Tongue-Twisters:  
Polish Palatalization Reanalyzed*

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0. Introduction

In this paper I examine lexical palatalization in Polish, a language characterized by a rich and controversial\(^1\) palatalization system (see, for instance, Gussmann (1987); Szpyra (1989); Czaykowska-Higgins (1988); and Rubach (1984)). I do not intend to engage in a discussion of postlexical palatalization, but instead concentrate on the phonological process found after morphology has been performed during a derivation. I propose a theory of palatalization based on Polish, a theory which is also of broader significance. To wit, I suggest that there is a single universal rule of lexical palatalization.

The paper is organized as follows: in §1 and §2 I give the Polish inventory and present data that show the palatalization processes. In §3 I present certain assumptions made in order to advance my analysis, followed by the representations assumed in §4. In §5 the proposal of the mechanism of palatalization is outlined, followed by a more intensive discussion, including sample derivations. In §§6-8 I conclude the paper with a discussion of problems and possible future implications.

1. The Inventory

Below I present the underlying consonant inventory of Polish that I assume in this paper:

<table>
<thead>
<tr>
<th>Labial</th>
<th>Dental/</th>
<th>Post-</th>
<th>Prepatal</th>
<th>Velar</th>
</tr>
</thead>
<tbody>
<tr>
<td>[NP]</td>
<td>[P]</td>
<td>[alveolar]</td>
<td>[alveolar]</td>
<td></td>
</tr>
<tr>
<td>Stop [+V]</td>
<td>p</td>
<td>p(^\text{J})</td>
<td>t</td>
<td>k</td>
</tr>
<tr>
<td>[-V]</td>
<td>b</td>
<td>b(^\text{J})</td>
<td>d</td>
<td>g</td>
</tr>
<tr>
<td>Fricative [+V]</td>
<td>f</td>
<td>f(^\text{J})</td>
<td>s</td>
<td>ś</td>
</tr>
<tr>
<td>[-V]</td>
<td>v</td>
<td>v(^\text{J})</td>
<td>z</td>
<td>ż</td>
</tr>
<tr>
<td>Affricate [+V]</td>
<td>c</td>
<td>c(^\text{J})</td>
<td>Ć</td>
<td>Ć</td>
</tr>
<tr>
<td>[-V]</td>
<td>m</td>
<td>m(^\text{J})</td>
<td>n</td>
<td>n</td>
</tr>
</tbody>
</table>


\(* I would like to acknowledge the inestimable contribution of Dr. Keren Rice, without whose assistance this paper would not be possible. Also, I would like to thank a number of the students of the Department of Linguistics (U of T), who lent me their support and knowledge, especially Anton Bures and Carrie Dyck. \(^1\) For many years phonologists have been arguing over how to handle Polish palatalization. For an excellent summary of these positions, see Gussmann (1987). Not just the framework, however, is controversial: the status of certain seemingly regular operations are assumed under some approaches to be a result of lexical marking (cf. Szpyra (1989); Czaykowska-Higgins (1988); etc.) and part of the regular phonological processes by others (cf. Rubach (1984); Gussmann (1987); etc.)
(1989) in assuming a set of palatal labials and have affricates and fricatives in the prepalatal column, following Rubach (1984) and Gorecka (1989).

The only potentially controversial assumption is that of the prepalatal nasal. Gorecka has no prepalatal nasal but Rubach does. Below I provide a few sample words that end in the prepalatal nasal. Because there is no affix that could condition an effect of palatalization, we can assume that prepalatal nasals are not derived, and therefore should be included in the inventory of underlying consonants (all data are from Ruback (1984)):

\[
\begin{align*}
\text{stień} & \quad \text{"hallway"} \\
\text{jesień} & \quad \text{"fall"} \\
\text{kon} & \quad \text{"horse"} \\
\text{kleszeń} & \quad \text{"pocket"}
\end{align*}
\]

2. The Data

Below I present data showing the effects of palatalization. These data are divided into two groups, "fronting" and 'raising" (see Bhat (1978)), which correlate with whether the targets are originally in the velar or dental domain, respectively. Further divisions (where applicable) are made within these groups as to "unmarked" versus "marked" cases. Here I am assuming that any process of palatalization not explicable by strict phonological facts is a "marked" case, and there will be little discussion of these types, as my main interest is in discovering the operation of a phonological rather than a morphological process. It should be noted that these data include both native and non-native words, and as they pattern together, I do not discuss them separately.

The data throughout is presented largely in traditional Polish orthography. However, I have presented each trigger and target in a more standardized alphabet, roughly based on the North American variation of IPA, but amended so that the postalveolar region is represented with the haeck, while the prepalatal area is represented with the acute accent. In addition, I use [j] to represent the front glide (see Appendix B for a symbol translation).

