THE LIFE CYCLE OF PHONOLOGICAL PROCESSES**

<table>
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<tr>
<th>§4</th>
<th>The notion of the life cycle of phonological processes has a very long tradition:</th>
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<tr>
<td>•</td>
<td>it can be traced back at least to the dawn of Structuralism with Kruszewski (1881) and Baudouin de Courtenay (1895) (§4);</td>
</tr>
<tr>
<td>• recent contributions include</td>
<td></td>
</tr>
<tr>
<td>Bermúdez-Otero (2007, 2015),</td>
<td></td>
</tr>
<tr>
<td>Bermúdez-Otero &amp; Trousdale (2012),</td>
<td></td>
</tr>
<tr>
<td>Ramsammy (2015, 2018),</td>
<td></td>
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<td>Turton (2016, 2017),</td>
<td></td>
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<tr>
<td>Sen (2016),</td>
<td></td>
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<tr>
<td>Bailey (under review).</td>
<td></td>
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</tbody>
</table>

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<thead>
<tr>
<th>§5</th>
<th>The life cycle in diagrammatic form (Bermúdez-Otero &amp; Trousdale 2012: 700):</th>
</tr>
</thead>
</table>
Overall, innovation propagates ‘upwards’, as representations at lower levels furnish the data for the acquisition of representations at higher levels (Bermúdez-Otero 1999: 102, 2003: §4.1).

**Phonologization**

§6 In phonologization, as defined here, a mechanical (physically or physiologically determined) phonetic pattern is reanalysed as a cognitively controlled, language-specific, gradient process of phonetic implementation.


§7 **Gradient nasalization in American English**

(i) The phonetic implementation of a [VN] target requires the velum to be lowered at the same time as an oral occlusion is formed at the V-to-N transition.

However, the velum is a relatively slow articulator (Bell-Berti 1993: 66), and this physiological fact causes the timing of maximum velar opening to deviate probabilistically from the achievement of oral closure.

(ii) In American English /CVN/ words like *den*, however, nasal airflow begins systematically early in the vowel: the effect has been *phonologized* (Cohn 1990, 1993).

In this environment, however, nasalization remains **gradient**: the vowel is not specified as [+nasal] in the surface phonological representation (the output of the categorical phonology): crucially, the nasalization pattern of the vowel involves **phonetic interpolation**, resulting in a cline-like contour which contrasts with the nasality plateau in cases of categorical nasalization like *dent* (cf. §16 below).

§8 Phonologization manifests itself diachronically as **neogrammarian change**, i.e. phonetically gradient, lexically regular change:

![diagram](image)


§9 In line with the predictions of a **modular feedforward grammatical architecture** (Bermúdez-Otero 2007: 501–503, 2012: 45–49), new phonetic implementation rules are only sensitive to surface phonological information and are free from morphological and lexical effects.

For a review of the evidence from traditional historical linguistics, see Hill (2014).

§10 **Challenge 1: the role of lexical usage factors**

E.g. lexical token frequency (Bybee 2001): high-frequency words are relatively hypoarticulated

- shorter duration (Whalen 1991; Gahl 2008 on *time* vs *thyme*)
- more vowel centralization (Wright 2003, Dinkin 2008)
- more coarticulatory vowel nasalization (Zellou & Tamminga 2014)

Response: the effect of frequency is orthogonal and remains stable through change, giving rise to **constant rate effects** (Bermúdez-Otero et al. 2015; Kiparsky 2016: 482)

Observed for anticipatory vowel nasalization in American English (Zellou & Tamminga 2014):

- Mean vowel nasalization changes gradiently during the 20th century:
• And there is an effect of lexical frequency: frequent words show more nasalization.
• But this effect is constant across time: there is no significant interaction between speaker birthyear and lexical frequency.
• Hence, there is no need to record the outcome of gradient phonetic change in lexical representations; there is no continuous phonetic information in the lexicon.


§11 Challenge 2: putative morphologically conditioned phonetics

Bybee (2001), Steriade (2000), etc. See Bermúdez-Otero (2010: §8), Kawahara (2011: §2.3.3), Morrison (2018), and Strycharczuk (forthcoming) for surveys of the literature.