2.1 Velar Fronting

Below I present what has traditionally been referred to as "velar fronting" processes:

2.1.1 Unmarked Fronting

Palatalization of a voiceless velar stop results in the creation of a postalveolar affricate. The palatalizing trigger may be either a high front vowel (3) or a mid front vowel (4). The examples in (3) and (4) illustrate the effect of palatalization on voiceless velar stops:

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2I ignore the effects of secondary palatalization, which creates a palatal out of any segment when it is adjacent to a front vowel or glide. I assume, following Green (1989 and 1990), that secondary palatalization is postlexical.

3I use these terms "marked" and "unmarked" without very much explanation in this section, although the basic notion is that anything that is motivated by phonology can be considered a regular "unmarked" process (i.e., it is predictable); anything that is motivated by lexical entries can be considered an exceptional "marked" process (i.e., idiomatic). For more information, see §3.3 and §3.6.

4The velars behave differently in the morphological cases of Nominative Plural, Dative, Locative or Adverbs. I follow the analysis advanced in Szpyra (1989), Gusmann (1987), Gorecka (1989) and Czajkowska-Higgins (1988), and thus will not address these cases here.
(3) kro[k] "step" kro[ć+ı]ć "to step"
    chłopak[ō] "boy" chłopak[ć+ı]sko (aug)
    so[k] "juice" so[ć+ı]sty (Adj.)

(4) krzy[k] "a shout" krzy[ć+e]ć "to shout
    bo[k] "side" bo[ć+e]k (dimin.)
    człowie[ke]k "man" człowie[ć+e]l (voc.)
    brelo[ke]k "breloque" brelo[ć+e]k (dimin.)

The voiced velar stop differs slightly. Like the voiceless stop, it becomes a postalveolar affricate:

(5) mia[zg+a] "pulp" mia[ţ̝+ı]ć "squash"

(6) mó[zg] "barin" mó[ţ̝+e]k (dimin.)
    drobia[zg] "detail" drobia[ţ̝+e]k (dimin.)

In (5)-(6), the stop is preceded by an obstruent and there appears to be two things happening. The velar is palatalized, but the preceding obstruent also assimilates to the place of articulation of the target. This assimilation is not restricted to this particular environment, but is part of a more widespread phenomenon, which will be addressed in §2.2.1.1 below.

When a sonorant precedes the target, it becomes a postalveolar continuant rather than an affricate. Here, I present an example of a non-palatalizing suffix on the left followed by an example of a palatalizing suffix on the right:

(7) wa[g+a] "scale" wa[ţ+ı]ć "to weigh"
    no[g+a] "leg" no[ţ+ı]sko (aug.)
    snie[g] "snow" snie[ţ+ı]sty (Adj.)

(8) ró[g] "horn" ró[ţ+e]k (dimin.)
    Bó[g] "God" Bó[ţ+e]l (voc.)
    dyftoon[g] "diphthong" dyftoon[ţ+e]k (dimin.)
    Wartbur[g] (car make) Wartbur[ţ+e]k (dimin.)
    szezlón[g] "chaise lounge" szezlón[ţ+e]k (dimin.)
    buldo[g] "bulldog" buldo[ţ+e]k (dimin.)

For these cases I assume, following Gußmann (1989), that when the target and the sonorant preceding it agree in voicing, [+cont] is spread from the sonorant onto the target. Since the stop is the only voiced segment among the velars, only it will be affected by this process. I assume that the manner distinction is not a direct result of palatalization, and consequently will not pursue this matter further.

The velar fricative also becomes postalveolar when followed by a front vowel, as the data below attest. I ignore any alternations outside the brackets, as these are not relevant to the present discussion:
<table>
<thead>
<tr>
<th>(9)</th>
<th>stra[x] &quot;fright&quot;</th>
<th>stra[s+i]c &quot;frighten&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>brzu[x] &quot;belly&quot;</td>
<td>brzu[s+i]sko (aug.)</td>
</tr>
<tr>
<td></td>
<td>pu[x] &quot;fluff&quot;</td>
<td>pu[s+i]sty (Adj.)</td>
</tr>
<tr>
<td></td>
<td>pe[x] &quot;bad luck&quot;</td>
<td>pe[s+i]c (V)</td>
</tr>
</tbody>
</table>

| (10) | słu[x] "hearing" | sły[s+e]c "hear" |
|      | głu[x+y] "deaf"  | głu[s+e]c "wood grouse" |
|      | kiel[i]x] "goblet" | kiel[i][s+e]k "glass" |
|      | patriarch[x+a] "patriarch" | patriarch[s+e] (dat.) |

The basic effect of palatalization on velars, then, is the fronting or assimilation to the postalveolar place of articulation.

2.2 Dentals

Two divisions must be made within the dentals: the "unmarked" and "marked" cases. The marked cases consist of noun stems ending in the voiceless dental fricative and the stem-final dental fricatives in denominal adjectives, both of which are followed by [i].

2.2.1 Dentals: the Unmarked Cases

2.2.1.1 Dental Stops and Fricatives

The dental stops become prepalatal affricates, whether followed by [i] (11) or by [e] (12):

| (11) | po[t] "sweat (N)" | po[ć+i]c "to sweat" |
|      | ko[t] "cat"       | ko[ć+i]ca (rem.)   |
|      | szwe[d] "Swede"  | szwe[ţ+i]sko (aug.) |
|      | bru[d] "dirt"    | bru[ţ+i]c "make dirty" |

| (12) | idio[t+a] "idiot" | idio[ć+e]jć (V) |
|      | lo[t] "flight"   | lo[ć+e]ć (V) |
|      | wia[d+o]my "known" | wie[ţ+e]ć (V) |
|      | wip[d+o]k "sight" | wip[ţ+e]ć (V) |

The fricatives also become prepalatal when they precede a front vowel. The high trigger [i] is represented in (13), while the mid trigger [e] is presented in (14) below:

| (13) | kosa "scythe" | ko[s+1]c "mow" |
|      | ple[s] "dog" | p[s+1]na (dimin.) |
|      | ko[z+a] "goat" | ko[ţ+1]a (denom. adj.) |
|      | mroz "frost" | mro[ţ+1]c "freeze" |
(14)  pa[s] "belt"  pa[š+e] (loc. sg.)
    ły[s+ı] "bald"  ły[š+e]ć (V)
    g+a[z] "stone"  g+a[ž+e] (loc. sg.)
    gry[z+o]m "they bite"  gry[ž+e] "he bites"

An interesting aspect surfaces when we examine what happens to the members of a
dental cluster when it is in a position to be palatalized. Both members surface as prepalatal, suggesting that assimilation to place occurs within the coronals. In (15) I present [i]-initial suffixes:

(15)  po[st] "a fast"  po[šć+ı]ć "to fast"
    lıngw[st+a] "linguist"  lıngw[šć+ı] (masc. pers. nom. pl.)
    ja[zd+a] "travel"  je[žʒ+ı]ć "to travel"

This can also be seen with [e]-initial suffixes, as (16) attests:

(16)  te[st] "test"  te[šć+e] (loc.)

The dental nasal becomes a prepalatal nasal without exception when in the palatalizing
environment. This occurs before either [i] (17), or [e] (18). Note that the [t] preceding the
nasal in "pulse" does not assimilate:

(17)  bara[n] "ram"  bara[ń+ı]a (denom. adj)
    tet[n+o] "pulse"  tet[ń+ı]ć (V)
(18)  dzwo[n] "bell"  dzwo[ń+e] (loc. sg.)
    to[n+o]m "they drown"  to[ń+e]sz "you drown"

If two nasals appear adjacent in a palatalizing environment, an assimilatory effect can be
seen with the result that both nasals are prepalatal on the surface. In (19) I present
examples of the result of inflecting nasal-final stems with the dat. sg.:

(19)  fonta[nn+a] "fountain" (fem. nom. sg.)  fonta[ńń+e]
    marza[nn+a] "woodruff"  marza[ńń+e]
    suta[nn+a] "cassock"  suta[ńń+e]

Likewise, when the dental nasal is preceded by a dental sibilant, it is realized as a
prepalatal. This is another example of assimilation within certain types of consonant
clusters, as shown in (20):

(20)  jasny "bright"  ja[šń+e] "brighter"

The assimilation in clusters involving the nasal stems from a more widespread
phenomenon in Polish: coronal clusters share place of articulation. Because these cases are
examples of a process which is independent of palatalization, I will not discuss them
further in my analysis of the process of palatalization, as their behaviour has more to do with external factors than the basic operation of palatalization.

2.2.1.2 Dental Affricates

In addition to stops and fricatives at the dental place of articulation, dental affricates are also found. They do not pattern with the stops and fricatives in the palatalizing environment. Instead, they surface aspostalveolar rather than prepalatal affricates:

\[(21)\text{ u}1\text{[c+a]} \quad \text{"street"} \quad \text{u}1\text{[c+i]ny} \quad \text{"street (Adj.)"}\]

\[(22)\text{ z}a\text{ja[c]} \quad \text{"hare"} \quad \text{z}a\text{ja[c+e]k (dimin.)}\]
\[\text{ku}p\text{e[c]} \quad \text{"merchant"} \quad \text{ku}p\text{[c+e] (voc.)}\]
\[\text{p}i\text{enj[=g]} \quad \text{"money"} \quad \text{p}i\text{enj[=g+e]k (dimin.)}\]

2.2.2 Dentals: the Marked Cases

Thus far we have seen examples of regular phonological rules operating on dental consonants. Below I entertain some discussion of a lexically marked case, which I assume is morphologically determined, and consequently is not discussed in any detail. I do not provide an examination of what Rubach assumed to be an abstract /j/ acting as a trigger for certain cases of palatalization, as other analyses have been approached which account for these to my satisfaction (for references, see footnote1).