E.g. English /l/-darkening and /uː/-retraction (Strycharczuk & Scobbie 2016)
Some speakers show a gradient phonetic difference between
• monomorphemic 
  hula 
  [huː.lə]

and • word-level
  fool-ing 
  [fuː.lɪŋ]

Response: a possible case of prosodic bounding (Bermúdez-Otero 2011: §4, §14iii, §15iv)
• stem level (stress-affecting affixation) ⇒ exhaustive footing
• word level (stress-neutral affixation) ⇒ stray syllables attached directly to \( \omega \)

\[ \begin{array}{c}
\text{hula} \\
\Sigma' \\
\text{but} \\
\Sigma \\
\text{fuːl-} \\
\Sigma \\
\text{fool-ing} \\
\Sigma° \\
\end{array} \]

disyllabic foot

\[ \begin{array}{c}
\text{disyllabic foot} \\
\text{but} \\
\text{fuːl} \\
\text{monosyllabic foot} \\
\end{array} \]

Other apparent cases of apparently morphologically conditioned phonetics involve rule scattering; see §32–§40 below.

§12 Challenge 3: putatively opaque phonetics (sensitive to nonsurface phonological information)

See Fruehwald (2013, 2016) on English /uː/-raising and /t/-flapping; §9ff.

Stabilization

§13 In stabilization, a gradient process of phonetic implementation is reanalysed as a categorical phonological rule applying across the board at the phrase level.

§14 Stabilization of voicing in word-final prevocalic /s/ in Quito Spanish

(Strycharczuk 2012: ch. 6; Strycharczuk et al 2014; §2ii)

(i) Stage 1: phonologization (gradient voicing)  
  más alto /mas alto/ \[ \text{[ma.}\ _\text{salto}] \text{  ‘taller’} \]

  \[ \begin{array}{c}
  \text{fast speech} \\
  \text{glottal pulsing} \\
  \end{array} \]

  \[ \begin{array}{c}
  \text{slow speech} \\
  \text{fricative constriction} \\
  \end{array} \]

(ii) Stage 2: stabilization (categorical voicing)  
  más alto /mas alto/ \[ \text{[ma.}\_\text{aalto}] \text{  ‘taller’} \]

  \[ \begin{array}{c}
  \text{fast speech} \\
  \text{passive voicing: tail duration remains the same} \\
  \end{array} \]

  \[ \begin{array}{c}
  \text{slow speech} \\
  \text{lower voicing-to-constriction ratio in slow speech} \\
  \end{array} \]

§15 Being able to diagnose stabilization may be crucial to arguments about the architecture of phonology:

e.g. Quito Spanish /s/-voicing provides a counterexample to OO-correspondence, in that the voicing of word-final prevocalic /s/ in the onset is opaque and cannot be generated by transderivational identity with related surface forms (Bermúdez-Otero 2011: §6)

[\[NP \_\text{[n mas]}\]]  
[\[NP \_\text{[n mas][a alto]}\]]  
[\[NP \_\text{[n mas][a noble]}\]]

\[ \begin{array}{c}
\text{IO-FATH} \\
\text{IO-FATH} \\
\text{IO-FATH} \\
\end{array} \]

\[ \begin{array}{c}
\text{OO-IDENT} \\
\text{OO-IDENT} \\
\text{OO-IDENT} \\
\end{array} \]

\[ \begin{array}{c}
[x] \text{absent} \\
[x] \text{opaque} \\
[x] \text{transparent, but not in a legitimate base} \\
\end{array} \]

But the argument only goes through if /s/-voicing is categorical (cf. e.g. Colina 2009).

For the stratal analysis of this pattern, §9–§11.
§16  Categorical nasalization in American English

Unlike words like *den* (§7), American English /CVNT/ words like *dent* exhibit categorical nasalization (Cohn 1990, 1993):

- the vowel is specified as [+nasal] on the surface, and the underlying /N/ is deleted;
- phonetically, the vowel shows a plateau-like contour of nasal airflow.