2.2.2.1 The Nominal Stem-final Postalveolar Voiceless Fricative

The stem-final voiceless postalveolar fricative changes to its prepalatal counterpart when adjacent to a high front vowel. Only those lexical suffixes which have [i] initially trigger this rule, and thus no examples with [e] are presented below:

\[(23)\text{ gro[=g]} \quad \text{(monetary unit)} \quad \text{gro[=g+e]k (dimin.)} \quad \text{gro[=g+e]wo (aug.)}\]
\[\text{kapelu[=g]} \quad \text{"hat"} \quad \text{kapelu[=g+e]k (dimin.)} \quad \text{kapelu[=g+e]sko (aug.)}\]
\[\text{kontu[=g]} \quad \text{(nobleman's overcoat)} \quad \text{kontu[=g+e]k (dimin.)} \quad \text{kontu[=g+e]sko (aug.)}\]
\[\text{ar}k\text{u[=g]} \quad \text{"sheet"} \quad \text{ar}k\text{u[=g+e]k (dimin.)} \quad \text{ar}k\text{u[=g+e]sko (aug.)}\]
\[\text{koko[=g+k]} \quad \text{"young hen"} \quad \text{koko[=g+e]c "to fidget"}\]

I assume that this process is a result of a special lexical marking which applies only to stem-final postalveolar voiceless fricatives and is marked only on a number of special [i]-initial suffixes (of which the diminutive and augmentative are members).

In summary, I present the completed chart of all alternations that have been discussed in §2:
<table>
<thead>
<tr>
<th>Dental/Alveolar</th>
<th>Postalveolar</th>
<th>Prepalatal</th>
<th>Velar</th>
</tr>
</thead>
<tbody>
<tr>
<td>t</td>
<td>---&gt;&gt;&gt;</td>
<td>č</td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>---&gt;&gt;&gt;</td>
<td>ź</td>
<td></td>
</tr>
<tr>
<td>s</td>
<td>---&gt;&gt;&gt;</td>
<td>š</td>
<td></td>
</tr>
<tr>
<td>z</td>
<td>---&gt;&gt;&gt;</td>
<td>ź</td>
<td></td>
</tr>
<tr>
<td>š</td>
<td>---&gt;&gt;&gt;</td>
<td>š' †</td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>---&gt;&gt;&gt;</td>
<td>ň</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>---&gt;&gt;&gt;</td>
<td>č</td>
<td></td>
</tr>
<tr>
<td>ź</td>
<td>---&gt;&gt;&gt;</td>
<td>ź</td>
<td></td>
</tr>
<tr>
<td>č</td>
<td></td>
<td></td>
<td>k</td>
</tr>
<tr>
<td>ź/ž</td>
<td></td>
<td></td>
<td>g</td>
</tr>
<tr>
<td>š</td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

†occurs only with an [i] trigger.⁵

3. Assumptions

In this section I outline basic assumptions that are relevant to the analysis undertaken in §4.

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⁵The elements characterized in italics in (24) represent the “marked” case. In addition, I mark a result with the character †, because it is only available with a limited environment ____[1]__
3.1 Feature Geometry

I assume that the internal structure of segments is hierarchically organized. The specific model of segment structure that I adopt is based on proposals by Clements (1976); Sagey (1986); and others and is shown in (25). I omit irrelevant structure, as it is largely place of articulation that is relevant in this paper.

\[(25)\]

```
Timing
Unit
Root
Continuant
Laryngeal
(etc.)
Supra-Laryngeal
Place
Coronal
Dorsal
Labial
```

The specific structure of consonants and vowels is worthy of comment. I assume that front vowels and palatal consonants have a similar structure (Clements (1976); Keating (1987), Mester and Itô (1989), etc.). Most importantly, I assume that front vowels and palatals are complex segments that have both coronal and dorsal nodes along the lines of Keating (1987). The particular geometry that I suggest is given in (26).

\[(26)\]

```
Place
Coronal
Dorsal
```

Arguments for such a representation for palatal consonants are presented in Keating (1976), while Clements suggests an analysis for front vowels that assigns them a coronal node. Given the similarity between palatals and front vowels (e.g., palatalization triggered by front vowels, alternations between palatal consonants and [j] or [i]), such a representation receives support.

The representation assumed for vowels really follows from the palatal segments. It is widely accepted that palatalization is a process of assimilation, and the contact between the target (a velar or coronal) and the trigger (a front vowel) results in greater resemblance between the two groups. Making the standard assumption that assimilation is represented as spreading (e.g., Hayes (1986)), it must be the case that the front vowel is (nearly)
identical in place of articulation to the palatal, and is basically distinguished by major class features. In fact, the concept that the only difference between a front vowel and a front glide is the feature [syllabic] is fairly uncontroversial, as many phonologists (starting with the Sanskrit grammarians (Antoine 1972)) have considered the [i] - [j] alternation as a simple matter of domination by syllable nucleus vs. coda or onset. On the assumption that we know what palatal consonants look like, we can extrapolate to palatal/front glides, and even further to front vowels. Below I contrast a front vowel with a front glide:

(27)

I provide no height and rounding features, as I assume that these are dependents of the dorsal and labial nodes, and hence not of interest to the present discussion.