§17  Categoricity via autosegmental delinking and spreading:

\[
\begin{array}{c|c|c|c|c|c|c}
\text{UR} & d & e & n & t & \text{delinking and spreading} & d & e & n & t \\
\hline
\text{SR} & d & e & n & t & \text{delinking and spreading} & d & e & n & t \\
\hline
\end{array}
\]

§18  The contrast between gradient nasalization in American English *den* and categorical nasalization in *dent* illustrates an important phenomenon in sound change, plausibly grounded in the scalar nature of its phonetic precursors:

**Rule generalization** (Bermúdez-Otero 2015: §22.3.1)

- Typically, phonologization and stabilization first take place in a relatively specific, highly phonetically favourable environment.
- Thereafter, further rounds of phonologization and stabilization may create new versions of the same process applying in more general, less phonetically favourable environments.
- The successive versions of the process (older relatively specific vs younger relatively general ones) may go through their life cycles separately.

See also Vennemann (1972: 186-187), Kiparsky (1988: §14.3.1), and §28-§29 below.

§19  Domain narrowing

Once stabilized as a phrase-level phonological process, the cyclic domain of a sound pattern may undergo narrowing:

- utterances > grammatical words > sublexical domains

Concomitantly, the process climbs up in the stratal hierarchy:

- phrase level > word level > stem level

§20  A textbook example of domain narrowing: the history of English postnasal plosive deletion

(Garrett & Blevins 2009: 527-528; Bermúdez-Otero 2011: §3; Bermúdez-Otero & Trousdale 2012: §2.3; Bailey 2018)

- Postnasal plosive deletion: \( g \rightarrow \emptyset / \eta / \eta ℓ \)
- N.B. the deletion of postnasal /d/ is opaque in the onset, i.e. when a vowel follows.

- Domain narrowing since Early Modern English:

\[
\begin{array}{c|c|c|c|c|c}
\text{Diachronic stage} & 0 & 1 & 2 & 3 \\
\hline
\text{elongate} & 99 & 99 & 99 & 99 \\
\text{prolong-er} & 99 & 99 & 99 & 99 \\
\text{prolong it} & 99 & 99 & 99 & 99 \\
\text{prolong} & 99 & 99 & 99 & 99 \\
\hline
\text{0} & \text{Early Modern English} & \text{deletion not yet stabilized} \\
1 & \text{Elphinston’s formal register} & \text{PL /}g/-deletion transparent \\
2 & \text{Elphinston’s colloquial register} & \text{WL /}g/-deletion overapplication in phrasal domains \\
3 & \text{Present-day English} & \text{SL /}g/-deletion overapplication in word and \text{phrase domains} \\
\end{array}
\]

§21  Recurrent input restructuring

\[
\begin{array}{c|c|c|c|c|c|c}
\text{level} & \text{deletion?} & \text{elongate} & \text{prolong-er} & \text{prolong it} & \text{prolong} \\
\hline
\text{a. Stage 0: Early Modern English} & & & & & \\
\text{SL} & \text{no} & \{[i.iŋ.g]ŋ\} & \{[p2.3.0g]ŋ\} & \{[p2.3.0g]ŋ\} & \{[p2.3.0g]ŋ\} \\
\text{WL} & \text{no} & \{[i.iŋ.g]ŋ\} & \{[p2.3.0g]ŋ\} & \{[p2.3.0g]ŋ\} & \{[p2.3.0g]ŋ\} \\
\text{PL} & \text{no} & \{[i.iŋ.g]ŋ\} & \{[p2.3.0g]ŋ\} & \{[p2.3.0g]ŋ\} & \{[p2.3.0g]ŋ\} \\
\hline
\text{b. Stage 1: Elphinston’s formal register} & & & & & \\
\text{SL} & \text{no} & \{[i.iŋ.g]ŋ\} & \{[p2.3.0g]ŋ\} & \{[p2.3.0g]ŋ\} & \{[p2.3.0g]ŋ\} \\
\text{WL} & \text{no} & \{[i.iŋ.g]ŋ\} & \{[p2.3.0g]ŋ\} & \{[p2.3.0g]ŋ\} & \{[p2.3.0g]ŋ\} \\
\text{PL} & \text{yes} & \{[i.iŋ.g]ŋ\} & \{[p2.3.0g]ŋ\} & \{[p2.3.0g]ŋ\} & \{[p2.3.0g]ŋ\}
\end{array}
\]
c. Stage 2: Elphinston’s casual register