3.2 Underspecification

I additionally assume the model of underspecification proposed in Avery and Rice (1989). Specifically, I assume that universally unmarked features such as coronal are absent from underlying representation unless properties of the inventory of the particular language force its presence. In particular, coronal is generally absent from the underlying representation as it is the unmarked place of articulation. However, if coronal contrasts exist within an inventory, then coronal must be specified. See Avery and Rice (1989) for further development; see also Avery (in preparation).

3.3 Markedness

I use the concept of "markedness" both phonologically and morphologically. Phonologically, I assume that markedness is involved in determining which features are absent from the underlying representations: marked features are present and unmarked features are generally absent (see §3.2). Morphologically, I assume that superficially regular processes that have morphologically limited triggers (or targets) are lexically marked, or listed in the lexicon.

3.4 Structure Preservation

Structure preservation (Kiparsky (1982)) and elsewhere) blocks a rule from applying if it creates a structure not present in the underlying inventory. Structure preservation is sometimes used in a more general sense, allowing the creation of an illicit structure so long
as it is repaired (eg., Myers (1989)). The version I adopt is the more general one. For example, palatalization of a dental nasal would create a postalveolar nasal. As there are no postalveolar nasals in underlying representation, the output of this rule, if it applies, must be repaired at a later stage.

3.5 Recoverability

In my discussion of the problems of predicting resulting manner features, I appeal to a principle of recoverability. If the differences between two targets are in danger of being neutralized by the operation of any process, recoverability functions to maintain the distinctness of the targets.

4. Representations

In this section I make explicit the place representations of Polish consonants, with particular reference to those affected by palatalization.

I begin with the velar consonants. The representation of these, which I assume is uncontroversial, is given in (28). Note that all non-place features are omitted in all representations:

(28)

VeLars

Root

Place

Coronal

Dorsal

The configuration above can represent either [k], [g], or [x], but the non-place features are absent from this representation.

I now turn to the representations of the various coronal places of articulation in Polish. Recall from §3.1 that I assume that coronal is specified underlyingly when coronal contrasts exist for a particular segment type. As discussed in §1, Polish has a three-way contrast in the coronal region, with dentals, postalveolars and prepalatals. I propose the following representations for the three coronal places of articulation:
Comments on these representations are in order. First, I assume that the dentals are the least marked of the coronals, and are marked simply by the presence of the Coronal node. This assumption should be relatively uncontroversial, as an inspection of Maddieson (1984) shows the dental stops to occur most frequently, and phonologically these often pattern as if a coronal specification were absent (see Avery and Rice (1989) for further discussion). Second, I assume that the prepalatals and postalveolars are both types of palatals and that, as discussed in §3.1, palatal are best represented as complex segments containing both coronal and dorsal nodes. I assume that the postalveolars and prepalatals are differentiated by a feature, a coronal dependent, which I will call [F]. This feature roughly corresponds to consonantal tongue height.\(^6\) I assume that this feature is found in the prepalatal rather than the postalveolar segments for the following reasons: first, in most cases of palatalization in Polish, the most common output is a segment in the postalveolar range. This suggests that the postalveolar is the more basic palatal, since it is so often the result of palatalization; second, in other languages that have palatalization processes, we find that the postalveolar range is commonly the only palatal region available, such as English (viz., "alveopalatal" or "palatoalveolar") or Sanskrit (viz., traditionally called just "palatal" (Antoine (1972)); third, in discussions of Polish underlying consonant inventories (as noted above) the phonemic status of the prepalatal region is often questioned, whereas that of the postalveolar is not. Finally, underlying inventories often contain postalveolars, but prepalatals seem to be rare.

5. The Proposal

Below I repeat my representations of a palatal consonant followed by a front vowel or glide

\(^6\)The presence of [F] implies that the body of the tongue is high in the mouth.
(30)

Given (30), the *modus operandi* of palatalization is the following: when a consonant (the target) comes into contact with either a front vowel or a glide (the trigger) the place nodes are joined, or fused together:

(31)

The hazy line above represents the fact that either the coronal or the dorsal node could be present on the target, and thus velars and dentals both become palatals of some sort, as a coronal node is added to a dorsal node while a dorsal node is added to a coronal node thereby forming a complex dorso-coronal. If both were present, this would represent a case of an OCP effect, as two identical configurations must merge. Just how the segment is realized on the surface is determined by the factors alluded to above, and discussed in more detail below.

According to this proposal, then, palatalization is universally a process that collapses the place nodes of a target with those of a trigger. Depending on the parameter settings for a particular language, the target's place node could be either coronal or dorsal, while the

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7 The presence of the coronal specification is not crucial, as I assume that labial palatalization would theoretically also be possible, given a target with the labial node specified. That operation, however, would be vacuous, as all palatal labials are underlying. For further discussion, see §7.1 below.
trigger is universally the complex dorso-coronal configuration. Fusing the place nodes of the target and the trigger yields one complex dorso-coronal specification that is shared by both participants.

6. Analysis

It is my intention to present below the analysis of how the unmarked cases of palatalization operate in Polish.

As outlined in §5, a process operates on the stem-final target and the suffix-initial trigger to produce a palatal segment. Following McCarthy (1986), I assume that if two adjacent segments have identical specifications for a certain node (in this case the place node), the OCP requires that they share the same node. Fusion could be said to be an extension of this principle, in that it recognizes the similarity of the target and the trigger and collapses the two nodes into one that is shared by both.

It is my contention that all palatalization is basically fusion. However, as Polish has two types of palatals, postalveolar and prepalatal, more detail must be given. To that end, I discuss the velar targets (fronting) first in §6.1, followed by the more complicated process for the coronal targets (raising) in §6.2. In §6.3 the issue of manner of articulation is addressed, followed by a discussion of why fusion is the preferred analysis to a simple case of spreading (§6.4).

6.1 Velar Targets

After having abstracted away from the morphological operations, there remains only one phonologically motivated action, which many have referred to as "velar fronting" (cf. Bhat (1978), etc.). Essentially, velar fronting is the relocation of a velar target to the palatal or dental region (depending on the language in question) as a result of palatalization. Recall that when the velar target is followed by a front vowel, a postalveolar is produced:

\[
\begin{align*}
\kappa &\rightarrow \tilde{c} \\
\gamma &\rightarrow \tilde{\varepsilon} / - - & i \\
\chi &\rightarrow \hat{\varepsilon} & e
\end{align*}
\]

As indicated in (32), when the trigger has the complex dorso-coronal specification and the target has the single dorsal node, the place nodes of the two segments fuse together to produce a palatal segment:

\[
\begin{align*}
\text{VELAR C:} &+ \\
\text{FRONT U:} & \\
\text{POSTALVEOLAR C:} &
\end{align*}
\]

- 53 -
As noted in §4, the place node of the velar dominates a dorsal node that has no dependents. Consequently, the specific palatal that results from fusion here is a postalveolar. At the same there is the question of why velar stops surface as postlaveolar affricates? This is addressed in §6.3 below.

6.2 Coronal Targets

As discussed in §4, I assume that the feature [F] is the phonologically marked feature on palatals. I also assume this feature must be forced to appear as a dependent of the coronal node whenever a dental is adjacent to a front vowel. The reasoning behind this is that if a dental should come to be followed by a front vowel, then the two coronal nodes will be adjacent. Such a sequence is a violation of the OCP:

(34)

I suggest that Polish makes use of a repair strategy that provides a specification for [F] and that this repair strategy takes precedence over the OCP:

(35)

With subsequent fusion of the two place nodes, the resulting palatal is "marked" in the phonological sense as a prepalatal:
Some questions of a problematic sort still remain unanswered. These are taken up in the next section.

6.3 Wrinkles of a Manner Nature

The first problem is that velar and coronal stops appear as affricates after having undergone palatalization (i.e., [k] \rightarrow [č], etc.). This is due to the fact that there are no postalveolar or prepalatal stops in the inventory: noncontinuant obstruents at these places of articulation are predictably affricates (i.e., manner is predictable for the noncontinuant nonsonorant postalveolar and prepalatal segments). Independently required redundancy rules will fill in the manner features that cause the segments to surface as affricates. Since this is predictable from the inventory and redundancy rules, it really forms no part of the process of phonological palatalization itself, and hence is of no immediate interest.

The second problem is that dental affricates appear as postalveolars, not as prepalatalas as expected. This is probably due to the fact that dental stops are supposed to become the corresponding prepalatalas, and as the prepalatal region has no stops that correspond exactly, the manner specification that would be filled in eventually by redundancy rules would be that of an affricate, thus neutralizing the distinction between the stop and affricate targets:
A general principle of recoverability can then be assumed to remove the extra feature on affricates after fusion has taken place in order to distinguish these segments from stops:

(38)

Because of this recoverability principle, we have avoided neutralizing the effect of palatalization between the dental stops and affricates. However, a price has been paid for this advance: now the distinction between the targets of the dental affricates and the velar stops has been neutralized:
Why does recoverability work between dental stops and affricates, but not dental affricates and velar stops? There is a possible answer to such a question: first, there are a limited number of segments in the palatal range, and so some sacrifices of recoverability must be made when consonants mutate into that region from two different directions; secondly, the only difference between dental stops and affricates, is manner, whereas dental affricates and the velar stops differ in place, and judging from their position in the hierarchy of the geometry, it is very likely that distinguishing segments on the basis of the status of their manner features is more important than distinguishing those on the basis of the status of their place features.

In any case, this problem poses no serious threat to the analysis proposed above in and of itself, as it mainly deals with attempting to explain the phenomenon of the place of articulation facts for Polish palatalization.