<table>
<thead>
<tr>
<th></th>
<th>SL</th>
<th>WL</th>
<th>PL</th>
</tr>
</thead>
<tbody>
<tr>
<td>no</td>
<td>[i-lhŋ.gt]</td>
<td>[i-lhŋ.gt]</td>
<td>[i-lhŋ.gt]</td>
</tr>
<tr>
<td>yes</td>
<td>[i-lhŋ.gt]</td>
<td>[i-lhŋ.gt]</td>
<td>[i-lhŋ.gt]</td>
</tr>
</tbody>
</table>

WL yes (vacuously) [i-lhŋ.gt] [i-lhŋ.gt] [i-lhŋ.gt]

§22 The role of alternant distribution in input restructuring

- In the conservative grammar (stage 1 in §20 and §21), the word *sing* was represented as */sVŋd/ in the input to the phrase-level phonology. Surface tokens lacking */d/ in preconsonantal and prepausal environments were derived by means of an unfaithful phrase-level mapping: see (a) below.
- Such tokens, however, occurred approximately three times more frequently than faithful prevocalic ones (Bybee 1998: 73). Learners who took them at face value replaced */sVŋd/ with */sVŋ/ in the phrase-level input: see (b) below.

(a)

(b)

§23 The role of the Anti-Alternation Bias

The quantitative distribution of alternants on the surface is not enough to explain domain narrowing.

- Crucially, the restructuring */Wl. sVŋ/ > */Wl. sVŋ/ gives rise to tokens of onset [ŋ] on the surface:
  - before input restructuring: */Wl. sVŋ/ + */Wl. n/ → */P. sVŋ.gt/
  - after input restructuring: */Wl. sVŋ/ + */Wl. n/ → */P. sVŋ.gt/
- Thus, domain narrowing is accompanied by the demotion of the markedness constraint *[ŋ] in the phrase-level phonology, even though this constraint is unviolated in the learner’s data.

Q. If, after pure phonotactic learning over surface forms, *[ŋ] is undominated in the phrase-level hierarchy, why does this ranking fail to prevent domain narrowing?

A. Because, after pure phonotactic learning is over, during the acquisition of alternations, an Anti-Alternation Bias (●§34ii, ▶) takes precedence over the Subset Principle, and so the M≫F ranking bias ceases to hold:

⇒ a learner who has only encountered preconsonantal and prepausal tokens of *sing*, i.e. *[sŋ]*, and who consequently assigns to it the word-level representation */WL. sVŋ/,* will avoid the unfaithful mapping */Wl. sVŋ/ + */Wl. n/ → */P. sVŋ.gt/* since it generates a novel alternant *[sŋ]* that she has not encountered before:

in consequence, she will demote *[ŋ] below DEP-[ŋ] in the phrase-level hierarchy.

Unlike implementations in OO-correspondence (McCarthy 1998; Hayes 2004; Tessier 2006, 2016; Do 2013, 2018), this approach to the Anti-Alternation Bias does not incorrectly predict that innovative sound changes will show cyclic misapplication effects from the outset: cf. §11.

§24 Morphologization and lexicalization

The story as told by Anderson (1988: 324-336)

• Proto-Germanic:

<table>
<thead>
<tr>
<th>nom./acc.</th>
<th>gen.</th>
<th>dat.</th>
</tr>
</thead>
<tbody>
<tr>
<td>lamb-iz</td>
<td>lamb-iz-ō</td>
<td>lamb-iz-ai</td>
</tr>
<tr>
<td>lamb-iz-ō</td>
<td>lamb-iz-aaz</td>
<td>lamb-iz-om</td>
</tr>
<tr>
<td>lamb-iz-omoz</td>
<td>lamb-iz-ai</td>
<td>lamb-iz-um</td>
</tr>
</tbody>
</table>

• Pre-Old High German:

As a result of various changes (including rhotacism), the paradigm below results.

At this stage, the relevant nouns take the ending */-ir-/ throughout the paradigm, but a set of phonological rules deletes */-ir-/ in a non-initial syllable word-finally:

phonological rule(s): ir → Ø / σ₁ #

§25 Morphologization as a rule of exponence: the development of Germanic s-stems in Old High German

The story as told by Anderson (1988: 324-336)

- Proto-Germanic:

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phonological rule(s): ir → Ø / σ₁ #

- nom./acc. | pl.
- lamb      | lamb-ir-ō
- lamb-ir-ō  | lamb-ir-um
• Early Old High German:
A further rule is added to the grammar, deleting final short /u/. This causes the rule deleting word-final /-ir/ to become opaque, as there is word-final [-ir-] on the surface in the nom./acc. pl.