7. Problems

In this section I consider certain problem areas that arise as a result of the analysis of palatalization developed in the preceding sections.

7.1 Is Fusion Limited to The Present Cases?

The most important question here is why the target has to be either dental or velar. The answer is that it could in fact be labial. However, assuming (following Gorecka (1989) and Czaykowska-Higgins (1988)) that a palatal labial is responsible for a following vowel being front, an assumption that is based on certain distributional facts (palatal labials are never followed by non-front vowels and non-palatal labials are never followed by front vowels), a situation in which a front vowel is preceded by a simple labial segment simply does not exist.

The question that remains, regarding possible triggers, then, is why only front vowels are involved in fusion? I assume that if a (back) rounded vowel triggered fusion, the result would be a labialized consonant. This is precluded by structure preservation, however, as a labialized consonant is not present in the underlying inventory of Polish.
7.2 Fusion vs. Spreading Rules

In this section I address the question of why fusion is preferable to using two separate spreading rules? Before providing arguments in support of the present analysis, however, I will first explain what such spreading rules would involve. Essentially the same results would be obtained under a spreading analysis. At the same time, the spreading approach involves positing one rule that spreads the dorsal node onto a target that is specified only for coronal in order to derive the complex dorso-coronal palatal, and another rule that spreads coronal onto a target which is specified only for dorsal. These two rules are presented below:

(40)

This approach predicts that there are cases of lexical palatalization that act independently of each other in other languages: e.g., velars undergo palatalization while dentals do not, and vice versa. However, the process of postlexical palatalization often obscures those of lexical orientation, and so I leave this query for future exploration.

One apparent argument in support of this approach is that spreading, unlike fusion, is an uncontroversial type of assimilation process that is well-grounded in the literature. It is also difficult to say just what motivates a rule like fusion, whereas spreading generally functions in order to fill in a gap on an adjacent segment, and thus appears to be better motivated. Actually, this is a deceptive advantage, as many phonologists allow spreading only if it can dock onto an empty target. The spreading approach necessarily violates that constraint in order to derive the complex dorso-coronal palatal. This is not the case with fusion, though.

As indicated above, the spreading approach predicts that the two processes, coronal and velar palatalization, are actually entirely separate phenomena, whereas fusion considers these to be only one. The fact that the triggers are identical for both coronal and velar palatalization is therefore coincidental for the spreading approach, which is the wrong prediction, as the nature of assimilation is that targets are made to resemble triggers more closely, thereby rendering the status of the trigger very important to assimilation rules.

7.3 The Feature [F]

One problem that my analysis has produced has to do with predicting how the feature
[F] is interpreted with regard to other languages and whether or not its appearance is universal? According to the Node Activation Condition (NAC) proposed in Avery and Rice (1989), the only inventories that are effected by this feature's appearance are those which have rich coronal ranges (i.e., dental, retroflex, and/or palatal). Therefore, whether or not [F] is universal, only those languages which have a rich coronal range are susceptible to its appearance, as only these ever have a coronal node overtly specified in the lexical component. Recall that my solution requires that this feature appear as a dependent of the coronal node when a dental is adjacent to a front vowel. If [F] is not distinctive in a given language, structure preservation blocks its insertion.

8. Future Implications

To summarize the analysis presented here, I repeat the rule of phonological palatalization in (40):

\[(40)\]

\[
\text{C} \quad \text{V} \\
\text{Root} \quad \text{Place} \quad \text{Coronal} \quad \text{Dorsal} \\
\]

Recall that I have motivated the appearance of the feature [F], which overtly indicates tongue height as a repair of the violation of the OCP by the coronal nodes of the target and trigger:

\[(41)\]

\[
\text{dental} + \text{front vowel} \\
\text{X} \quad \text{X} \quad \text{X} \\
\text{Root} \quad \text{Place} \quad \text{Coronal} \quad \text{Dorsal} \\
\]

Fusion produces a prepalatal as in (42).
The same does not apply to the velar targets, as there is only one coronal and two dorsal nodes, and the two dorsal nodes are distinct by virtue of the fact that there are vowel specifications as dependents of dorsal, thereby correctly predicting that the result of fusion with velar targets is a segment with postalveolar place of articulation.

The dental affricates do not become prepalatal like their stop and fricative counterparts, but instead are realized as postalveolar. I claim that this is due to the principle of recoverability, as a prepalatal result would mean that the underlying stops and affricates would be neutralized. This principle therefore requires that the feature [F] be delinked after fusion as a repair strategy, thereby producing a postalveolar.

Below I explain why spirantization has not played a role in my analysis of Polish palatalization (§8.1), and finish with a look beyond Polish towards what we can expect if we apply these general principles to other languages (§8.2).