As a consequence, the behaviour of /-ir-/ is reanalysed: instead of being deleted in a phonological context, viz. word-finally, it is analyzed as being inserted in a morphological context, viz. in oblique (cases other than nom. and acc.) or plural forms.

morphological rule:
\[ \emptyset \rightarrow \text{-ir-} / \text{Stem}[^{+\text{class}}] \]
[\{[^{+\text{oblique}}] \}] [\{[^{+\text{plural}}] \}]

• Later Old High German:
Morphologization is confirmed by the fact /-ir-/ insertion is now reduced to a subset of morphological environments, viz. in the plural:

|   | sg. | pl.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>nom./acc.</td>
<td>lamb</td>
<td>lamb-ir</td>
</tr>
<tr>
<td>gen.</td>
<td>lamb-ir-as</td>
<td>lamb-ir-o</td>
</tr>
<tr>
<td>dat.</td>
<td>lamb-ir-a</td>
<td>lamb-ir-um</td>
</tr>
</tbody>
</table>

morphological rule:
\[ \emptyset \rightarrow \text{-ir-} / \text{Stem}[^{+\text{class}}] \] [^{+\text{plural}}]

§27 Lexicalization as a via-rule: umlaut plurals in English

In pre-Old English, umlauted plurals were the result of a phonological rule:

\[ \alph:\rightarrow \text{C}_0 \text{i} / \text{C}_1 \text{a} \text{i} \]

UR /foot/ /foot-iz/  
SR [foot] [foot-iz]  
‘foot’ ‘feet’

In present-day English, they are undoubtedly stored irregular forms, at best linked by a via-rule:

\[ [\text{NG} \ldots \text{V}[^{+\text{hi},^{+\text{bk}}}] \text{C}_1] \rightarrow [\text{NG} \ldots \text{C}_1] \]

foot  feet  
goose  geese  
tooth  teeth

In pre-Old English, umlauted plurals were the result of a phonological rule:

\[ \alph:\rightarrow \text{C}_0 \text{i} / \text{C}_1 \text{a} \text{i} \]

UR /foot/ /foot-iz/  
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‘foot’ ‘feet’

In present-day English, they are undoubtedly stored irregular forms, at best linked by a via-rule:

\[ [\text{NG} \ldots \text{V}[^{+\text{hi},^{+\text{bk}}}] \text{C}_1] \rightarrow [\text{NG} \ldots \text{C}_1] \]

foot  feet  
goose  geese  
tooth  teeth
§30 Mild high, drastic low: liquid lenition in English


In a long-term lenition trajectory, the milder, older process ↔ synchronically higher stratum (narrower domain) more drastic, younger process ↔ synchronically lower stratum (wider domain).

E.g. (i) /l/-lenition trajectory

\[
\begin{align*}
  \bar{1} & \overset{\text{lenition}}{\rightarrow} \bar{4} & \overset{\text{deletion}}{\rightarrow} \varnothing \\
  \text{/l/-lenition is older than /l/-deletion.}
\end{align*}
\]

(ii) /v/-lenition trajectory:

\[
\begin{align*}
  \bar{1} & \overset{\text{darkening}}{\rightarrow} \bar{1} & \overset{\text{vocalization}}{\rightarrow} \varnothing (\overset{\text{deletion}}{\rightarrow} \varnothing) \\
  \text{/v/-darkening is older than /v/-vocalization.}
\end{align*}
\]

\[
\begin{align*}
  /l/-lenition, /v/-darkening: \text{older} & \Rightarrow \text{higher stratum (narrower domain)} \\
  /l/-deletion, /v/-vocalization: \text{younger} & \Rightarrow \text{lower stratum (wider domain)}
\end{align*}
\]

§31 Word-level processes (overapply to word-final prevocalic Cs):

\[
\begin{align*}
  /l/-lenition & \text{does apply in car alarm} \\
  /v/-darkening & \text{does apply in sea lilt}
\end{align*}
\]

Phrase-level processes (do not overapply to word-final prevocalic Cs):

\[
\begin{align*}
  /l/-deletion & \text{does not apply in car alarm} \\
  /v/-vocalization & \text{does not apply in sea lilt}
\end{align*}
\]

§32 RULE SCATTERING (after Robinson 1976):

Diachronic change often introduces a new avatar of an existing pattern into a higher component of the grammar by reanalysis, while the old avatar remains in situ.