8.1 Spirantization

An issue that has been largely overlooked is that of spirantization. Spirantization is a phonological process which renders a stop a non-stop. Most phonologists tend to use the umbrella term palatalization not just for the phonological and lexically-marked types mentioned above, but also for the cases of spirantization and other sundry operations, some of which have nothing to do with each other. Many times, these processes are all linked together because they share the same environments as are generally accepted to trigger palatalization; however, the wisdom of this approach is unclear. It is possible that spirantization is completely separate from palatalization proper in some (if not all) languages, but the dividing lines tend to become somewhat blurred.

My position is that a strict approach to palatalization leaves no room for spirantization as a part of the general palatalization process. On occasion (as can be attested by the Polish data above), some spirantization-like effects can be seen, but these are actually superficial resemblances, as they can all be predicted from the inventory. For that reason, I have not

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Some spirantization rules create affricates while others create fricatives. It is not my desire to engage in a discussion of how best to characterize the manner features of affricates. For that reason, I will not include more detail into the precise operation of spirantization.
attempted to include a discussion of spirantization as a subset of palatalization, but instead prefer to postpone it until a later date.

8.2 Predictions

Here I discuss the implications of the above approach to lexical palatalization in languages other than Polish. The fact, that most languages do not have as rich a palatal inventory as Polish could lead us to the conclusion that palatalization in these other languages is a simpler process on the assumption that the underlying inventory is inextricably linked to the operation of palatalization. The underlying inventory determines what processes create violations of structure preservation, and how a segment is to be realized on the surface as a result of some repair operation. If a segment or articulation range is not available in the lexical domain (because it is not underlying), it cannot be created by means of a lexical rule, as it is a structure-changing operation. Therefore, either the rule is blocked or a repair strategy is performed after its application. It follows, then, that any language with a simpler underlying palatal inventory than that of Polish will produce simpler rule operations, as the complexity of the inventory determines the complexity of the rule's results. Therefore, we should be able to predict the operation of palatalization in any language given this model and a knowledge of any particular language's inventory.

For example, assume that Language A has an inventory that includes only one type of palatal, the postalveolar (or alveopalatal). Assuming that lexical palatalization is an active process in this language, we can predict that (1) both velars and dentals would be affected, and (2) the outcome of palatalization is a postalveolar segment. Upon contact with a velar target, the complex place node of the front vowel would fuse with the simple place node, producing the default palatal, just as in Polish.

(43)

```
VELAR C:     FRONT V:     POSTALVEOLAR C:

X +           X +           X

Root

Place

Coronal

Dorsal
```

The dental target would also be postalveolar, as no prepalatal range exists and so would not be allowed to be built. That is, if the feature [F] is not distinctive for this language, it would not appear as a dependent of the coronal node at all, thus creating a postalveolar segment as a result of fusion:
The prediction then is that a language of this type will have both dental and velar palatalization.

Now consider Language B with no palatal segments at all. Lexical palatalization is simply not possible due to the fact that fusion in the lexical domain would create a segment which does not exist in the underlying inventory. Structure preservation would prevent its creation by blocking the rule of lexical palatalization.

8.3 A Word Concerning the Lexical Framework and its Implications for Predictions

Throughout this paper, I have examined only cases of lexical palatalization: that is, the processes of palatalization that occur within the domain of morphology, subject to exceptions and functioning only between newly-concatenated morphemes. Postlexical palatalization operates independent of these criteria, applying across the board, whether between morphemes or at word edges. Unfortunately, the operation of postlexical palatalization obscures the application or non-application of lexical palatalization. If an utterance makes its way through the lexical component and palatalization is blocked by structure preservation, by the time it reaches the surface postlexical palatalization will have had a chance to apply. The result is that the effects of postlexical palatalization will cover the non-effects of lexical palatalization, and thus we will never be sure whether or not the prediction made by this analysis is sound. For that reason, I have not documented empirical evidence from real languages.

Further research could be undertaken on lexical palatalization by examining each language under consideration very carefully, essentially becoming intimate with the specific machinations of each rule and how it is applied. Such a task is clearly beyond the scope of this paper, and yet it is the only method possible when dealing with lexical palatalization. It is my contention that this type of intensive research will bear out the analysis of lexical palatalization presented here.

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APPENDIX 'A'

The symbols which are represented here, unchanged from the North American system are: t, d, s, z, n, l, l', etc.

Symbols which are foreign to the standard system are provided below:

any voiceless affricate ([ts]): [c]
any voiced affricate ([dz]): [ʐ]

These may be altered with diacritics to show their membership in the postalveolar or prepalatal range, as the fricative symbols also may:

postalveolars: [ć], [ź], [ś], [ż], etc.
prepalatalts: [ć], [ź], [ś], [ż], [ń], etc.

Variations on the diacritic for secondary palatalization are as follows: cY, ç, c'

I have chosen this transcription system for two reasons: (1) it closely resembles the standard Polish orthography; and (2) it clearly shows a true relation between the actual symbols and the distribution of the various units under question (i.e., there are no possible stops in the postalveolar or prepalatal region)