Rule scattering at the phonology-phonetics interface

§33 A perfectly ordinary stage of affairs: two cognate rules, one gradient, one categorical, representing different stages in the diachronic life cycle of the same sound pattern, coexist within the same grammar.

Examples: • Philadelphia **æ**-tensing (Labov 1994) §35-§36 below  
  • Pre-yod /s/-palatalization (Zsiga 1995) §37-§39 below

§34 Why is this stage of affairs common? Presumably because of the mechanics of stabilization (i.e. of the diachronic process of reanalysis whereby tokens of a gradient rule of phonetic implementation are reinterpreted as involving a categorical distinction): the reanalysed tokens give rise to a new categorical rule, whilst the nonreanalysed tokens preserve the gradient rule in situ (Bermúdez-Otero 2015: 387-388).

§35 Philadelphia **æ**-tensing: a categorical default stem-level rule...

• categorical opposition between lax [æ] and tense [æː]
  • the phonetic realizations of [æ] and [æː] occupy largely nonoverlapping regions in auditory space (Labov 1989: 8-10)
  • default pattern: **æ** is normally tense before coda /m, n, f, θ, s/ (Labov 1994: 430)
  • counterbalanced by resyllabification before word-level suffixes:
    e.g. m[æ]n, m[æ]nner, m[æː]nn-ing (Labov 1994; 430-31)
  • outright lexical exceptions: [æː] in mad, bad, glad; but [æ] in sad, sad, lad
  • [æ] in strong verbs like began, ran, swam

§36 …overlaid with a gradient phonetic process

the precise formant values of the acoustic realization of [æː] are exquisitely sensitive to the phonetic environment
§37 Pre-yod /s/-palatalization: A neutralizing stem-level morphophonological process…

\[
\text{confi[s]/j/on} \rightarrow \text{confi[ʃ]on}
\]

§38 …coexisting with gradient gestural overlap across word-boundaries

\[
\text{pres/} \# /j/\text{on} \rightarrow \text{pre[ʃ]on}
\]

§39 But the same diachronic origin! Cf. Chaucer’s confe\(\text{si}\text{.uːn}\)/.

§40 The rule systems created by scattering exhibit phonetic gradience and morphological sensitivity in the same grammar without violating modularity (cf. §11 above):

- the old phonetic process exhibits gradience;
- the new categorical process exhibits morphological sensitivity.

E.g. /s/-reduction in New York Spanish (Erker 2012)

\[
\begin{align*}
\text{(i) categorical [s]-absence} & \rightarrow \text{sensitive to morphemic status (e.g. inflectional or not)} \\
\text{(ii) gradient reduction of [s]-duration} & \rightarrow \text{insensitive to morphology}
\end{align*}
\]

Rule scattering at the morphology-phonology interface

§41 The effect of contextual factors upon phonological variation decreases in magnitude for high-frequency, apparently exceptional items:

E.g. final /t,d/-deletion in New Zealand English

<table>
<thead>
<tr>
<th>Context</th>
<th>Other Words</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>88%</td>
</tr>
<tr>
<td>V</td>
<td>75%</td>
</tr>
<tr>
<td>Range</td>
<td>13%</td>
</tr>
</tbody>
</table>

Small contextual effect

Big contextual effect

§42 Guy’s explanation: variable allomorphy + variable phonology

- AND has two allomorphs: and and an‘; other words have a single UR.
- Selection of an‘ pre-empts variable /t,d/-deletion, and so attenuates the effect of factors governing the phonological process.

See also Mackenzie (2013) on English auxiliaries.

Again, this is outcome of diachronic rule scattering: the allomorphic pattern and the variable phonological rule have the same historical origin. The resulting two-process system is modular in that the phonological rule of /t,d/-deletion is blind to lexical identity.

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